PILOT'S OPERATING HANDBOOK

AND FAA APPROVED

AIRPLANE FLIGHT MANUAL

Mooney M20K

THIS HANDBOOK INCLUDES THE MATERIAL REQUIRED TO BE FURNISHED TO THE PILOT BY THE FEDERAL AVIATION REGULATIONS, AND CONSTITUTES THE FAA APPROVED AIRPLANE FLIGHT MANUAL.

COMPLIANCE WITH THE FAA APPROVED MATERIAL IN THIS FLIGHT MANUAL IS MANDATORY.

THIS DOCUMENT MUST BE CARRIED IN THE AIRCRAFT AT ALL TIMES.

This book meets GAMA Specification No. 1, Specification For Pilot's Operating Handbook, issued Feb. 15, 1975 and revised Dec. 31, 1981.

MOONEY AIRCRAFT CORPORATION
P.O. BOX 72, KERRVILLE, TEXAS 78029-0072

SERIAL NUMBER: 25-1066

REGISTRATION NUMBER: ~~N252SS~~ OE-KOG

FAA APPROVED: L.B. Andriesen

for Don P. Watson, Manager
Aircraft Certification Division
FEDERAL AVIATION ADMINISTRATION
Department of Transportation
Southwest Region
Fort Worth, Texas

FAA APPROVED in Normal Category based on CAR PART 3 and applicable portions of FAR PART 23; applicable to Model M20K S/N listed above only.

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C	5-29-87

Always destroy superseded pages when inserting revised pages.

1234 REV. C

PILOTS OPERATING HANDBOOK AND AIRPLANE FLIGHT MANUAL
LOG OF REVISIONS

WARNING: This manual may not include the latest revisions.

Revision Number	Revised Pages	Description of Revisions	FAA Approved	Date
A	i,iii/ivBLANK	Revised Data	C L Stone	4/7/86
	2-5,2-6	Revised and Added Data		
	4-10 thru 4-12,	Revised Data		
	4-13 thru 4-16,	Revised and Relocated Data		
	4-19	Revised and Relocated Data		
B	3-19	Added CAUTION	C L Stone	8-15-86

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

CONGRATULATIONS . . .

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

-NOTICE-

This manual is provided as an operating guide for the Mooney Model M20K. It is important that you--regardless of your previous experience--carefully read the handbook from cover to cover and review it frequently.

All information and illustrations in the manual are based on the latest product information available at the time of publicatión approval and all sections including attached supplements are mandatory for proper operation of the aircraft. The right is reserved to make changes at any time without notice. Every effort has been made to present the material in a clear and convenient manner to enable you to use the manual as a reference. Your cooperation in reporting presentation and content recommendations is solicited.

REVISING THE MANUAL

The "i" pages of this manual contain a "List of Effective Pages" containing a complete current listing of all pages i.e., Original or Revised. Also, in the lower right corner of the outlined portion, is a box which denotes the manual number and issue or revision of the manual. It will be advanced one letter, alphabetically, per revision. With each revision to the manual a new List of Effective Pages and a "Log of Revisions" page(s) will be provided to replace the previous ones.

This handbook will be kept current by Mooney Aircraft Corporation when the information card in front of this handbook has been completed and mailed to Mooney Aircraft Corporation, P.O. Box 72, Kerrville, TX 78029-0072.

PILOT'S OPERATING HANDBOOK AND AIRPLANE FLIGHT MANUAL
LOG OF REVISIONS

WARNING: This manual may not include the latest revisions.

Revision Number	Revised Pages	Description of Revisions	FAA Approved	Date
C	i, iii/ivBLANK, 2-3,3-3,3-16,	Revised Data	Henry A Armstrong	5-29-87
	4-19,	Added Data		
	4-20	Deleted Data		

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

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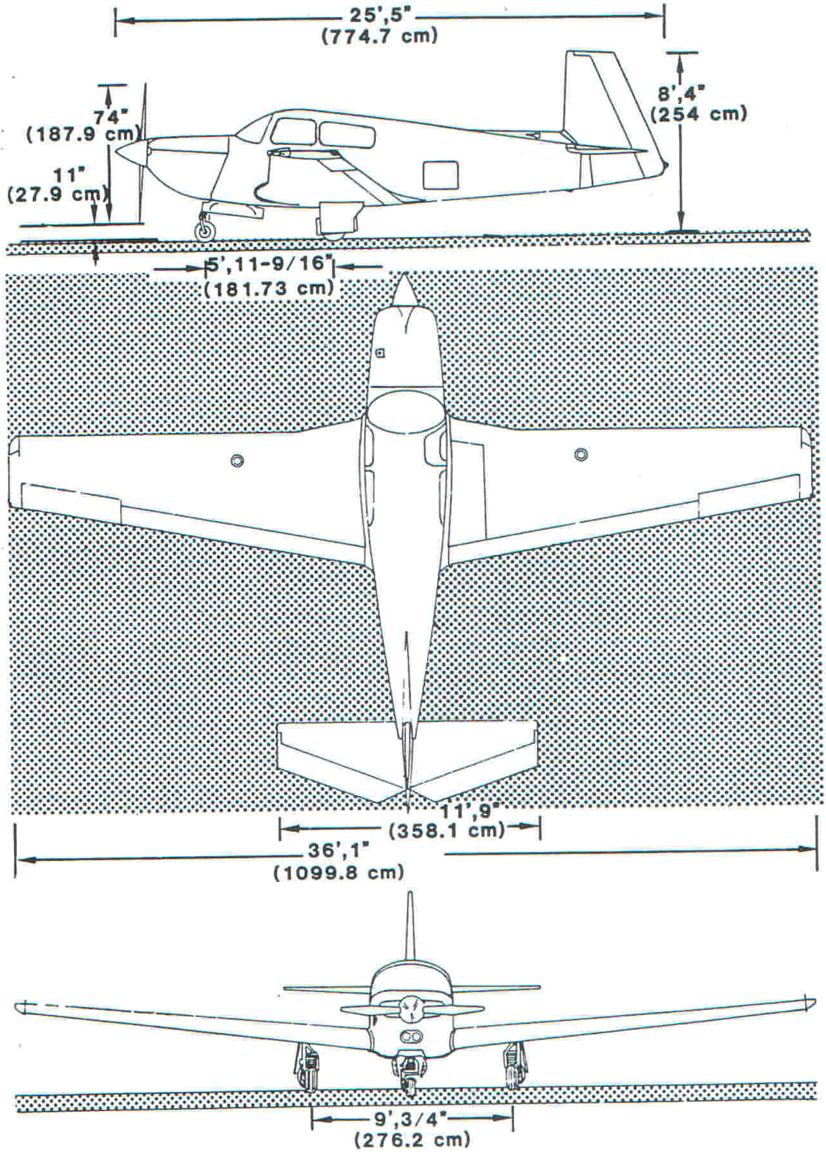

FIGURE 1-1 THREE VIEW

SECTION I
GENERAL

MOONEY M20K

INTRODUCTION

This Pilot's Operating Handbook contains 10 sections and includes the material required to be furnished to the pilot by CAR Part 3. 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 Pilot's Operating Handbook.

DESCRIPTIVE DATA

ENGINE

Number of engines..............................1
Engine Manufacturer.......Teledyne Continental Motors
Model...............................TSIO-360-MB1
Recommended TBO.......................1800 Hours
Type..............Reciprocating, turbocharged, intercooled, aircooled, fuel injected.
Number of cylinders...6, Horizontally opposed
Displacement...........360 Cu. In. (5899.4 cc)
Bore........................4.44 In. (11.28 cm)
Stroke.......................3.88 In. (9.86 cm)
Compression ratio..........................7.5:1

Fuel System

Type........Continuous flow fuel injection
Make...........Teledyne Continental Motors
Fuel-Aviation Gasoline.........100 or 100LL min. grade

Accessories

Magnetos....................Slick-No. 6224 (Pressurized)
Ignition Harness......5 MM Shielded (.750-20 Thd. Connection)
Spark Plugs................18 MM X .750-20 Thd. Connection
Turbocharger.......................Airesearch
Oil Cooler.....Teledyne Continental Motors
Alternator.........................TCM, 28V
Starter............................TCM, 28V
Alternator, Standby (Opt)...........TCM, 28V
Intercooler...........................TCM

Ratings:
Maximum Continuous Sea
Level BHP-RPM....................210 - 2700
Manifold Pressure at S.L......36.0 In. Hg.
Manifold Pressure at
Critical Altitude (Density)...36.0 In. Hg.
23000 ft. (+/-1500 ft.)

PROPELLER
Number.......................................1
Manufacturer........................McCauley*
Model Number.......2A34C221/90DHC-16E or -16EP*
Number of Blades.............................2
Diameter (No cutoff
allowed).................74.0 in. (187.96 cm)*
Type...........................Constant Speed
Governing.............Hydraulically controlled
by engine oil
Blade Angles @ 30 in. Sta.:
Low..............14.7 degrees +/- .2 degrees*
High............38.0 degrees +/- .5 degrees*

*OPTION: Hartzell BHC-J2YF-1BF/F8459A-11Q
73.0" (185.42 cm) (No cutoff allowed)
Blade Angles: @30 in. sta.
Low: 14.7 degrees +/- .1 degree
High: 36.5degrees +/- 1 degree
Spinner: Hartzell No. A2295

FUEL
Minimum Fuel Grade (Color)..........100 (Green)
100 LL (Blue)
Total Capacity....................78.6 U.S. Gal.
(297.7 Liters) (65.5 Imp. Gal.)
Usable.........................75.6 U.S. Gal.
(286.4 Liters) (63.0 Imp. Gal.)

OIL (After Break-In Period)
Oil Specification.............MHS-24B OIL (SAE)
SAE Oil Grade..................15W-50 or 20W-50
Total Oil Capacity........8 Qts. (7.57 Liters)
Oil Capacity (Minimum for Flight)........5 Qts.
(4.73 Liters)
Oil Filter...........................Full Flow

MOONEY M20K

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 14 degrees left or right of center.

Wheel Base..............71 9/16 in. (181.73 cm)
Wheel Thread............108 3/4 in. (276.2 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
Min. Turning Radius
(No brakes applied)............41 ft. (12.5 m)

MAXIMUM CERTIFICATED WEIGHTS

Maximum Loading (unless limited by C.G. envelope)
Gross Weight................2900 Lbs. (1315 Kg)
Baggage Area................120 Lbs. (54.43 Kg)
Hat Rack......................10 Lbs. (4.54 Kg)
Cargo (Rear Seats
Folded Down)................340 Lbs. (154.2 Kg)

STANDARD AIRPLANE WEIGHTS

Basic Empty Weight...............See Page 1-11
Useful Load..............Varies with installed equipment. See Section VI for specific airplane weight (pg. 6-6).

CABIN AND ENTRY DIMENSIONS

Cabin Width (Maximum)......43.5 In. (110.5 cm)
Cabin Length (Maximum)........114 In. (290 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	35 In. (88.9 cm)
Compartment Height	35 In. (88.9 cm)
Compartment Volume	17.0 Cu. Ft. (.476 cubic meters)
Cargo Area (with rear seat folded down)	33.0 Cu. Ft. (.924 cubic meters)
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	16.6 Lbs./Sq. Ft.
Power Loading @ Maximum Gross Weight	13.8 Lbs./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, temperature and compressibility.
Va	MANEUVERING SPEED - The maximum speed at which application of full available aerodynamic control will not overstress the airplane.
Vfe	MAXIMUM FLAP EXTENDED SPEED - The highest speed permissible with wing flaps in a prescribed extended position.
Vle	MAXIMUM LANDING GEAR EXTENDED SPEED - The maximum speed at which an aircraft can be safely flown with the landing gear extended.
Vlo	MAXIMUM LANDING GEAR OPERATING SPEED - The maximum speed at which the landing gear can be safely extended or retracted.
Vne	NEVER EXCEED SPEED or MACH NUMBER - The speed limit that may not be exceeded at any time.
Vno	MAXIMUM STRUCTURAL CRUISING SPEED - The speed that should not be exceeded except in smooth air and then only with caution.
Vs	STALLING SPEED - The minimum steady flight speed at which the airplane is controllable.

Vso	STALLING SPEED - The minimum steady flight speed at which the airplane is controllable in the landing configuration.
Vx	BEST ANGLE-OF-CLIMB SPEED - The airspeed which delivers the greatest gain of altitude in the shortest possible horizontal distance.
Vy	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 - The power developed by the engine.
MCP	MAXIMUM CONTINUOUS POWER - The maximum power for normal, abnormal or, emergency operations.
MP	MANIFOLD PRESSURE - Pressure measured in the engine's induction system and is expressed in inches of mercury (Hg).
RPM	REVOLUTIONS PER MINUTE - Engine speed.
TIT	TURBINE INLET TEMPERATURE - The exhaust gas temperature measured at the turbo-charger turbine inlet.
Turbo-charger	A device used to supply increased amounts of air to an engine induction system. In operation, the turbine is driven by engine exhaust gas mixture. The turbine directly drives a compressor which pumps air into the engine intake.

ENGINE CONTROLS & INSTRUMENTS TERMINOLOGY

Propeller Control	The control used to select engine speed.
Throttle Control	The control used to select engine power, from the lowest through the highest power settings.
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.
T.I.T. Gauge	A temperature measuring system that senses exhaust gas temperature at the inlet side of the turbocharger. The T.I.T. gauge is the primary indicator for mixture leaning in cruising flight at 78.6 % power or less.
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 the RPM of the engine/propeller by increasing or decreasing the propeller pitch, through a pitch change mechanism in the propeller hub.

AIRPLANE PERFORMANCE AND FLIGHT PLANNING TERMINOLOGY

Critical Altitude	The altitude above which the manifold pressure required for engine rated horsepower, at rated RPM, can no longer be maintained.

Demon-strated 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.

METEOROLOGICAL TERMINOLOGY

Density Altitude	Altitude as determined by pressure altitude and existing ambient temperature. In standard atmosphere (ISA) density and pressure altitude are equal. For a given pressure altitude, the higher the temperature, the higher the density altitude.
Indicated Pressure Altitude	The number actually read from an altimeter when, and only when, the barometric subscale has been set to 29.92 inches of mercury or 1013.2 millibars.
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 degrees 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 degrees C (-69.7 degrees F) is -0.00198 degrees C (-0.003564 degrees F) per foot.

OAT	OUTSIDE AIR TEMPERATURE - The free air static temperature, obtained either from inflight temperature indications or ground meteorological sources. It is expressed in degrees Celsius (previously Centigrade).
Pressure Altitude	The indicated pressure altitude corrected for position and instrument error. 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 the 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.
C.G. Arm	The arm obtained by adding the airplane's individual moments and dividing the sum by the total weight.
C.G. in percent MAC	Center of Gravity expressed in percent of mean aerodynamic chord.

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.
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 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 runout test has been completed in accordance with governmental regulations.
Usable Fuel	Fuel available for airplane propulsion.
Useful Load	The basic empty weight subtracted from the maximum weight of the aircraft. This load consists of the pilot, crew if applicable, usable 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	929.030 sq. centimeters
1 square yard	0.836 sq. meter

VOLUME OR CAPACITY	
U. S. Customary Unit	Metric Equivalents
1 cubic inch	16.387 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	453.59237 grams

SECTION II
LIMITATIONS

MOONEY M20K

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MOONEY M20K

INTRODUCTION

Section II includes operating limitations, instrument markings, and basic placards necessary for the safe operation of the airplane, its engine, standard systems and standard equipment. The limitations included in this section have been approved by the Federal Aviation Administration. When applicable, limitations associated with optional systems or equipment such as autopilots are included in Section 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 M20K.

SPEED

AIRSPEED LIMITATIONS

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

	SPEED	KCAS	KIAS	REMARKS
V_{NE}	Never Exceed Speed	195	196	DO NOT exceed this speed.
V_{NO}	Maximum Structural Cruising Speed	174	174	DO NOT exceed this speed except in smooth air, and then with caution.
V_{A}	Maneuvering Speed at: lb./Kg. 2092/949 2250/1021 2900/1315	99 103 117	101 104 118	DO NOT make full or abrupt control movements above this speed.
V_{FE}	Maximum Flap Extended Speed	109	112	DO NOT exceed this speed with flaps in full down position.
V_{LE}	Maximum Landing Gear Extended Speed	165	165	Maximum speed aircraft can be flown safely with landing gear extended.
V_{LO} (EXT)	Max. Speed for Gear Extension	139	140	Max. speed at which the ldg. gear can be safely extended.
V_{LO} (RET)	Max. Speed for Gear Retraction	104	107	Max.speed landing gear can be safely retracted.
	Maximum Pilot Window Open Speed	130	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)	56-112	Lower limit is maximum weight Vso at most fwd CG in landing configuration. Upper limit is max. speed permissible with flaps extended.
Green Arc (Normal Operating Range)	61-174	Lower limit is maximum weight Vs at most fwd CG with flaps retracted. Upper limit is maximum structural cruising speed.
Yellow Arc (Caution Range)	174-196	Operations must be conducted with caution and only in smooth air.
Red Line	196	Maximum speed for all operations.

FIGURE 2-2 AIRSPEED INDICATOR MARKINGS

POWER PLANT LIMITATIONS

Number of Engines....................................1
Engine Manufacturer....Teledyne Continental Motors
Engine Model Number....................TSIO-360-MB1
Engine Operating Limits for
Takeoff and Continuous Operations:
Maximum Power................................210 BHP
Maximum Engine Speed.....................2700 RPM
Maximum Manifold Pressure.............36.0 In. Hg
Maximum Turbine Inlet Temperature (TIT)
Continuous.......................1650 Degrees F
Maximum Turbine Inlet Temperature (TIT)
Transient........................1700 Degrees F
Max. Cylinder Head Temperature....460 Degrees F
Maximum Oil Temperature...........240 Degrees F
Minimum Oil Temperature-Ground Run-Up.....75 Degrees F
Minimum Oil Temperature-Takeoff........100 Degrees F
Oil Pressure
Normal Operating.......................30-80-PSI
Minimum (IDLE ONLY)........................10 PSI
Maximum (cold oil).........................100 PSI
Fuel flow
Maximum Continuous Horsepower (MCP) -
(Mixture Control FULL RICH at climb
critical altitude-NASA Standard Day Temp.)
Minimum-------(100LL) 21.5 GPH (125 lbs/hr)**
Maximum-------(100LL) 23.2 GPH (135 lbs/hr)**
Fuel Grade (Color)........100LL (Blue)/100 (Green)
Oil Specification.........................MHS-24B
Propeller Manufacturer...................McCauley*
Propeller Model Number.2A34C221/90DHC-16E or -16EP *
Propeller Diameter:
Min..........................74.0 In. (187.96cm)
Max. (No cutoff allowed)....74.0 In. (187.96cm)
Propeller Blade Angles @ 30 In. sta.:
Low.................14.7 Degrees +/- .2 Degrees*
High................38.0 Degrees +/- .5 Degrees*
Propeller Operating Limits(MAX)...........2700 RPM

*OPTION: Hartzell BHC-J2YF-1BF/F8459A-11Q
73.0 In. (185.42 cm) (No Cutoff Allowed)
* Low: 14.7 +/- .1 Degree
* High: 36.5 Degrees +/- 1Degree
**100LL fuel is calibrated at 5.82 lb/gal.
**100 octane fuel is calibrated at 6.0 lb/gal.

POWER PLANT INSTRUMENT MARKINGS

INSTRUMENT	REDLINE MINIMUM LIMIT	GREEN ARC NORMAL OPERATING	REDLINE MAXIMUM LIMIT
Tachometer	700 (No Redline)	1800-2700	2700 RPM
Manifold Pressure		10.0-36.0 In Hg.**	36.0 In. Hg.
Turbine Inlet Temperature		1300-1650 Degrees F	1650 Degrees F *
Cylinder Head Temperature		250-460 Degrees F	460 Degrees F
Oil Temperature	**** 100°F-Takeoff (No Redline)	100-240 Degrees F	240 Degrees F
Oil Pressure	(IDLE ONLY) 10.0 PSI***	30-80 PSI	100 PSI

* Operating time above 1650 Degrees F. T.I.T. must not exceed 30 seconds. Do not exceed 1700 Degrees F. under any condition.

** Normal operating range, no green arc required. (36 In. may be exceeded temporarily up to 38 In. maximum, not to exceed 2 minutes duration)

***Yellow arc - 10 to 30 PSI, CAUTION RANGE.

****75° F. Min.(Grnd. Run-up)Needle moves off White Dot.

NOTE

Refer to Teledyne Continental Motors (TCM) Engine Maintenance and Operators Manual Section on Engine Specifications and Operating Limits for recommended cruise power and temperature limitations.

WEIGHT LIMITS

Maximum Weight (takeoff and landing)....................2900 lb. (1315 Kg.)
Maximum Weight in Baggage Compartment..................120 lb. (54.4 Kg.) @ Fus. Sta. 95.5
Maximum Weight in Hatrack......10 lb. (4.54 Kg.) @ Fus. Sta. 119.0
Maximum Weight in Cargo Area (Rear seats folded down).....340 lbs. (154.2 KG) @ Fus. Sta. 70.7

CENTER OF GRAVITY LIMITS (GEAR DOWN)

Most Forward-40.6 In. (Fus. Sta. in IN.)
16.13% MAC.......................2360 lb. (1070 KG.)
Forward Gross-43.5 IN. (Fus. Sta. in IN.)
20.89% MAC.......................2900 lb. (1315 KG.)
Aft Gross-49.3 IN. (Fus. Sta. in IN.)
30.39% MAC.......................2900 lb. (1315 KG.)
MAC (at Wing Sta. 94.85)..................61.00 In.

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

NOISE LIMITS

The certificated noise level for the M20K at 2900 lbs. (1315 Kg.) maximum weight is 75.4 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.

MANEUVER LIMITS

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

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

Avoid sideslips with flaps extended and partial power (15-25 In. Hg. MP) applied.

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

Takeoff maneuvers when the selected fuel tank contains less than 12 gallons (45.5 liters, 10 IMP. Gal.) of fuel have not been demonstrated.

NOTE

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

Slow throttle movement required at airspeed above 165 KIAS. Above 165 KIAS, rapid throttle movement may cause momentary propeller RPM overspeed.

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.

KINDS OF OPERATION LIMITS

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

DO NOT OPERATE IN KNOWN ICING CONDITIONS.

TAKEOFFS WITH THE COWL FLAP INOPERATIVE ARE PROHIBITED.

Autopilot limitations --See Section IX.

FUEL LIMITATIONS

NOTE

Except for takeoff, fuel in the selected tank can be safely used until the quantity indicator reads empty (top of red line) for all other coordinated flight conditions.

NOTE

A visual fuel quantity gauge is installed on top of each tank and is to be used as a reference for filling the tanks only.

Standard Tanks.............(2) 39.3 U.S. Gal. each
(148.9 Liters) (32.7 Imp. Gal.)
Total Fuel:............................78.6 U.S. Gal
(297.7 Liters) (65.5 Imp. Gal.)
Usable Fuel:...........................75.6 U.S. Gal
(286.4 Liters) (63 Imp. Gal.)
Unusable Fuel:...........................3 U.S. Gal
(11.4 Liters) (2.5 Imp. Gal.)

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

CAUTION

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

OPERATING ALTITUDE LIMITATIONS

Maximum operating altitude is 28000 feet MSL. If this airplane is not equipped with an approved oxygen system and flight operations above 12,500 feet are desired, this airplane must be, (1) equipped with supplemental oxygen in accordance with FAR 23.1441 ,(2) operated in accordance with FAR 91.32 and (3) equipped with avionics in accordance with FAR 91 or FAR 135.

OTHER INSTRUMENTS AND MARKINGS

The following standard equipment is normally vacuum operated.

1. Artificial horizon.
2. Directional Gyro.

DECALS AND PLACARDS

CABIN INTERIOR

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

OPERATIONAL LIMITATIONS

THIS AIRPLANE MUST BE OPERATED AS A NORMAL CATEGORY AIRPLANE IN COMPLIANCE WITH THE OPERATING LIMITATIONS STATED IN THE FORM OF PLACARDS, MARKINGS AND MANUALS. NO AEROBATIC MANEUVERS, INCLUDING SPINS, ARE APPROVED. MAXIMUM SPEED WITH LANDING GEAR EXTENDED, 140 KIAS. MAXIMUM SPEED TO RETRACT GEAR, 107 KIAS. MAXIMUM SPEED TO EXTEND GEAR, 140 KIAS. MAXIMUM MANEUVERING FLIGHT LOAD FACTOR–FLAPS UP +3.8, -1.5; DN +2.0, -0.

EMERGENCY MANUAL GEAR EXTENSION

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

CAUTION

1. TURN OFF STROBE LITES WHEN TAXIING NEAR OTHER ACFT OR WHEN 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

DEFROSTER PULL ON	CABIN HEAT PULL ON	CABIN VENT PULL ON

CHECK LIST

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

On Lower Left Console Below Controls

VOLTS

Above ~~Loadmeter~~
(Used with OPT No. 2 ALT only)

DO NOT SLAM DOOR

LOCKED

Above Inside Door Handle

DO NOT OPEN
ABOVE 132 KIAS

On Pilots Window

PULL FOR
ALTERNATE
STATIC SOURCE

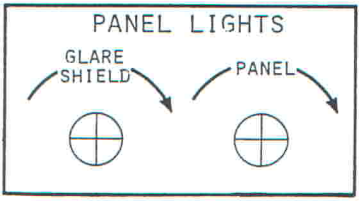
Left of Pilots
Control Wheel

LANDING
LIGHTS
L R

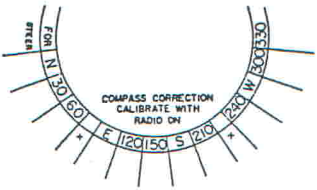
Above Split Switch

ALT AIR PULL ON | PARK BRAKE PULL ON

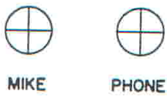
Upper Left Front
of Console



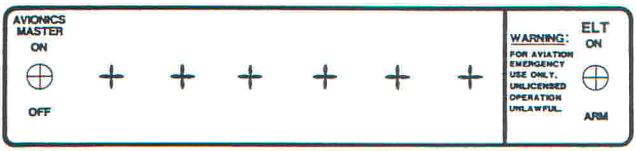
Right Lower
Radio Panel



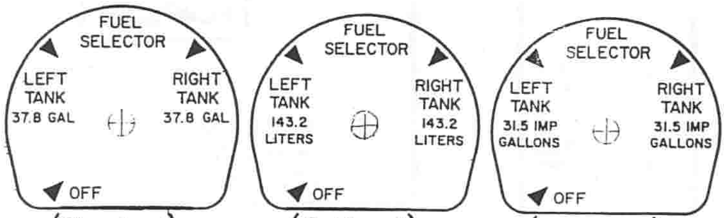
On Magnetic Compass



Lower Left
Instrument Panel

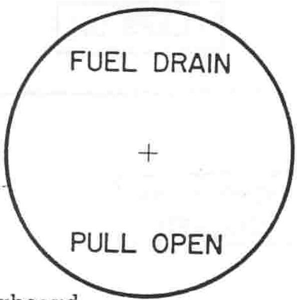


Top Right Instrument Panel
(Legend Varies With Equipment Installed)

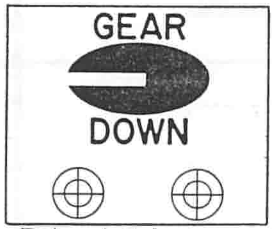


(Standard) (Optional) (Optional)

Floorboard
Aft of Console



Floorboard
Fwd of Pilot Seat



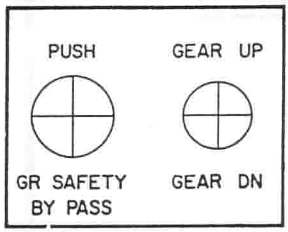
On Retract Tube
(Displayed thru Window
in Floorboard When LDG GR.
is Extended.)

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

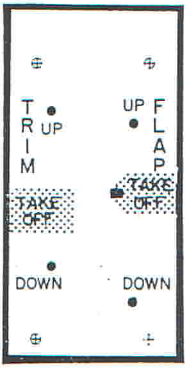
On Top Baggage Door Jamb

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

Above Inside
Baggage Door Handle



Upper Center
Instrument Panel

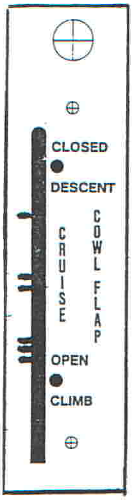


On Lower Engine Control Console

FLAPS UP

Right Console Above and Below Flap Switch

FLAPS DN



On Lower Console Below Flap Switch

COWL FLAP CLOSED

On Console Above & Below Cowl Flap Switch (Under Mixture Control)

COWL FLAP OPEN

ALT FIELD 1

Above Split Switch

(ALT No. 2 OPTIONAL)

THROTTLE
PUSH INCREASE

PROP
PUSH INCREASE

MIXTURE
PUSH RICH

Above Each Control on Lower Instrument Panel

GLARE SHIELD PANEL

BUS BATT

Under Right Radio Panel (Fuses)

Under Circuit Breaker Panel (Fuses)

PUSH TO PRIME

Lower Center Instrument Panel (Optional)

PUSH TO RELEASE

Between Seats on Emergency Gear Extension Release

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

Above Baggage Compartment On Hatrack Shelf

WARNING:

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

SEE AIRCRAFT LOADING SCHEDULE DATA FOR BAGGAGE COMPARTMENT ALLOWABLE

On Forward End of Rear Seat Bottom Structure

EXTERIOR:
The Following Placards Must Be Installed On The Exterior Of The Aircraft At The Locations Specified.

TIRE PRESSURE 42 LBS.

On Main Gear Doors

TIRE PRESSURE 49 LBS.

On Nose Gear Door

FUEL DRAIN Under each Wing near Sump Drains.	**PITOT DRAIN** Under Left Hand Wing Leading Edge near Fuselage
GASCOLATOR DRAIN Under Fuselage Aft of Nose Wheel Well	**STATIC DRAIN** Under Tailcone Aft of Wing Trailing Edge

TOWING LIMITS

WARNING
DO NOT EXCEED TOWING LIMITS

On Nose Gear Leg

NO STEP

On Inboard End of Flaps, Wing Leading Edges and Wing Ahead of Flaps

DO NOT PUSH

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

HOIST POINT

On Underside of Wings

FUEL-100 (GREEN) OR 100 LL (BLUE) MIN OCT 37.8 U.S. GAL USEABLE Standard	FUEL-100 (GREEN) OR 100 LL (BLUE) MIN OCT 143.2 LITERS USEABLE Optional
On Fuel Tank Caps	FUEL-100 (GREEN) OR 100 LL (BLUE) MIN OCT 31.5 IMP GAL USEABLE Optional

FUSELAGE INTERIOR
The Following Placards Must Be Installed Inside The Fuselage At The Locations Specified.

MAINTAIN ↓

LEVEL HERE

On Hydraulic Brake Reservoir

INFORMATIONAL:
The following placards are not required for airworthiness but are provided for informational purposes or aesthetics.

IMPORTANT INSTRUCTIONS

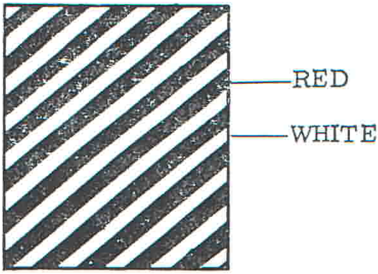
ALWAYS ADD WATER - NEVER ADD ACID.
NEVER FILL OVER BAFFLE NOR MORE THAN
1/4" OVER THE TOPS OF SEPARATORS.
FULLY CHARGED SPECIFIC GRAVITY - 1.275
RECHARGE REQUIRED WHEN SP. GR. REACHES 1.225
CHARGING RATES:
START - 4 AMPERES FINISH - 2 AMPERES
MAXIMUM TEMPERATURE ON CHARGE - 120° F (49° C)

KEEP CHARGED — PREVENT FREEZING

CARE SHOULD BE TAKEN NOT TO SPILL BATTERY
ACID WHEN SERVICING OR REMOVING BATTERY

Above Battery On Aft Side Baggage Compartment Bulkhead

Front Center of Control Wheels



On Retract Tube (Displayed thru Window on Floorboard When LDG Gr is Retracted).

DIM OFF BRT
CABIN LIGHT

On Headliner By Interior Light Switches

AIR VENT
— OPEN →

On Headliner Near overhead shutoff valve.

Mooney M20K

CRUISE POWER SCHEDULE
LEAN TO PEAK

NOTE: ADD 1" M.P. FOR EACH 10°C OAT ABOVE STD. DAY TEMPERATURE. SUBTRACT 1" M.P. FOR EACH 10°C OAT BELOW STD. DAY TEMPERATURE. IF OAT ABOVE STD. PRECLUDES OBTAINING THE DESIRED M.P., USE THE NEXT HIGHER RPM/M.P. WITH APPROPRIATE TEMPERATURE CORRECTION TO M.P. DO NOT EXCEED 1650° TIT.			Max. Recommended Cruise Pwr. 78.6% Pwr. (165 BHP)				70% Power (147 BHP)						65% Power (136.5 BHP)					
	Pressure Altitude Feet Std.Day	RPM	2400	2500	2600	2700	2200	2300	2400	2500	2600	2700	2200	2300	2400	2500	2600	2700
		Fuel Flow	12.7	12.8	12.9	12.9	11.3	11.5	11.7	11.7	11.7	11.8	10.5	10.7	11.0	11.0	11.0	11.1
		Std. Temp	MANIFOLD PRESSURE - INCHES OF MERCURY															
	S.L.	15°C	30.4	29.5	28.6	27.6	30.8	29.3	27.8	27.1	26.3	25.3	29.7	28.1	26.5	25.8	25.1	24.1
	2000	11°	30.1	29.2	28.3	27.3	30.4	29.0	27.5	26.8	26.0	25.1	29.2	27.7	26.1	25.4	24.7	23.7
	4000	7°	29.8	28.9	28.0	27.0	30.0	28.6	27.2	26.4	25.7	24.8	28.7	27.3	25.8	25.1	24.3	23.4
	6000	3°	29.6	28.6	27.7	26.8	29.7	28.3	26.9	26.1	25.4	24.5	28.2	26.9	25.5	24.8	24.0	23.2
	8000	1°	29.3	28.4	27.5	26.5	29.3	28.0	26.6	25.8	25.1	24.2	27.8	26.5	25.2	24.4	23.7	22.9
	10000	-5°	29.1	28.1	27.2	26.3	29.0	27.7	26.3	25.6	24.8	24.0	27.3	26.1	24.9	24.1	23.4	22.7
	12000	-9°	28.8	27.9	27.0	26.1	28.7	27.4	26.1	25.3	24.5	23.7	26.9	25.8	24.6	23.9	23.1	22.4
	14000	-13°	28.6	27.7	26.8	25.9	28.4	27.1	25.8	25.1	24.3	23.6	26.5	25.5	24.4	23.6	22.9	22.2
	16000	-17°	28.4	27.6	26.6	25.7	28.2	26.9	25.6	24.8	24.1	23.4	26.2	25.3	24.2	23.4	22.6	22.0
	18000	-21°	28.3	27.4	26.5	25.6	28.0	26.7	25.4	24.6	23.9	23.2	26.0	25.0	24.0	23.2	22.4	21.8
	20000	-25°	28.2	27.3	26.4	25.5	27.8	26.6	25.3	24.5	23.7	23.0	25.9	24.8	23.8	23.1	22.3	21.6
	22000	-29°	28.1	27.3	26.4	25.5	27.6	26.4	25.3	24.4	23.6	22.9	25.9	24.8	23.7	23.0	22.2	21.5
	24000	-33°	28.2	27.3	26.4	25.5	----	----	25.3	24.4	23.5	22.9	26.0	24.9	23.7	22.9	22.1	21.4
	26000	-37°	28.3	27.4	26.5	25.7	----	----	25.4	24.5	23.5	22.9	26.3	25.0	23.8	22.9	22.1	21.4
	28000	-40°	28.5	27.6	26.8	26.0	----	----	25.7	24.7	23.7	23.0	----	----	24.0	23.1	22.1	21.4

FOR MORE DETAILED INFORMATION CONSULT THE P.O.H. SECTION V.

On Pilots Sunvisor

On Wing Aft of Fuel Filler Caps

OPTIONAL:
See Section IX Supplements for Optional Placards required.

SECTION III
EMERGENCY PROCEDURES

MOONEY M20K

TABLE OF CONTENTS

SECTION III
EMERGENCY PROCEDURES

MOONEY M20K

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

Engine Failure after Takeoff
Wing flaps UP..........................85 KIAS
Wing flaps TAKEOFF/DOWN..................75 KIAS

Maximum Glide Speed
2900 lb/1315 kg........................87 KIAS
2700 lb/1225 kg........................83 KIAS
2500 lb/1134 kg........................81 KIAS
2300 lb/1043 kg........................76 KIAS

Maneuvering Speed
2900 lb/1315 kg.......................118 KIAS
2250 lb/1021 kg.......................104 KIAS
2092 lb/949 kg........................101 KIAS

Precautionary Landing with Engine Power,
Flaps DOWN..............75 KIAS

Emergency Descent (Gear UP)
Smooth Air............................196 KIAS
Turbulent Air
2900 lb/1315 kg...................118 KIAS
2250 lb/1021 kg...................104 KIAS
2092 lb/949 kg....................101 KIAS

Emergency Descent (Gear DOWN)
Smooth Air............................165 KIAS
Turbulent Air
2900 lb/1315 kg...................118 KIAS
2250 lb/1021 kg...................104 KIAS
2092 lb/949 kg....................101 KIAS

ANNUNCIATOR PANEL WARNING LIGHTS

WARNING LIGHT	FAULT & REMEDY
Gear Unsafe	Landing gear is not in fully extended/or retracted position. Refer to "Failure of landing gear to extend electrically" procedure on page 3- 19 or "Failure of Landing Gear to Retract" procedure on page 3- 20.
Left or Right Fuel Low	2 1/2 to 3 gallons of usable fuel remain in the respective tanks. Switch to fuller tank.
VAC (Flashing)	Suction is below 4.25 inches of mercury.
VAC (Steady)	Suction is above 5.5 inches of mercury.

NOTE

When either a steady or flashing VAC light is illuminated, the information obtained from the attitude and directional gyros is unreliable. Vacuum system should be checked and/or adjusted as soon as practicable.

Volts (Flashing)	Low voltage. Refer to "Alternator Low Voltage" on page 3- 19.
Volts (Steady)	Overvoltage or tripped voltage relay. Refer to "Alternator Overvoltage" on page 3- 18.
Alt. Air	Alternate air door is OPEN.
Start Power ON	Switch or relay malfunction and starter is engerized. Flight should be terminated as soon as practicable. Engine damage may result.

ENGINE

POWER LOSS - DURING TAKEOFF ROLL

Throttle....................................CLOSED
Brakes...........................Apply(Maximum)
Fuel Selector..................................OFF
Magneto/Starter Switch.......................OFF
Master...OFF

POWER LOSS - AFTER LIFTOFF AND DURING CLIMB

Airspeed................................85 KIAS (Flaps UP)
75 KIAS (Flaps TAKEOFF/DOWN)
Fuel selector.............OTHER TANK (fullest tank)
Throttle.............................FULL FORWARD
Propeller..................FULL FORWARD(High RPM)
Mixture.................................FULL RICH
Magneto switch....................Verify on BOTH
High Boost.......................................ON

If engine does not restart, proceed to POWER OFF LANDING, page 3- 17.

POWER LOSS - DURING FLIGHT (RESTART PROCEDURES)

Airspeed.......................... 85 KIAS Minimum
Fuel Selector...............Verify on FULLEST TANK

NOTE

At altitudes above 12,000 feet engine restart will take 13 seconds or longer when switching from an empty fuel tank to a full tank.

Magneto/Starter Switch...............CHECK on BOTH
If the engine shows no indication of restarting after the above items are accomplished, proceed as follows:

Throttle.............................FULL FORWARD
Propeller..................FULL FORWARD (HIGH RPM)
Mixture................................FULL RICH

NOTE

At altitudes above 18,000 ft., it may be necessary to slowly lean the mixture from the full rich position to facilitate engine restart.

If the engine still shows no indication of restarting:
High Fuel Boost Pump.....................................ON

CAUTION

With a normally operating engine, operation of the HIGH or LOW BOOST PUMP with low power settings may result in loss of engine power due to an overrich condition. The High Boost Pump Switch is guarded to prevent inadvertent operation but can be held on for momentary operation without removing the guard. Rotate guard clockwise to enable switch to be placed in the ON position.

If engine does not restart after several attempts using these procedures, proceed to POWER OFF LANDING, Pg.3-17.

After engine restarts:

Throttle..........................ADJUST as required
Propeller.........................ADJUST as required
Mixture.................RELEAN as power is restored
High Fuel Boost Pump................................OFF

NOTE

If engine fails when the high boost pump is turned OFF, suspect engine driven fuel pump failure. Procede to ENGINE DRIVEN FUEL PUMP FAILURE, page 3- 12.

CAUTION

Should the engine excessively cool during engine out, care should be exercised during restart to avoid excessive oil pressure. Allow the engine to warm up at minimum governing RPM and 16-18 inches MP. 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 degrees 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 the cowl opening and travel inside the inlet duct to the induction air filter. The ice particles or water droplets may collect and freeze on the air filter causing partial or total blockage of the primary engine induction system.

Indications of primary induction system blockage are either a loss of manifold pressure with a fixed throttle position or the need to gradually advance the throttle to maintain a given manifold pressure setting. In extreme conditions, the loss of indicated manifold pressure and engine power may be quite rapid. A loss of as much as 10 inches HG manifold pressure within one minute can be experienced.

If primary induction air system blockage occurs, the alternate engine induction air system will automatically open, supplying the 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 OUT 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 the loss of ram effect and the induction of warmer inlet air. Due to this loss of available power when using alternate air, especially when operating at altitudes above 15000 ft., it will be necessary to increase propeller RPM and relean the mixture control for optimum engine power.
Based upon the previous discussion, the following list should be used if a partial power loss due to primary induction air system blockage is experienced:

Engine Power..........................Verify progressive manifold pressure loss
Alternate Air.................Verify OPEN (annunciator ON)

NOTE

The alternate air door should open automatically if there is a restriction in the primary induction system. If the alternate air door has not opened (Annun.light-OFF) it can be opened manually by pulling the alternate air control knob OUT.

Throttle...............INCREASE to maintain desired manifold pressure.
Propeller..............INCREASE if necessary to maintain desired cruise power setting (Ref. Section V)
Mixture.........................RELEAN to peak TIT

NOTE

Approximately 75% power can be maintained at 20000 ft. with the primary induction system totally blocked, alternate air door open, full throttle, 2700 RPM and leaned to peak TIT.

Flight......................................CONTINUE
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....................................85 KIAS
Alternate Air.......................Manually OPEN
Throttle..........................Full FORWARD
Propeller.....................FULL FWD (HIGH RPM)
Mixture...................IDLE CUTOFF (initially)
Magneto/Starter Switch.............Verify on BOTH
High Fuel Boost Pump...........................OFF
Mixture...................ADVANCE slowly toward RICH until engine starts.

After engine restarts:
Throttle...........................ADJUST as required
Propeller ....ADJUST as required
Mixture ....RELEAN as power is restored(Refer to Power Charts - Section V)

If engine does not restart after several attempts, proceed to POWER OFF LANDING, page 3-17.

TURBOCHARGER FAILURE - COMPLETE LOSS OF ENGINE POWER

WARNING

> If a turbocharger failure is a result of a loose, disconnected or burned through exhaust, then a serious fire hazard exists. If a failure in the exhaust system is suspected in flight, LAND AS SOON AS POSSIBLE. If a suspected exhaust system failure occurs before takeoff, DO NOT FLY THE AIRCRAFT.

If a suspected turbocharger or turbocharger waste gate control system failure results in a complete loss of engine power, the following procedure is recommended:

NOTE

> At altitudes above 12,000 ft., an overrich mixture may result and the engine may quit operating if the turbocharger fails.

Mixture..IDLE CUTOFF
Throttle..............................SET at CRUISE POSITION
Propeller..FULL FORWARD
Mixture...................ADVANCE slowly until engine starts then ADJUST to fuel flow for selected power setting.
Continued Flight....... LAND as soon as practible

TURBOCHARGER FAILURE - REDUCTION OF POWER BUT ENGINE CONTINUES TO RUN

If the turbocharger wastegate control fails in the OPEN position, a partial loss of power may result. The following procedure is recommended if a suspected turbocharger/wastegate control failure results in a partial loss of engine power:

Throttle..........................USE AS LITTLE as possible
Propeller.......................................AS REQUIRED
Mixture.......ADJUST to fuel flow for selected power setting
Continued Flight....................LAND AS SOON AS PRACTIBLE

TURBOCHARGER FAULURE - ENGINE POWER OVERBOOST

If the turbocharger wastegate control fails in the closed position, an engine power overboost condition may be experienced. The following precedure is recommended for an overboost condition:

Throttle.................REDUCE as necessary to keep manifold pressure within limits.

NOTE

> Expect manifold pressure response to throttle movements to be sensitive.

Propeller.......................................AS REQUIRED
Mixture.........ADJUST to fuel flow for selected power setting
Continued Flight..................LAND AS SOON AS PRACTICABLE

ENGINE ROUGHNESS

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

//////////////
///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 - DURING FLIGHT on page 3-5. 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 if a lesser throttle setting causes roughness to decrease.

REDUCTION IN POWER

(Interruption of fuel flow, engine surging)

Mixture Control........................IDLE CUTOFF
Fuel Selector..........................OTHER TANK
Low Fuel Boost Pump.....................On 3-5 sec
Throttle.......................CRUISE POSITION
Propeller................................2700 RPM
Mixture.....................ADVANCE SLOWLY until engine starts
Boost Pump....................................OFF
Mixture....................ADJUST to obtain fuel flow appropriate to MP and RPM
If engine does not restart......High Fuel Boost On
If engine does not restart............Repeat after descending below 12000 feet

COWL FLAP FAILURE IN FULL CLOSED POSITION

Acceptable engine operating temperatures can always be maintained during flight with the cowl flap failed in the full closed position using the following:

Power..................................AS REQUIRED
Mixture....................................RICH
Airspeed...............................130 KIAS
Cylinder Head & Oil Temperature........MONITOR
in the normal operating range.

HIGH CYLINDER HEAD TEMPERATURE

Mixture......................READJUST to proper TIT value for power being used
Cowl Flap........................OPEN as required
Airspeed..................................INCREASE
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.

Cowl Flap........................OPEN as required
Airspeed..................................INCREASE
Power.......................................REDUCE
Prepare for possible engine failure if temperature continues high.

LOW OIL PRESSURE

Monitor..................Oil temperature and pressure
Pressure below 10 PSI........Expect engine failure, proceed to POWER OFF landing

ENGINE DRIVEN FUEL PUMP FAILURE

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

When operating the engine at moderate power with the HI BOOST PUMP ON and a failed engine driven fuel pump, the engine may quit when the manifold pressure is reduced below 20 in. Hg unless manually leaned.

NOTE

The maximum fuel flow capacity of the HIGH-BOOST PUMP decreases as density altitude is increased, therefore, the maximum available horsepower will also decrease as altitude is increased. At sea level the available fuel flow is approximately 14.1 U.S. GPH and by leaning 64% to 76% horsepower will be available. At 24000 feet the fuel flow is approximately 6.1 U.S. GPH and 29% to 41% horsepower will be available.

An engine driven fuel pump failure is probable when the engine will only operate with the boost pump on. Operation of the engine with a failed engine driven fuel pump and the HIGH-BOOST ON will require smooth operation of the engine controls and corresponding mixture change when the throttle is repositioned or the engine speed is changed. When retarding throttle or reducing engine speed lean the mixture to prevent the engine from quitting from an overrich condition. Enrich the mixture when opening the throttle or increasing engine speed to prevent engine stoppage 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:
Mixture..............................IDLE CUTOFF
Throttle.......................CRUISE Position
High Boost Pump...................................ON
Mixture...........INCREASE until engine starts and
adjust for smooth engine operation.
LAND as soon as practicable.

ENGINE PRIMER FAILURE (IN ON POSITION)

Engine primer failure in "ON" position will cause extremely rough running engine or loss of power. The following procedure will turn OFF the primer:
Panel Sw. Bus Circuit Breaker..........Pull "OFF"

NOTE

When Panel Sw. Bus Circuit Breaker is "OFF" all external lights, heated pitot, electric elevator trim (with some Avionics), high and low fuel boost, and the ability to turn off radio with the radio master switch will be lost.

FUEL VAPOR SUPPRESSION (Fluctuating Fuel Flow)

Low Fuel Boost Pump..........................ON
Fuel Flow................................MONITOR
Low Fuel Boost...............................OFF
(If condition still exists, repeat procedure).

FIRES

ENGINE FIRE-DURING START ON GROUND

Starter Switch............HOLD in cranking position
If engine starts:
Power..................1500 RPM for several minutes
Engine.............SHUTDOWN and inspect for damage
If engine does NOT start:
Starter Switch...................CONTINUE CRANKING
Mixture......................IDLE CUTOFF (Full Aft)
Throttle..............................FULL OPEN
Fuel Selector Valve..............................OFF
Magneto/Starter Switch...........................OFF
Master Switch....................................OFF
Fire Extinguisher.............................OBTAIN
Fire............EXTINGUISH with Fire Extinguisher

ENGINE FIRE-IN FLIGHT

Fuel Selector Valve..............................OFF
Throttle.........................CLOSED (Full Aft)
Mixture Control.............IDLE CUTOFF (Full Aft)
Magneto/Starter Switch...........................OFF
Cabin Ventilation & Heating Controls........CLOSED
(Controls Forward)
Cowl Flap.....................................CLOSED

NOTE

If fire is not extinguished, attempt to increase airflow over the engine by increasing glide speed and open cowl flap. Proceed with POWER OFF LANDING as described on page 3-17. DO NOT attempt an engine restart.

ELECTRICAL FIRE IN FLIGHT (Smoke in Cabin)

Master Switch....................................OFF

WARNING

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

Alternator Field Switch(es)....................OFF
Cabin Ventilation..............................OPEN
Heating Controls..........CLOSED (Control Forward)
Circuit Breakers..........CHECK to identify faulty circuit if possible

LAND as soon as practicable.

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

Master Switch....................................ON
Alternator Field Switch(es)......................ON
Select ESSENTIAL switches ON one at a time, and 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 with idle power, flaps UP & cowl flap CLOSED with the aircraft in two different configurations:

Configuration No. 1: Gear Down, 165 KIAS
Configuration No. 2: Gear UP , 196 KIAS

For an emergency descent from altitude, Configuration No. 1 is recommended. The angle of descent is greater and at 165 KIAS the ride will be smoother, resulting in less pilot workload.

THEREFORE:

The following procedure should be used for an emergency descent:

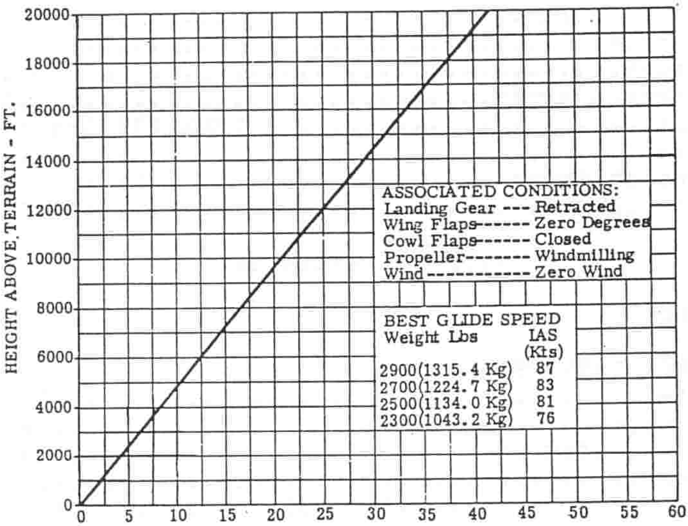
Power....................................RETARD Initially
Airspeed..140 KIAS
Landing Gear..EXTEND
Airspeed.....................INCREASE TO 165 KIAS after landing gear is extended.
Wing Flaps..UP
Cowl Flaps..CLOSED
Power During Descent...MP not less than 20 In. Hg.
Airspeed.........MAINTAIN 165 KIAS during descent.
Speedbrakes (If installed)..................EXTEND
Altitude.............................AS DESIRED

~ CAUTION ~

Do not exceed 20 In. Hg. Manifold Pressure before cylinder head temperature is above 250 Degrees F (121 Deg. C)

GLIDE

MAXIMUM GLIDE DISTANCE
MODEL M20K



GROUND DISTANCE - NAUTICAL MILES

LANDING EMERGENCY

POWER OFF-GEAR RETRACTED OR EXTENDED

Emergency Locator Transmitter..................ARMED
Seat Belts and Shoulder Harnesses............SECURE
Cabin Door...............................UNLATCHED
Fuel Selector.................................OFF
Mixture...........................IDLE CUTOFF
Magneto/Starter...............................OFF
Flaps....................Full DOWN (33 Degrees)
Gear..............DOWN or UP Depending on Terrain
Approach Speed............................75 KIAS
Master......................OFF, prior to landing

POWER ON - GEAR RETRACTED

Emergency Locator Transmitter..................ARMED
Seat Belts and Shoulder Harnesses...........SECURE
Cabin Door..................................UNLATCHED
When sure of making landing area:
   Fuel Selector................................OFF
   Throttle..................................CLOSED
   Mixture............................IDLE CUTOFF
   Magneto/Starter...............................OFF
   Flaps....................Full DOWN (33 Degrees)
   Master..OFF
   Approach Speed..............As Slow As Possible
   Wings..........................LEVEL ATTITUDE

SYSTEMS EMERGENCIES

PROPELLER

PROPELLER OVERSPEED
Throttle....................................RETARD
Oil Pressure.................................CHECK
Propeller...DECREASE, set if any control available
Airspeed....................................REDUCE
Throttle...............AS REQUIRED to maintain RPM
below 2700 RPM

FUEL

LOW FUEL FLOW
Check mixture...............................ENRICH
Fuel Selector........................Fullest TANK
If condition persists, use Boost Pump if necessary
and LANDING should be made as soon as practicable.

ELECTRICAL

ALTERNATOR OVERVOLTAGE (Voltage warning light illuminated steady)

Radio Master...................................OFF
Master.................................OFF, then ON
If Warning Light is still illuminated, the
following steps are required:
   Alternator Field Circuit Breaker...........PULL
   Non-essential Electrical Equipment..........OFF
   LAND as soon as practicable.

ALTERNATOR LOW VOLTAGE (Voltage warning light flashing)

Alternator Field Switch(es)............OFF then ON
If warning light still flashing, the following are required:
  Alternator Field Circuit Breaker...........PULL
  Non-essential Electrical Equipment..........OFF
  LAND as soon as practicable.

LANDING GEAR

FAILURE OF LANDING GEAR TO EXTEND ELECTRICALLY

Airspeed.........................140 KIAS or less
Landing Gear Actuator Circuit Breaker.........PULL
Gear Switch...................................DOWN
Manual Gear 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 ON; STOP when resistance is felt.
Visual Gear Down Indicator...................CHECK alignment by viewing from directly above the indicator

CAUTION

Continuing to pull on T-handle after GEAR DOWN light ON will bind actuator;electrical retraction MAY not be possible until binding is eliminated.

CAUTION

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

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.

FAILURE OF LANDING GEAR TO RETRACT

("GR SAFETY BY PASS", both gear annunciator lights illuminated and gear warning horn activated.)

"GR SAFETY BY PASS SWITCH"...........DEPRESS until gear fully retracted
"GEAR UNSAFE" and "GEAR DOWN" Lights...........OUT
"GEAR RELAYS" Ckt. Bkr.....PULL (Warning horn OFF)
Gear Extension.......RESET "GEAR RELAYS" Ckt. Bkr.
Gear Switch.................................DOWN
Check "Airspeed Safety Switch" as soon as practicable.

NOTE

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

OXYGEN

Refer to Section IX for operational procedures, if aircraft is equipped with oxygen. 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 the outside of the aircraft to the cabin interior.

Alternate Static Source..................PULL ON
Airspeed and Altimeter
Readings................CHECK Calibrations Tables

UNLATCHED DOOR IN FLIGHT

If the 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. Return to the field in a normal manner. If practicable, during the landing flare have a passenger hold the door to prevent it from swinging open.

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

Airspeed....................................96 KIAS
Pilot's Window..............................OPEN
Aircraft................RIGHT SIDESLIP (Right bank with left rudder)
Door............................PULL SHUT & LATCH

ICE PROTECTION

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

DO NOT OPERATE IN KNOWN ICING CONDITIONS.

The Model M20K 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:

Pitot Heat..................................ON
Propeller Deice...................ON (if installed)
Alternate Static Source...........ON (if required)
Manifold Pressure Gauge.....................MONITOR for any engine power reduction

| NOTE |

A loss of manifold pressure while operating in icing conditions may be an indication of primary engine induction system blockage. Refer to POWER LOSS PRIMARY ENGINE INDUCTION AIR SYSTEM BLOCKAGE on page 3-6.

Alternate Air..........................Verify OPEN
(System will operate automatically if the primary induction system becomes blocked.

| NOTE |

If primary engine induction inlet blockage is suspected and the alternate induction air system has failed to operate automatically,it can be operated manually by pulling out on the ALTERNATE AIR push-pull control.

Throttle..................... ....INCREASE
as necessary for desired power setting or aircraft performance.

PROPELLER..............................INCREASE
as necessary for desired power setting or aircraft performance.

Mixture.......................RELEAN to Peak TIT
(not to exceed 1650 deg. F.)

Cowl Flap...................................OPEN
as required for increased engine cooling.

AVOID FURTHER ICING CONDITIONS

A slight increase in engine vibration may be experienced if icing conditions are inadvertantly encountered. This is due to the uneven shedding of ice from the leading edges of each propeller blade. Use of the optional electrically heated propeller deice boots in icing conditions may also cause a slight vibration increase as ice is shed unevenly from each boot surface.

If an approach and landing becomes necessary with an ice accumulation on the airplane, the following suggestions are given:

1. To improve visibility through an iced over windshield select the cabin heat and defroster full ON.

2. Higher stall speeds and an increase in drag should be expected with airframe ice accumulation. During landing approach, add 10 KIAS to normal approach speeds and be prepared to use more power during descent and landing flare to overcome increased drag due to ice. Use of flaps during the approach with ice accumulation should be limited because of unpredictable changes in airflow over the tail surfaces.

EMERGENCY EXIT OF AIRCRAFT

CABIN DOOR
PULL latch handle AFT.
OPEN door and exit aircraft.

BAGGAGE COMPARTMENT DOOR
Fold rear seat backs forward, CLIMB OVER.
PULL off plastic cover.
PULL white button.
Lift red handle "UP".
OPEN door and exit aircraft.

To verify re-engagement of outside latch mechanism; open outside handle fully, close inside red handle to engage pin into cam slide of latch mechanism, push in on white button until it snaps in place. Replace cover. Operate outside handle in normal manner.

SPINS

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

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

NOTE

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

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

Rudder...............Apply FULL RUDDER opposite the direction of spin
Control Wheel........FORWARD of neutral in a brisk motion. Additional FORWARD elevator control may be required if the rotation does not stop.
Ailerons.................................NEUTRAL
Throttle..........................RETARD to IDLE
Hold anti-spin controls until rotation stops.
Flaps (If extended)........................RETRACT as soon as possible
Rudder.................NEUTRALIZE when spin stops
Control Wheel...........SMOOTHLY move aft to bring the nose up to a level flight attitude.

OTHER EMERGENCIES

Refer to Section IX for Emergency Procedures of Optional Equipment.

TABLE OF CONTENTS

SECTION IV
NORMAL PROCEDURES

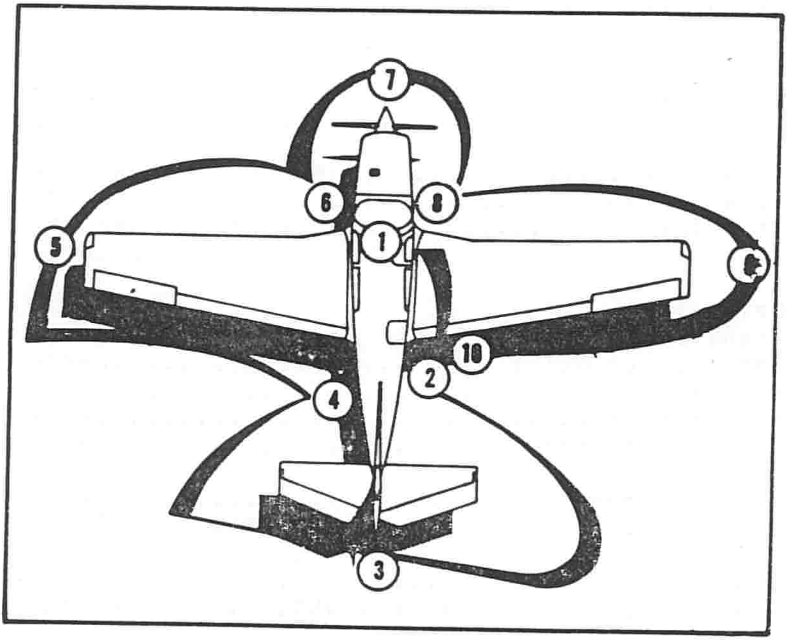
MOONEY M20K

INTRODUCTION

This section describes the recommended procedures for the conduct of normal operations for the airplane. All of the required (FAA 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 (Supplements).



PREFLIGHT INSPECTION

1. Cockpit -

Gear Switch....................................DOWN
Magneto/Starter.................................OFF
Master Switch....................................ON
Internal/External Lights...................CHECK
Fuel Gauges, Quantity.......................CHECK
Master Switch...................................OFF
Fuel Selector..............R: PULL gascolator ring (5 seconds)
Fuel Selector..............L: PULL gascolator ring (5 seconds)

2. Right Tailcone Area -

Instrument Static Port...............UNOBSTRUCTED
Right Fuselage.................CHECK skin condition
Tail tiedown...............................REMOVE

3. Empennage -
Elevator and rudder attach points and control linkage attachments..........................CHECK
General skin condition..........................CHECK
Remove all ice, snow, or frost.

4. Left Tailcone Area -
Fresh Air Vent (on dorsal fin)................CLEAR
Instrument Static Port.................UNOBSTRUCTED

Left Fuselage..................CHECK Skin condition
Tailcone Access Door.........................SECURED
Static System Drain................Push Plunger UP, (Hold 3-5 Seconds)

5. Left wing -
Skin condition.....Remove all ice, snow, or frost.
Flap and attach points.........................CHECK
Aileron and attach points....................CHECK
Control linkages..............................CHECK
Wing tip and lights...........................CHECK

Left wing leading edge.........................CHECK
Pitot tube......................UNOBSTRUCTED. Heat Element Operative.
Stall Switch Vane......................UNOBSTRUCTED
Fuel Tank..............CHECK QUANTITY. SECURE CAP

NOTE

The anti-siphon fuel filler will trap fuel in the filler neck. Always push bottom of filler open when filling tank and when checking fuel.

NOTE

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

Tiedown......................................REMOVE
Tank Vent..........................UNOBSTRUCTED
Wheel chock..................................REMOVE
Left main gear, shock discs and tire.........CHECK
Left main gear doors..........................CHECK
Fuel tank sump drain.............DRAIN Until Clear
Pitot System Drain................Push plunger UP,

Gascolator drain valve............CLOSED (Hold for 3-5 seconds) (Check for drips)

6. Left Cowl Area -
Windshield....................................CLEAN
Left Side Engine Cowl Fasteners............SECURED
Cowl Flap.....................................CHECK
Engine Oil.........CHECK QUANTITY (Maximum 8 qts.)
Oil Filler Cap.............................SECURED

7. Propeller -
Blades.........CHECK for nicks, cracks & oil leaks
Spinner..................CHECK for security, cracks
Cooling Air Intakes...................UNOBSTRUCTED
Landing Light..................CHECK Lens & Bulbs
Nose gear, shock discs and tire.............CHECK
Nose Gear Door.............CHECK for Loose Linkage
Wheel Chock................................REMOVE

8. Right cowl area -
Right Side Engine Cowl Fasteners...........SECURED
Engine Induction Air Inlet Duct.......UNOBSTRUCTED
Exhaust Pipe...............................SECURED
Windshield...................................CLEAN
Cabin Cooling Vent....................UNOBSTRUCTED

9. Right Wing -
Fuel Tank Sump Drain.............DRAIN until clear
Right main gear, shock discs and tire.......CHECK
Right main gear doors.......................CHECK
Wheel chock................................REMOVE
Tank vent.............................UNOBSTRUCTED
Tiedown....................................REMOVE
Right wing leading edge.....................CHECK
Fuel Tank...................CHECK QTY (Secure Cap)

| NOTE |

The anti-siphon fuel filler will trap fuel in the filler neck. Always push bottom of filler open when filling tank and when checking fuel.

| NOTE |

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

Wing tip and lights..........................CHECK
Aileron and attach points....................CHECK
Control linkages.............................CHECK
Flap and attach points.......................CHECK
Skin condition......Remove all ice, snow, or frost

10. Baggage door..............................SECURED

BEFORE STARTING CHECK

Preflight Inspection.....................COMPLETED
Seats, seat belts and
shoulder harness..................ADJUST & SECURE
Magneto/starter switch.........................OFF
Master switch..................................OFF
Alternator Field Switch(es)....................OFF
Radio master switch............................OFF
Fuel boost pump................................OFF
Alternate static source...................Push OFF
Internal/External lights.......................OFF
Pitot heat.....................................OFF
Throttle....................................CLOSED
Propeller.................................HIGH RPM
Mixture................................IDLE CUTOFF
Cowl flap..........Verify Switch in OPEN position
Parking brakes.................................SET
Flap switch...................CENTERED (flaps up)
Cabin heat................................PUSH OFF
Defrost...................................PUSH OFF
Cabin vent..............................AS DESIRED
Fuel selector.........................FULLEST TANK
Compass (slave switch)...........ON (if installed)

Circuit breakers.............................CHECK

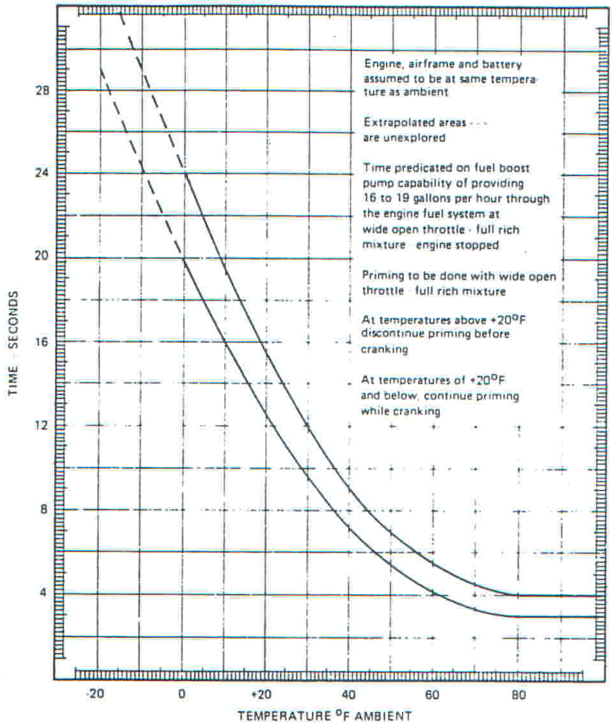
Emergency locator transmitter....................ARM
Radios................SET FREQUENCIES (Non-digital radios)
Landing gear switch............................DOWN
Passengers...................Emergency and general information briefing
Refer to Section IX for Optional Equipment Checks.
Obtain local information prior to engine start.

STARTING ENGINE

NOTE

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

Throttle..................FULL OPEN while priming, then retard to 1/4 OPEN
Propeller................FULL FORWARD (HIGH RPM)
Mixture........................FULL FORWARD (RICH)
Master switch..................................ON
Alternator Field Switch(es)......................ON
Annunciator lights...................PRESS TO TEST
(All light bulbs except the "START POWER ON" should illuminate)
Primer.................ON (See Priming Time Table)



PRIMING TIME REQUIREMENT

| NOTE |

At temperatures below 20 degrees F. (-7 degrees C), continue priming while cranking until engine starts.

Propeller Area..................................CLEAR
Magneto/Starter switch............TURN and PUSH to start, release to both when engine starts. Additional prime if engine does not continue to run.

NOTE

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

Throttle....................Set at 1000 to 1200 RPM
Engine Oil Pressure........if MINIMUM OIL PRESSURE is not indicated within 30 seconds, STOP ENGINE and determine problem.
Voltmeter...........CHECK for 27-28 Volts (to verify the alternator(s) are ON LINE)

NOTE

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

FLOODED ENGINE STARTING

Fuel boost pump......................................OFF
Throttle.............................FULL FORWARD
Mixture..............................IDLE CUTOFF
Magneto/Starter switch...........TURN and PUSH to start, release to both when engine starts.
Throttle........................Retard to 1200 RPM
Mixture........................Full forward (RICH)
Engine Oil Pressure........if MINIMUM OIL PRESSURE is not indicated within 30 seconds, STOP ENGINE and determine problem

WARM ENGINE STARTING

Fuel boost pump.....................................OFF
Throttle..............................Slightly open
Mixture.............................Full forward (RICH)
Magneto/Starter switch............TURN and PUSH to start, release to both when engine starts.
Throttle..........................1000 to 1200 RPM

Engine Oil Pressure........If MINIMUM OIL PRESSURE is not indicated within 30 seconds, STOP ENGINE and determine problem.

BEFORE TAXI

Radio Master Switch..............................ON
External Lights.......................As desired
Directional Gyro...........SET or SLAVE SWITCH - ON
Instruments......................Normal Operation
Radios.....................CHECK (Set Frequencies)
Altimeter..SET
Fuel Selector.................Switch tanks, verify engine runs on other tank
Cowl Flap..Check operation,Position OPEN or AS REQUIRED

NOTE

During cold weather, ground operations may be conducted with cowl flap positioned partially or fully closed to help keep engine temperatures in their normal operating ranges prior to takeoff. However, if cowl flap is positioned fully closed for ground operations, monitor engine temperatures to avoid exceeding maximum allowable limits.

TAXI

NOTE

It may be necessary to increase RPM slightly to prevent flashing of the "LOW VOLTS" light.

Parking brake..................................Release
Brakes..........................Check during Taxi
Directional Gyro..........Proper indication during turns
Turn Coordinator..........Proper indication during turns
Artificial Horizon...............Erect during turns
Taxi...................................Minimum power

BEFORE TAKEOFF

NOTE

A thorough pre-takeoff check is recommended, however EXCESSIVE time spent conducting a pre-takeoff check list will effect fuel economy.

Parking Brake..SET
Fuel Selector...........................FULLEST TANK
Throttle....................................1200 RPM
Propeller...................................HIGH RPM
Mixture.........................Full Forward (RICH)
Cowl Flap...OPEN or AS REQUIRED to keep engine temperatures in normal operating ranges.
Alternate Air......................VERIFY CLOSED
Alternator(s)...............................CHECK
PROPER ALTERNATOR OPERATION IS CHECKED AS FOLLOWS:
Alt. 1 Sw............................OFF(Alt output/load 0%)
Volts...............Approx. 24V(HIGH/LOW VOLT Annun. flashes)
Alt. 1 Sw.........................~~ON(Alt output~~/load increases)
Volts..........Approx. 28V(HIGH/LOW VOLT Annun. extinguishes)

OPTIONAL DUAL ALTERNATORS(IF INSTALLED)
Both Alt #1 & #2 Switches..................................ON
Alt. 1 Sw......OFF(Alt 1 output 0%, Alt 2 output/load assumed)
Volts............PUSH load/volts selector, check approx. 28V
Alt. 1 Sw.........................ON(check for normal output, (Basic load carried by Alt 2)
Alt. 2 Sw ......OFF(Alt 2 output 0%, Alt 1 output/load assumed) (% output may be less than Alt 2 value)
Volts............PUSH load/volts selector, check approx. 28V
Alt. 2 Sw.............ON(check for normal output/load/volts indications;Alt 2 can normally be expected to carry most of the indicated output/load)
Alternator field Switch(es)...............Verify ON (after above check)
Oil Temperature................75 Degrees F minimum (Needle moves off white dot)

CAUTION

Do not operate the engine at run-up speed unless the oil temperature is 75 Degrees F. minimum. Operation of the engine at too high a speed before reaching minimum oil temperature may cause loss of oil pressure.

Throttle....................................1700 RPM
Magnetos..............CHECK, Both to L, Both to R, Both, (Maximum 150 RPM drop each magneto, 50 RPM 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
Throttle.......................Retard to 1000 RPM
Trim.............................Takeoff setting
Flaps...............Check operation. SET TAKEOFF
(10 Degrees)
Controls...........Check free and correct movement
Cabin Door.........................CHECK SECURED
Seat Belts and Shoulder Harness............SECURED
Avionics and auto pilot............Check (Refer to
Section IX)
Annunciator Lights..................Press to Test
Internal/External Lights................As Desired
Rotating Beacon/Strobe Lights...................ON
Pilots Window.................................CLOSE
Emergency gear extension red handle...........DOWN
and LATCHED
Parking Brake...............................Release

TAKEOFF PROCEDURES

CAUTION

The ENGINE OIL MUST BE WARM, at least 100 Degrees F. (bottom of green arc) before takeoff, to assure proper turbocharger operation. The engine must not be operated at high power until the oil has reached this temperature.

CAUTION

If the turbocharger and its controlling system are properly rigged, manifold pressure will increase to 36.0 inches Hg. when the throttle is full open. However, during cold weather operations, a full throttle takeoff may result in a 1.0 to 2.0 in. Hg. increase in manifold pressure above the 36.0 in. Hg. allowable limit. This condition is allowed for short periods of time only (under 2 minutes). If this slight overboost occurs at full throttle, reduce the throttle slightly (within the 2 minute time limit) to obtain the recommended 36.0 in. Hg. maximum power manifold pressure setting.

NOTE

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

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

TAKEOFF

Fuel boost pump....................................OFF
Alternate air...................................CLOSED
Parking brake......................................OFF
Engine oil temperature.......100 Degrees F MINIMUM
Power..........................36.0" MP and 2700 RPM
Engine instruments........Check proper indications
Aircraft attitude.......Lift nose wheel at 67 KIAS
Climb speed..................74 KIAS until clear of obstacle, then accelerate to 95 KIAS
Landing gear................Retract in climb AFTER clearing obstacle
Wing flaps.........Retract AFTER clearing obstacle

NOTE

See Section V, pages 5-15 and 5-16 for takeoff distances and aircraft weight vs speed table.

CLIMB

CAUTION

During cold weather operations, climbing with full throttle may result in a 1.0 to 2.0 in. Hg. increase in manifold pressure above the 36.0 in. Hg. allowable. When executing a full throttle climb, monitor manifold pressure readings and adjust the throttle as necessary to maintain 36.0 in. Hg.

NOTE

During cold weather operations, climbing with cowl flap positioned less than full open is permitted provided engine temperatures are maintained within normal operating ranges.

Use noise abatement procedures as published by airport and/or this manual.

CLIMB (NORMAL)

Power.........................32" MP, and 2500 RPM
Mixture...........RICH (Ref. TCM Operators Manual)
Cowl flap.................Full OPEN or AS REQUIRED
Airspeed.............................95 to 115 KIAS
Maintain these power settings and attitude to at least 3000 feet AGL or cruise altitude.

CLIMB (BEST RATE)

Power..........................36.0" MP and 2700 RPM
Mixture...RICH
Cowl flap...................Full OPEN or AS REQUIRED
Airspeed................................96 KIAS

NOTE

See Section V, Page 5-17 for rate of climb graph.

CLIMB (BEST ANGLE)

Power..........................36.0" MP and 2700 RPM
Mixture...RICH
Cowl flap...................Full OPEN or AS REQUIRED
Airspeed...........71 KIAS at sea level increasing approximately 1.5 KIAS for each 5000 feet altitude

CRUISE

NOTE

Reference Section V for power setting tables and performance charts.

Airspeed..............Accelerate to cruise airspeed
Throttle................Set MP to selected setting
Propeller..............Set RPM to selected setting
Mixture..........................LEAN to PEAK TIT (not to exceed 1650 Deg. F.)

///WARNING///

Continuous operation with TIT in excess

of 1650 deg. F is prohibited for all conditions. Leaning to a TIT of 1700 deg. F for a maximum of 30 seconds is permitted.

| NOTE |

Careful leaning of the mixture control will result in maximum possible fuel efficiency. This requires operating at peak TIT for the power setting being used. Failure to do so will result is excessive fuel burn.

After leveling off at cruise altitude, set MP and RPM for desired power setting per Cruise Power Chart in Section V. Slowly lean Mixture until until TIT reaches peak value. TIT indica tions become sensitive as peak is approached; careful adjustments are necessary for accurate settings. Changes is altitude or power MAY require readjustment of TIT.

Cowl flap..........AS REQUIRED to maintain cylinder head and oil temperatures in their normal operating ranges.

CAUTION

When cruising in conditions where OAT is well above standard or at very high altitudes, it may be necessary to OPEN cowl flap to as much as the 1/4 open position in order to keep engine temperatures within operating limits. When the cowl flap is OPEN during cruise the following effects on cruise speed will result:

Cowl Flap -1/4 Open(indicator positioned at first index) Approx. loss in TAS.........(2)KTAS

Cowl Flap -1/2 Open(indicator positioned at second index) Approx. loss in TAS..........(4)KTAS

| NOTE |

During high OAT, a very low fluctuation in fuel flow may occur. If this occurs, proceed as follows:

Low Boost Pump............................ON

Fuel Flow..........................MONITOR

Low Boost Pump...........................OFF

If condition persists, repeat procedure above.

Engine temperatures............Stabilize at cruise condition (approximately 5 minutes)

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

Do not use the HIGH BOOST PUMP unless the engine driven fuel pump has failed. See emergency procedures for operation of the High Boost Pump.

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

DESCENT

NOTE

Avoid extended descents at manifold pressure settings below 20 in. Hg. as the engine can cool excessively and may not accelerate satisfactorily when power is reapplied. Additionally, leaning the mixture to peak TIT during descent will save fuel and will eliminate any engine roughness associated with an overly rich mixture setting. During descent engine MP will tend to increase as the aircraft loses altitude. Occasional power reductions with the throttle may be required to maintain the original descent manifold pressure setting.

Normal (Gear Up)
Gear...UP
Throttle.........................ABOVE 20 IN. Hg. MP
Propeller...............................2200 RPM
Mixture.................................PEAK TIT
Cowl flap...............................CLOSED
Cylinder head temperature....Monitor-250 Degrees F minimum
Airspeed..............................AS DESIRED

NOTE

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

Normal (Gear Down)
Airspeed.....................DECELERATE to 140 KIAS
Gear..DOWN
Throttle.........................ABOVE 20 In. Hg. MP
Propeller...............................2200 RPM
Mixture.................................PEAK TIT
Cowl Flap...............................CLOSED
Cylinder Head Temperature......MONITOR (250 deg. F minimum)
Airspeed...........................165 KIAS or less

| NOTE |

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

APPROACH FOR LANDING

Internal/External lights..................As desired
Seat belts, shoulder harness..............FASTENED
Landing gear...............EXTEND (below 140 KIAS)
(Gear down light on - Check visual indicator)
Mixture........................FULL RICH (on final)
Propeller.......................HIGH RPM (on final)
Fuel Boost Pump.................................OFF
Fuel Selector.......................FULLEST TANK
Wing flaps..............As desired (full down below 112 KIAS)

CAUTION

From a flaps retracted trimmed condition, the force required for nose up pitch control will rapidly increase when power is reduced to idle and as flaps are fully extended. Timely trimming action should be accomplished to minimize forces. Control force change with extending landing gear is minimal.

Trim....................................As desired

NOTE

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

Parking Brake..............................Verify OFF

GO AROUND (BALKED LANDING)

CAUTION

From a flaps extended and power at idle trimmed condition, the force required for nose down pitch control will rapidly increase when Maximum Continuous Power (MCP) is applied and as flaps are fully retracted. Little control force change will be experienced when retracting the landing gear.

Power.........................36.0" MP and 2700 RPM
Mixture..........................VERIFY FULL RICH
Flaps.....After climb established-TAKEOFF position
Trim....Reduce control force by trimming NOSE DOWN
Airspeed.......................Accelerate to 77 KIAS
Landing Gear..................................RETRACT
Flaps...RETRACT
Cowl Flap..OPEN
Airspeed.......................Accelerate to 94 KIAS

LANDING

LANDING (NORMAL)

Airspeed on Final..............75 KIAS (Full Flaps)
Touchdown..........................Main wheels first
Landing Roll...............Lower nose wheel gently
Brakes............................Minimum required

NOTE

See Section V, Pages 5-35 and 5-36 for Landing Distance Tables.

LANDING (MAXIMUM PERFORMANCE)

Airspeed on Final..............69 KIAS (Full Flaps)
Touchdown..........................Main Wheels First
Landing Roll...........Lower nose wheel as quickly as possible
Brakes.............MAXIMUM without locking wheels

LANDING (CROSSWIND)

Airspeed on Final............Above normal approach airspeed with Full Flaps (if crosswind component is above 12 KTS use 1/2 Flaps)
Final Approach..............Allow Aircraft to crab
Prior to flare.............Slip aircraft into wind
Touchdown..Main wheels first (aligned with runway)
Landing Roll...........Lower nose wheel as quickly as possible
Brakes................As required to slow aircraft as quickly as possible

CAUTION

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

TAXI AFTER LANDING

Throttle..........................1000 to 1200 RPM
Flaps......................................RETRACT
Cowl Flap.....................................OPEN
Trim..........................RESET to Takeoff
Radios..................................As required

SHUTDOWN

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

Operate the engine at idle (below 1500 RPM) for 5 minutes to allow the TURBOCHARGER TO COOL. Taxi time after landing may be considered as part of the 5 minutes.

Parking brake......................................SET
Throttle........1000 RPM (approximately 5 minutes)
Radio master.......................................OFF
Internal/External Lights...........................OFF
Mixture...................................IDLE CUTOFF
Magneto/Starter Switch...OFF(when propeller stops)
Alternator Field Switch(es)........................OFF
Master Switch......................................OFF

SECURING THE AIRCRAFT

Magneto/Starter.............VERIFY OFF/Key removed
Master Switch........................VERIFY OFF
Radio Master.........................VERIFY OFF
Electrical Switches..................VERIFY OFF
Parking Brake.....RELEASE and install wheel chocks
For extended parking.........Control wheel secured with seat belts, cabin vents closed; tie down aircraft at wing and tail points.

SECTION V
PERFORMANCE

MOONEY M20K

SECTION V
PERFORMANCE

MOONEY M20K

INTRODUCTION

Performance data charts on the following pages are presented so that the pilot can derive the information needed to plan flights with reasonable accuracy. The performance data and charts presented are calculated based upon actual flight tests , using average piloting techniques, 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.

It is not possible to make allowances in the charts for varying levels of pilot technique, proficiency or environmental conditions. The effect of soft runways, winds aloft or airplane configuration changes must be evaluated by the pilot. However, the performance data on the charts can be duplicated, by following the stated procedures, in a properly maintained, standard M20K.

Mechanical or aerodynamic modifications to the aircraft are not authorized since they can affect the performance or flight characteristics of the aircraft.

USE OF PERFORMANCE CHARTS

Performance data is presented in tabular or graphical form to illustrate the effect of different variables. Example problems are shown on each chart to demonstrate how each chart is used. Only on those charts whose use is obvious is no example given.

Generally, three items are required before entering each performance chart: (1) aircraft weight, (2) outside air temperature and (3) aircraft pressure altitude. The aircraft weight can be calculated utilizing the information provided in Section VI of this handbook. Outside air temperature is obtained by reading the OAT gauge in the aircraft's altimeter to 29.92 in. Hg. and read the indicated altitude. (BE SURE TO RETURN THE ALTIMETER TO THE LOCAL BAROMETRIC PRESSURE SETTING AFTER OBTAINING PRESSURE ALTITUDE).

Performance information derived by extrapolation beyond the limits shown on the charts should not be used for flight planning purposes. REMEMBER--To get chart performance, follow the chart procedures.

OPERATIONAL PROCEDURES FOR MAXIMUM FUEL EFFICIENCY

For maximuim fuel efficiency in the M20K, proper mixture leaning during cruise flight must be accomplished. The TSIO-360-MB1engine in the M20K has been designed to attain maximum fuel efficiency at the desired cruise power at peak T.I.T.(turbine inlet temperature). T.I.T. 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 T.I.T. as the primary reference instead of setting to a particular fuel flow.

The following procedure is recommended for setting cruise power and leaning to peak T.I.T. at 78.6% power or less:

1. After leveling off, set the manifold pressure and RPM for the desired cruise power in accordance with the cruise power schedule on page 5-21. At this point, the mixture control is at full rich from the climb.

2. Next, slowly move the mixture control toward lean while observing the T.I.T. indicator. If leaning the mixture toward peak T.I.T. causes the original manifold pressure setting to change, use the throttle to maintain that desired cruise manifold pessure and continue leaning. Continue this procedure until the T.I.T. peaks. (Peak T.I.T. is defined as the point where further leaning causes a drop rather than a rise in T.I.T.). Several throttle and mixture adjustments may be required before peak T.I.T. and the desired

cruise manifold pressure are obtained.

3. Under conditions of high outside air temperatures and high power, peak T.I.T. may be found to be in excess of 1650 degrees F. If that is the case, the leanest allowable condition for continuous operation will be at 1650 degrees F T.I.T.

NOTE

It is permissible to exceed the T.I.T. limit of 1650 deg. F for periods not to exceed 30 seconds. However, do not exceed 1725 deg. F under any condition.

PERFORMANCE CONSIDERATIONS

USE OF COWL FLAP

When in level cruise flight with outside air temperatures well above standard or when cruising at very high altitudes, it may be necessary to open the cowl flap to keep engine temperatures in the normal operating range. Since the cowl flap in the M20K is multi-position, numerous open settings are available to keep cylinder head and oil temperatures in the green arc under the most adverse conditions.

Using the cowl flap position indicator as a reference, the following cowl flap open positions are given along with their effects on cruise speed:

Cowl flap closed to cowl flap 1/4 OPEN(indicator positioned at first index)(Approx. loss in TAS.................2 Kts.
Cowl flap closed to cowl flap 1/2 OPEN(indicator positioned at second index)(Approx. loss in TAS................4 Kts.

An appropriate adjustment to the range data shown for the cowl flap closed condition can be made based on the flight time planned with the cowl flap partially open. For example, using the above speed decrement for the cowl flap 1/2 open for a 5 hour flight will result in the following decrease in range:

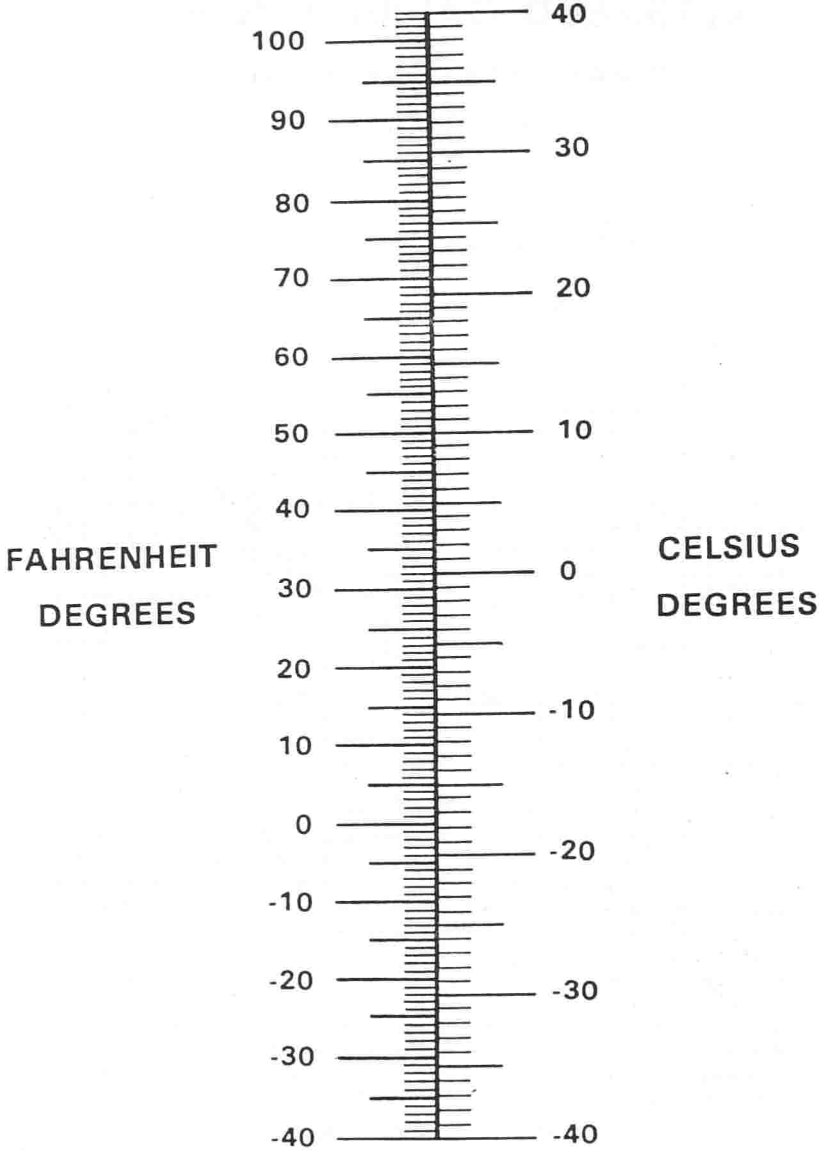
5 hr. x 4 Kts. = 20 N.M. reduction in range

MAIN GEAR LOWER DOOR REMOVAL

If numerous takeoffs and landings are to be conducted on soft fields or in tall grass, or if ice and snow are likely to be present on runway and taxiway surfaces for extended periods, it may be advantageous to remove the lower doors installed on each main landing gear. These doors can be damaged during operations in soft field conditions, or a heavy accumulation of packed snow or ice inside the doors could prevent proper landing gear operation.

If these small 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:

a. Decrease true airspeed at cruise by approximately 5 Kts.
b. Decrease range by as much as 65 N.M. for 75.6 gallon fuel capacity.



TEMPERATURE CONVERSION

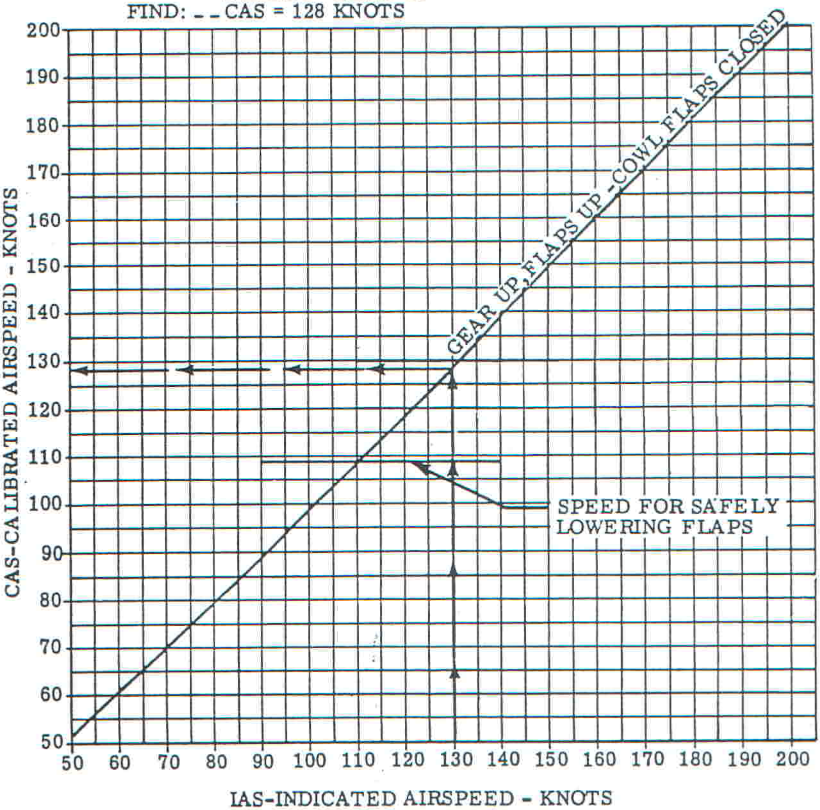
AIRSPEED CALIBRATION

PRIMARY STATIC SYSTEM

(GEAR UP)

NOTE: INDICATED AIRSPEED ASSUMES
ZERO INSTRUMENT ERROR.

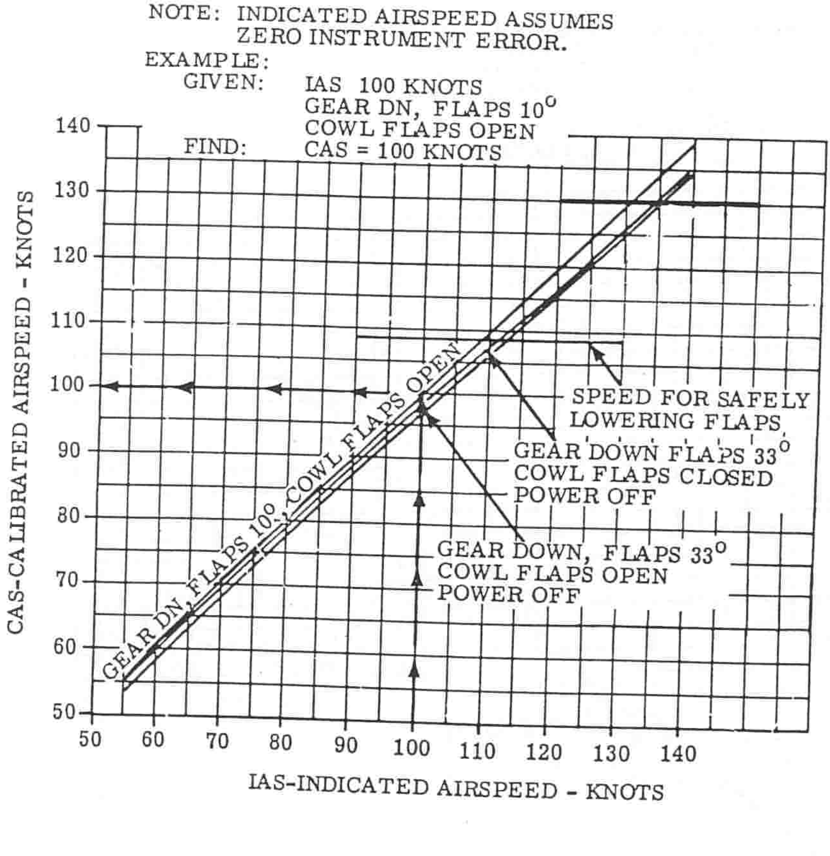
EXAMPLE:
GIVEN: - - IAS 130 KNOTS
FLAPS 0° GEAR UP
FIND: - - CAS = 128 KNOTS



AIRSPEED CALIBRATION

PRIMARY STATIC SYSTEM

(GEAR DOWN)

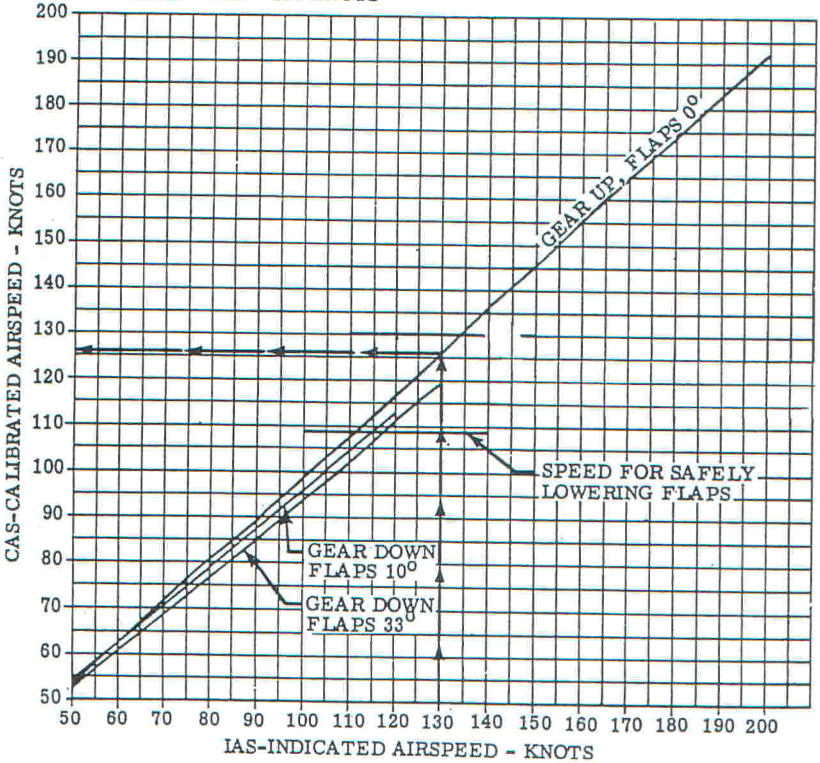


AIRSPEED CALIBRATION

ALTERNATE STATIC SYSTEM

NOTE: INDICATED AIRSPEED ASSUMES ZERO INSTRUMENT ERROR.
VENT CLOSED, DEFROSTER ON
COWL FLAPS CLOSED, POWER ON

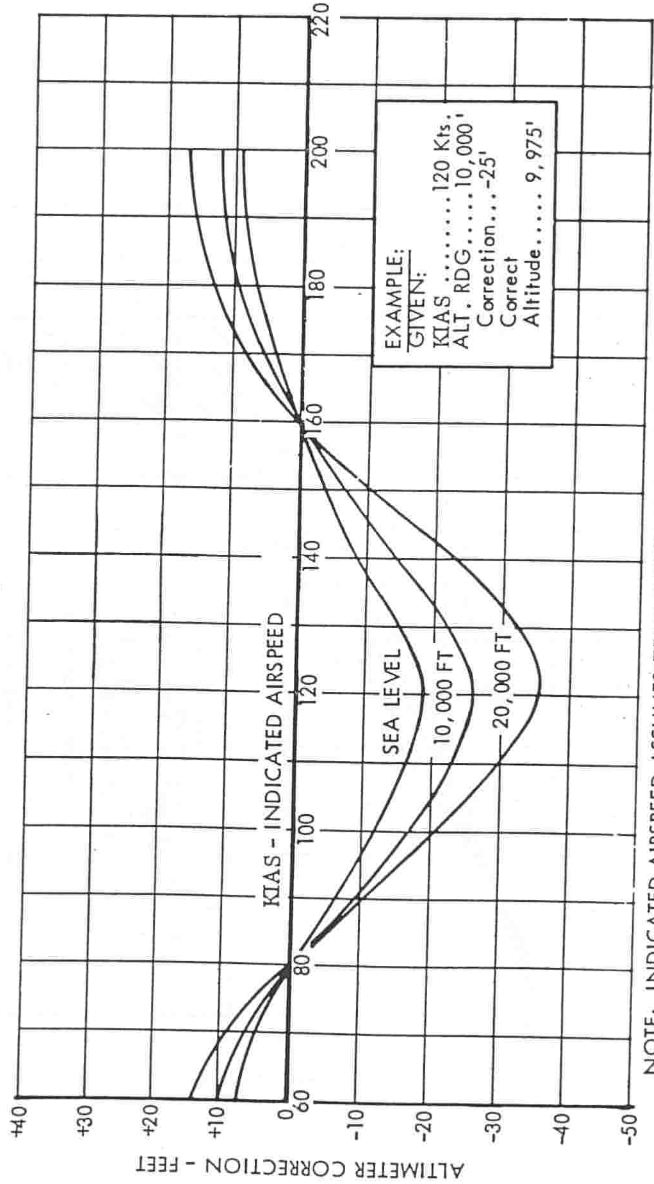
EXAMPLE:
GIVEN: IAS 130 KNOTS
GEAR UP, FLAPS UP
FIND: CAS = 126 KNOTS



ALTIMETER CORRECTION

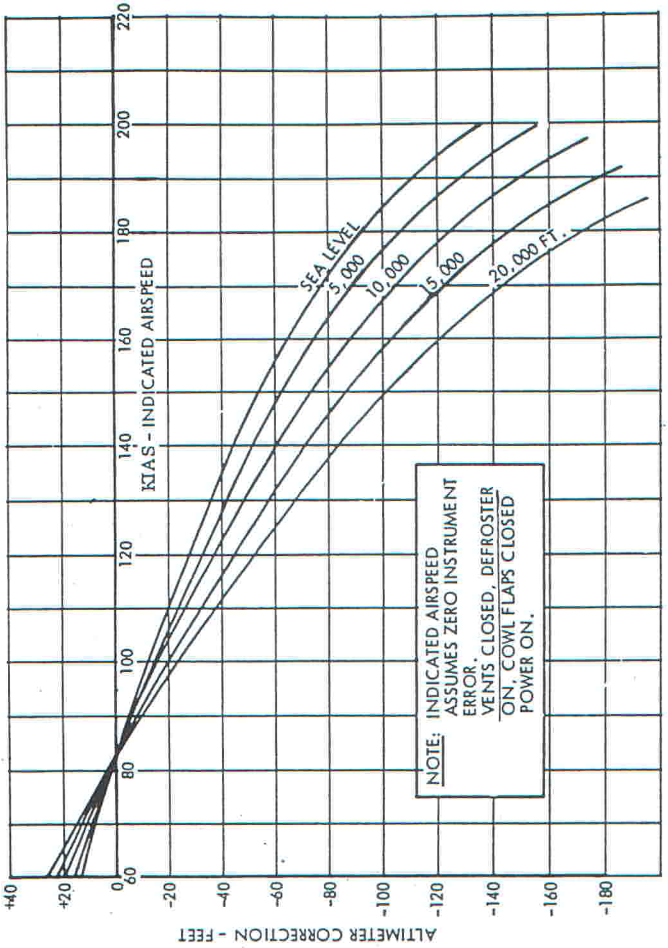
PRIMARY STATIC SYSTEM

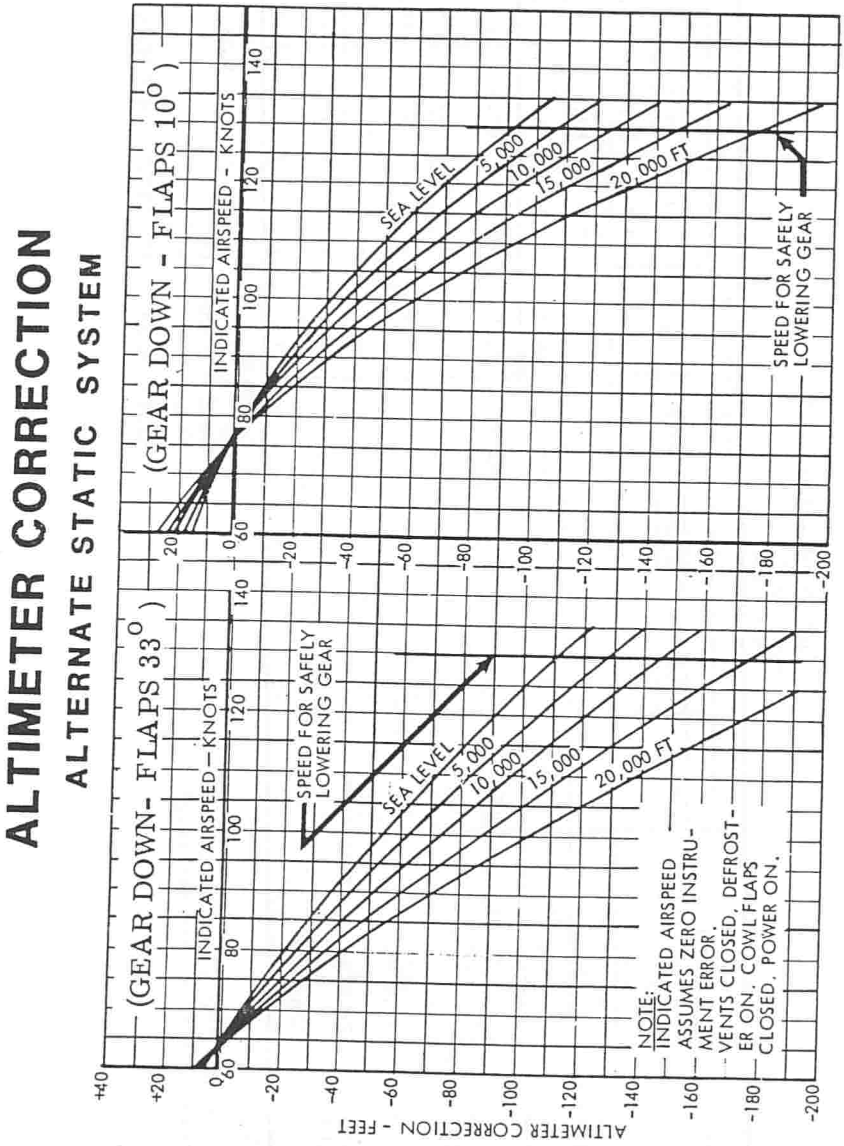
(GEAR UP, FLAPS UP)



NOTE: INDICATED AIRSPEED ASSUMES ZERO INSTRUMENT ERROR.

ALTIMETER CORRECTION
ALTERNATE STATIC SYSTEM
(GEAR UP, FLAPS UP)




ALTIMETER CORRECTION
ALTERNATE STATIC SYSTEM
(GEAR DOWN - FLAPS 10°)
(GEAR DOWN- FLAPS 33°)
INDICATED AIRSPEED - KNOTS
60
80
100
120
140
SEA LEVEL
5,000
10,000
15,000
20,000 FT
SPEED FOR SAFELY LOWERING GEAR
+40
+20
0
-20
-40
-60
-80
-100
-120
-140
-160
-180
-200
ALTIMETER CORRECTION - FEET
NOTE:
INDICATED AIRSPEED ASSUMES ZERO INSTRUMENT ERROR.
VENTS CLOSED, DEFROSTER ON, COWL FLAPS CLOSED, POWER ON.

STALL SPEED vs ANGLE OF BANK

ASSOCIATED CONDITIONS:

Forward C.G.
Power Idle

GROSS WEIGHT	GEAR AND FLAP POSITION	ANGLE OF BANK							
		0°		30°		45°		60°	
		KCAS	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS	KIAS
2900 LBS (1315 KGS)	GEAR UP, FLAPS 0°	62.5	61.0	67.0	67.0	74.5	74.5	88.5	89.5
	GEAR DOWN, FLAPS 10°	61.5	60.5	66.5	66.5	73.5	73.5	87.5	87.5
	GEAR DOWN, FLAPS 33°	57.5	59.0	61.5	63.5	68.0	70.0	81.5	84.0
2600 LBS (1179 KGS)	GEAR UP, FLAPS 0°	59.0	58.0	63.5	63.0	70.5	70.5	83.5	84.0
	GEAR DOWN, FLAPS 10°	58.5	58.0	63.0	62.5	69.5	69.5	82.5	82.5
	GEAR DOWN, FLAPS 33°	54.5	56.5	58.5	60.5	64.5	66.5	76.5	79.0
2300 LBS (1043 KGS)	GEAR UP, FLAP 0°	55.5	55.0	60.0	59.5	66.0	66.0	78.5	79.0
	GEAR DOWN, FLAPS 10°	55.0	54.5	59.0	58.5	65.5	65.0	77.5	77.5
	GEAR DOWN, FLAPS 33°	51.0	50.0	55.0	57.0	60.5	62.0	72.0	74.0

NOTE:

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

EXAMPLE:

Weight	2600 LBS (1179 KGS)
Landing Gear	Down
Flaps	10°
Angle of Bank	45°
Stall Speed	69.5 KCAS (69.5 KIAS)

TAKEOFF DISTANCE

TAKEOFF WEIGHT - LBS (KGS)	TAKEOFF SPEED KIAS	SPEED AT 50 FT.-KIAS
2900 (1315)	67	74
2600 (1179)	64	70
2300 (1043)	60	65

NOTE 1) MAXIMUM DEMONSTRATED CROSSWIND VELOCITY IS 12 KNOTS.

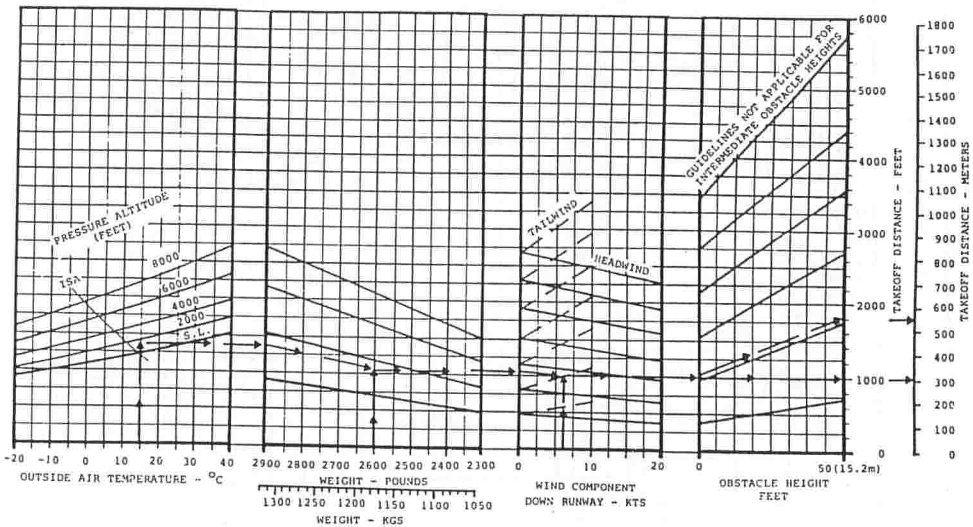
2) CONDITIONS OF HIGH HUMIDITY CAN RESULT IN AN INCREASE OF UP TO 10% TO THE TAKEOFF DISTANCE.

ASSOCIATED CONDITIONS

POWER	36 IN. MANIFOLD PRESSURE 2700 RPM
LANDING GEAR	DOWN UNTIL OBSTACLE CLEARED
WING FLAPS	10°
COWL FLAPS	FULL OPEN
RUNWAY SURFACE	PAVED, LEVEL, DRY

EXAMPLE: →

OAT	15°C
PRESSURE ALTITUDE	1500 FT.
WEIGHT	2600 LBS. (1179 KGS)
HEADWIND COMPONENT	6 KTS
GROUND ROLL	1000 FT. (305m)
TOTAL TAKEOFF ISTANCE 50 FT. OBSTACLE)	1800 FT. (549m)



TAKEOFF DISTANCE - GRASS SURFACE

TAKEOFF WEIGHT - LBS (KGS)	TAKEOFF SPEED - KIAS	SPEED AT 50 FT - KIAS
2900 (1315)	67	74
2600 (1179)	64	70
2300 (1043)	60	65

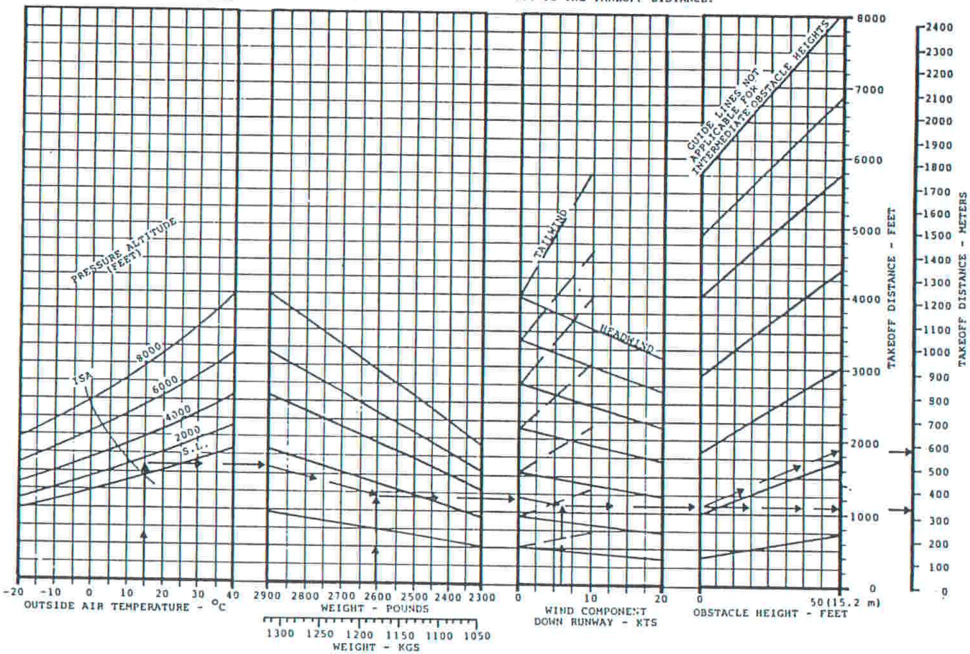
ASSOCIATED CONDITIONS

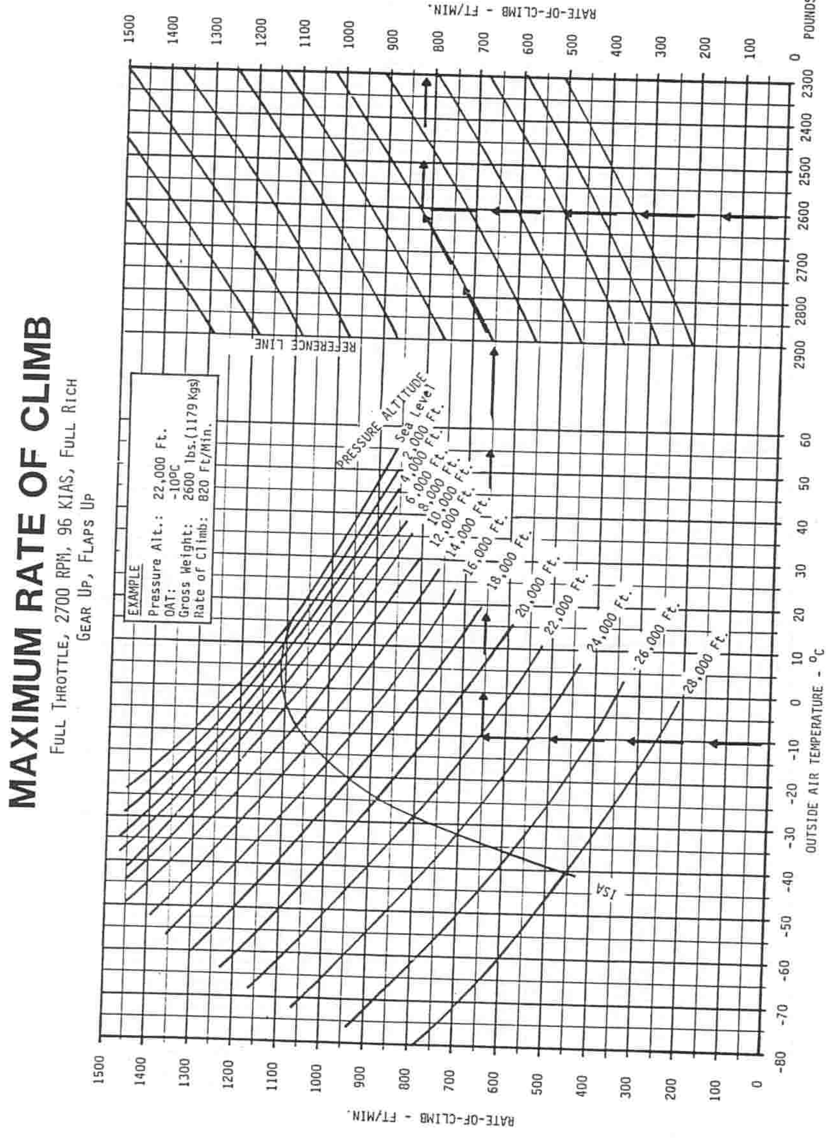
- POWER: 36 IN MANIFOLD PRESSURE, 2700 RPM
- LANDING GEAR: DOWN UNTIL OBSTACLE CLEARED
- WING FLAPS: 10°
- COWL FLAPS: FULL OPEN
- RUNWAY SURFACE: SHORT, LEVEL, DRY GRASS

EXAMPLE: →

OAT	$15^\circ C$
PRESSURE ALTITUDE	1500 FT.
WEIGHT	2600 LBS (1179 KGS)
HEADWIND COMPONENT	6 KTS
GROUND ROLL	1100 FT. (335 m)
TOTAL TAKEOFF DISTANCE (50 FT. OBSTACLE)	1900 FT. (579 m)

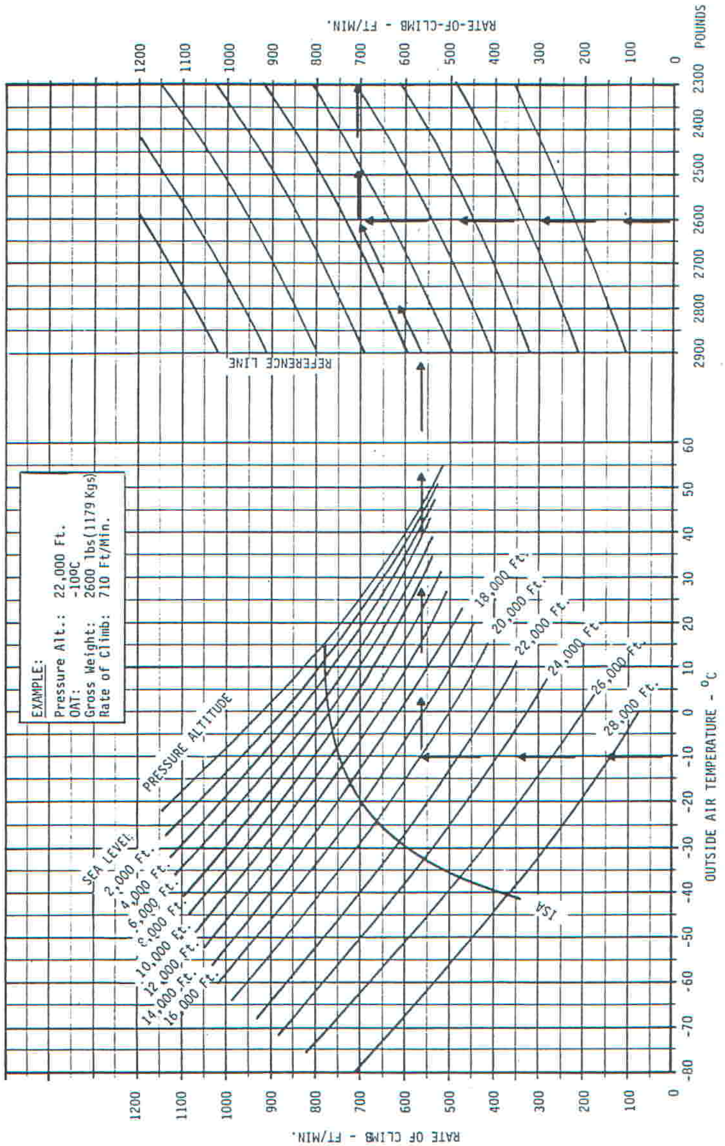
NOTE 1) MAXIMUM DEMONSTRATED CROSSWIND VELOCITY IS 12 KNOTS.
2) CONDITIONS OF HIGH HUMIDITY CAN RESULT IN AN INCREASE OF UP TO 10% TO THE TAKEOFF DISTANCE.




MAXIMUM RATE OF CLIMB
FULL THROTTLE, 2700 RPM, 96 KIAS, FULL RICH
GEAR UP, FLAPS UP
EXAMPLE
Pressure Alt.: 22,000 Ft.
OAT: -10ºC
Gross Weight: 2600 lbs.(1179 Kgs)
Rate of Climb: 820 Ft/Min.
PRESSURE ALTITUDE
Sea Level
2,000 Ft.
4,000 Ft.
6,000 Ft.
8,000 Ft.
10,000 Ft.
12,000 Ft.
14,000 Ft.
16,000 Ft.
18,000 Ft.
20,000 Ft.
22,000 Ft.
24,000 Ft.
26,000 Ft.
28,000 Ft.
ISA
REFERENCE LINE
RATE-OF-CLIMB - FT/MIN.
POUNDS
2300 2400 2500 2600 2700 2800 2900
OUTSIDE AIR TEMPERATURE - ºC
-80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30 40 50 60
RATE-OF-CLIMB - FT/MIN.
0 100 200 300 400 500 600 700 800 900 1000 1100 1200 1300 1400 1500

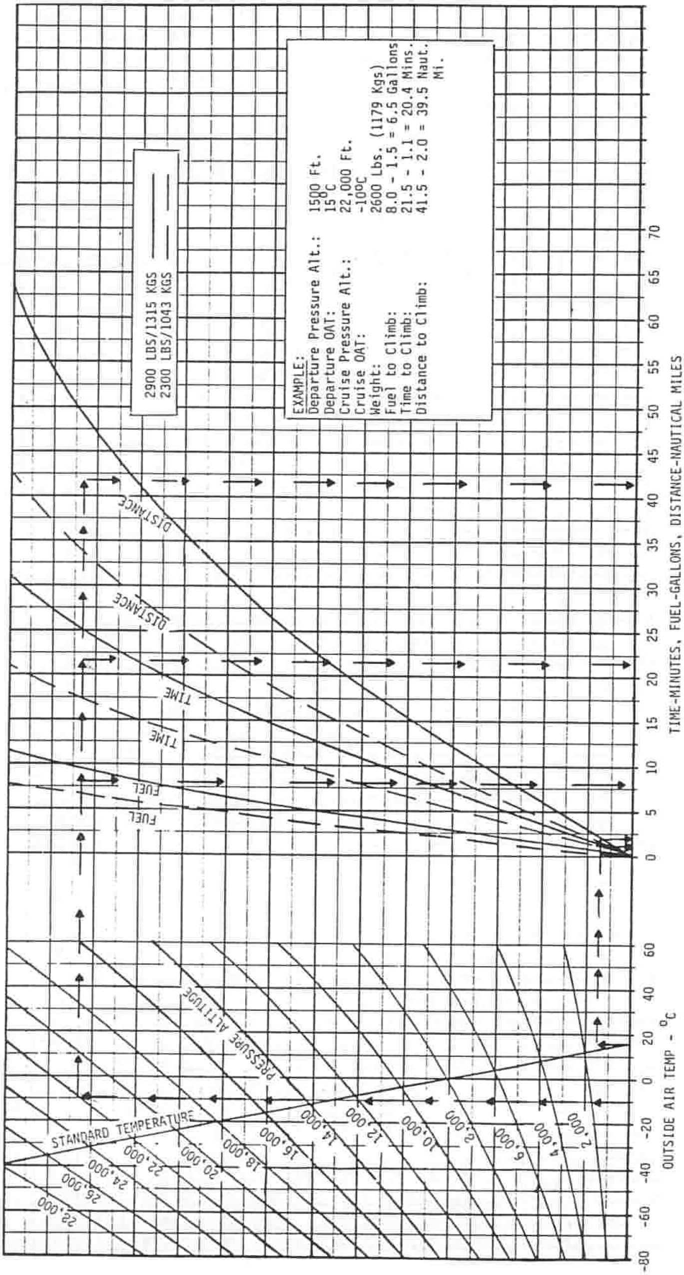
CRUISE CLIMB

32 In. Hg, 2500 RPM, 105 KIAS, Full Rich
Gear Up, Flaps Up



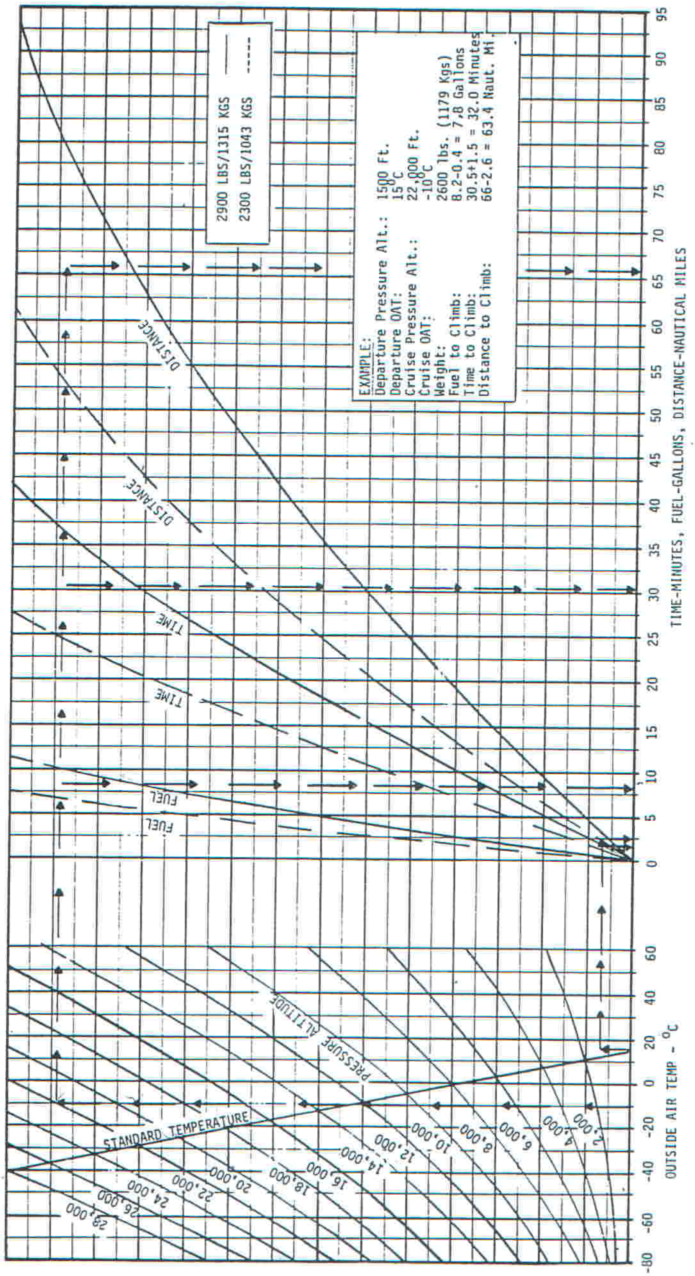
TIME - FUEL - DISTANCE TO CLIMB (MAX CLIMB)

TIME-FUEL-DISTANCE TO CLIMB (MAXIMUM CLIMB)
FULL THROTTLE, 2700 RPM, 96 KIAS, FULL RICH
GEAR UP, FLAPS UP



TIME - FUEL - DISTANCE TO CLIMB (CRUISE CLIMB)

TIME-FUEL-DISTANCE TO CLIMB (CRUISE CLIMB)
32 IN. HG, 2500 RPM, 105 KIAS, FULL RICH
GEAR UP, FLAPS UP



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CRUISE POWER SCHEDULE

Pressure Altitude Feet Std.Day	RPM	Max. Recommended Cruise Pwr. 78.6% Power (165 BHP)						70% Power (147 BHP)						65% Power (136.5 BHP)					
	RPM	2200	2300	2400	2500	2600	2700	2200	2300	2400	2500	2600	2700	2200	2300	2400	2500	2600	2700
	Fuel Flow	12.6	12.7	12.7	12.8	12.9	12.9	11.3	11.5	11.7	11.7	11.7	11.8	10.5	10.7	11.0	11.0	11.0	11.1
	Std. Temp.	MANIFOLD PRESSURE - INCHES OF MERCURY																	
S.L.	15°C	----	----	30.4	29.5	28.6	27.6	30.8	29.3	27.8	27.1	26.3	25.3	29.7	28.1	26.5	25.8	25.1	24.1
2000	11°	----	----	30.1	29.2	28.3	27.3	30.4	29.0	27.5	26.8	26.0	25.1	29.2	27.7	26.1	25.4	24.7	23.7
4000	7°	----	----	29.8	28.9	28.0	27.0	30.0	28.6	27.2	26.4	25.7	24.8	28.7	27.3	25.8	25.1	24.3	23.4
6000	3°	----	----	29.6	28.6	27.7	26.8	29.7	28.3	26.9	26.1	25.4	24.5	28.2	26.9	25.5	24.8	24.0	23.2
8000	1°	----	----	29.3	28.4	27.5	26.5	29.3	28.0	26.6	25.8	25.1	24.2	27.8	26.5	25.2	24.4	23.7	22.9
10000	-5°	----	----	29.1	28.1	27.2	26.3	29.0	27.7	26.3	25.6	24.8	24.0	27.3	26.1	24.9	24.1	23.4	22.7
12000	-9°	----	----	28.8	27.9	27.0	26.1	28.7	27.4	26.1	25.3	24.5	23.7	26.9	25.8	24.6	23.9	23.1	22.4
14000	-13°	----	----	28.6	27.7	26.8	25.9	28.4	27.1	25.8	25.1	24.3	23.6	26.5	25.5	24.4	23.6	22.9	22.2
16000	-17°	----	----	28.4	27.6	26.6	25.7	28.2	26.9	25.6	24.8	24.1	23.4	26.2	25.3	24.2	23.4	22.6	22.0
18000	-21°	----	----	28.3	27.4	26.5	25.6	28.0	26.7	25.4	24.6	23.9	23.2	26.0	25.0	24.0	23.2	22.4	21.8
20000	-25°	----	----	28.2	27.3	26.4	25.5	27.8	26.6	25.3	24.5	23.7	23.0	25.9	24.8	23.8	23.1	22.3	21.6
22000	-29°	----	----	28.1	27.3	26.4	25.5	27.6	26.4	25.3	24.4	23.6	22.9	25.9	24.8	23.7	23.0	22.2	21.5
24000	-33°	----	----	28.2	27.3	26.4	25.5	----	----	25.3	24.4	23.5	22.9	26.0	24.9	23.7	22.9	22.1	21.4
26000	-37°	----	----	28.3	27.4	26.5	25.7	----	----	25.4	24.5	23.5	22.9	26.3	25.0	23.8	22.9	22.1	21.4
28000	-40°	----	----	28.5	27.6	26.8	26.0	----	----	25.7	24.7	23.7	23.0	----	----	24.0	23.1	22.1	21.4

NOTE: Add 1" M.P. for each 10°C OAT above Std. Day Temperature.
Subtract 1" M.P. for each 10°C OAT below Std. Day Temperature.
If OAT above Std. Precludes obtaining the desired M.P., use the next higher RPM/M.P. with appropriate temperature correction to M.P.

LEAN TO PEAK-DO NOT EXCEED 1650 DEG. TIT

EXAMPLE:

CRUISE PRESSURE ALT-22000 ft
CRUISE OAT: -10°C
POWER: 65%
RPM: 2400
MAP: 25.6 in. Hg.
FUEL FLOW : 11.0 GPH

CRUISE POWER SCHEDULE

Pressure Altitude Feet Std.Day	RPM	60% Power (126 BHP) 2200	2300	2400	2500	2600	2700	55% Power (115.5 BHP) 2200	2300	2400	2500	2600	2700	50% Power (105 BHP) 2200	2300	2400	2500	2600	2700
	Fuel Flow	9.7	10.0	10.2	10.3	10.3	10.4	9.0	9.2	9.5	9.5	9.5	9.7	8.3	8.5	8.7	8.7	8.7	8.9
	Std. Temp.	MANIFOLD PRESSURE - INCHES OF MERCURY																	
S.L.	$15^{o}C$	27.7	26.5	25.2	24.5	23.8	22.9	26.1	25.1	24.1	23.3	22.5	21.8	24.8	23.8	22.9	22.2	21.5	20.6
2000	11^{o}	27.3	26.1	24.9	24.2	23.5	22.6	25.7	24.7	23.7	22.9	22.1	21.4	24.3	23.4	22.5	21.8	21.1	20.2
4000	7^{o}	26.8	25.7	24.5	23.8	23.1	22.3	25.2	24.3	23.3	22.6	21.8	21.1	23.9	22.9	22.0	21.4	20.7	19.9
6000	3^{o}	26.4	25.3	24.2	23.5	22.8	22.0	24.8	23.9	22.9	22.2	21.5	20.8	23.4	22.5	21.6	21.0	20.3	19.6
8000	1^{o}	26.0	24.9	23.9	23.1	22.5	21.7	24.4	23.5	22.6	21.8	21.1	20.5	23.0	22.1	21.3	20.7	20.0	19.2
10000	-5^{o}	25.6	24.6	23.6	22.8	22.2	21.4	24.0	23.1	22.2	21.5	20.8	20.2	22.6	21.7	20.9	20.3	19.6	18.9
12000	-9^{o}	25.2	24.2	23.3	22.5	21.9	21.2	23.7	22.8	21.9	21.2	20.5	19.9	22.1	21.3	20.6	20.0	19.3	18.6
14000	-13^{o}	24.9	24.0	23.0	22.3	21.7	21.0	23.4	22.5	21.6	20.9	20.3	19.6	21.8	21.0	20.2	19.6	19.0	18.3
16000	-17^{o}	24.6	23.7	22.8	22.1	21.4	20.7	23.1	22.2	21.3	20.6	20.0	19.4	21.5	20.7	19.9	19.3	18.7	18.1
18000	-21^{o}	24.4	23.4	22.5	21.8	21.2	20.6	22.8	21.9	21.0	20.4	19.8	19.2	21.2	20.4	19.6	19.1	18.4	17.8
20000	-25^{o}	24.2	23.3	22.3	21.7	21.0	20.4	22.6	21.7	20.8	20.2	19.6	19.0	21.0	20.2	19.4	18.8	18.2	17.6
22000	-29^{o}	24.1	23.2	22.2	21.6	20.9	20.2	22.5	21.6	20.7	20.0	19.4	18.8	19.9	20.1	19.3	18.6	18.0	17.4
24000	-33^{o}	24.1	23.2	22.2	21.5	20.8	20.1	22.5	21.6	20.7	20.0	19.3	18.7	19.9	20.1	19.2	18.5	17.9	17.3
26000	-37^{o}	24.3	23.3	22.2	21.5	20.7	20.0	22.6	21.7	20.7	20.0	19.2	18.6	20.0	20.1	19.2	18.5	17.8	17.1
28000	-40^{o}	----	----	22.4	21.6	20.7	20.0	----	----	20.9	20.1	19.3	18.5	----	----	19.3	18.6	17.9	17.1

NOTE: Add 1" M.P. for each $10^{o}C$ OAT above Std. Day Temperature.
Subtract 1" M.P. for each $10^{o}C$ OAT below Std. Day Temperature.
If OAT above Std. precludes obtaining the desired M.P., use the next higher RPM/M.P. with appropriate temperature correction to M.P.

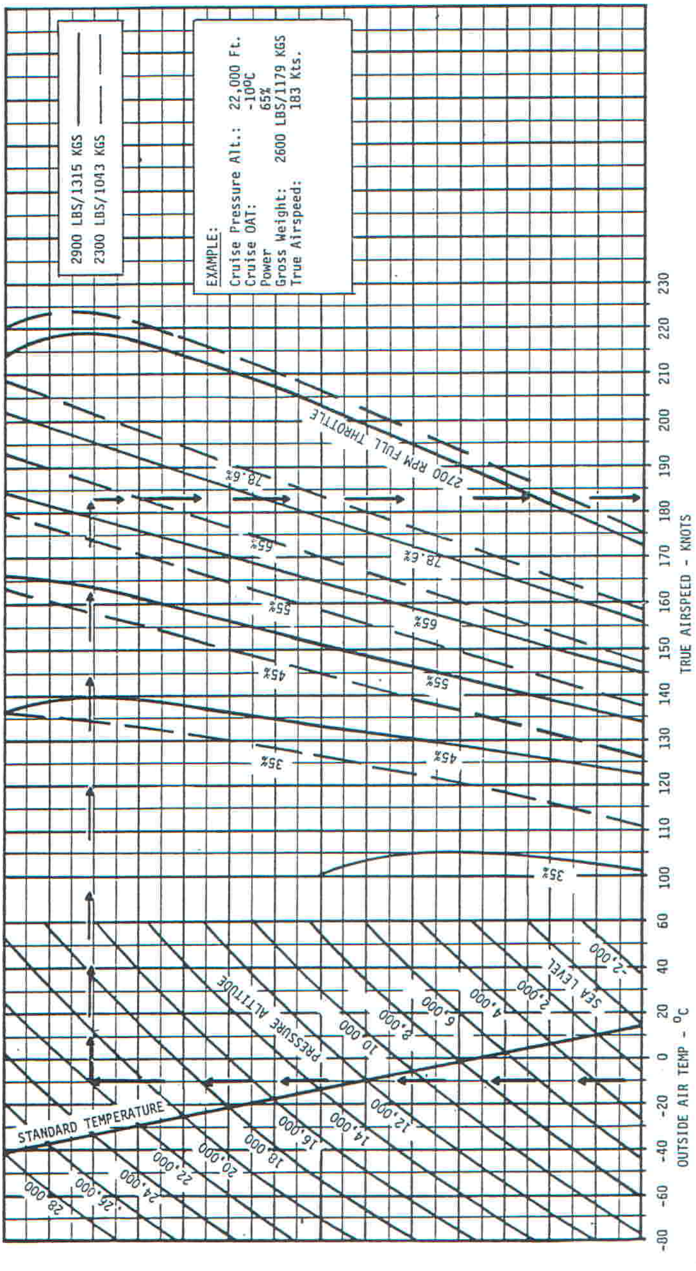
LEAN TO PEAK-DO NOT EXCEED 1650 DEG. TIT

CRUISE POWER SCHEDULE

Pressure Altitude Feet Std. Day	RPM	45% Power (94.5 BHP)						40% Power (84 BHP)						35% Power (73.5 BHP)					
	RPM	2200	2300	2400	2500	2600	2700	2200	2300	2400	2500	2600	2700	2200	2300	2400	2500	2600	2700
	Fuel Flow	7.5	7.7	7.9	7.9	7.9	8.2	6.8	6.9	7.0	7.0	7.0	7.3	6.1	6.1	6.1	6.1	6.1	6.3
	Std. Temp.	MANIFOLD PRESSURE - INCHES OF MERCURY																	
S.L.	15°C	23.2	22.3	21.4	20.9	20.4	19.6	21.7	21.1	20.5	19.9	19.4	18.8	20.5	19.9	19.3	18.9	18.5	18.0
2000	11°	22.7	21.9	21.0	20.5	20.0	19.2	21.2	20.6	20.0	19.5	18.9	18.3	20.0	19.4	18.8	18.4	17.9	17.4
4000	7°	22.3	21.5	20.6	20.1	19.5	18.8	20.8	20.2	19.5	19.0	18.4	17.8	19.5	18.9	18.3	17.8	17.4	16.8
6000	3°	21.8	21.0	20.2	19.7	19.1	18.4	20.4	19.8	19.1	18.5	18.0	17.3	19.0	18.4	17.8	17.3	16.8	16.3
8000	1°	21.4	20.6	19.8	19.3	18.8	18.1	20.0	19.3	18.6	18.1	17.5	16.9	18.5	17.9	17.3	16.8	16.3	15.8
10000	-5°	21.0	20.2	19.4	18.9	18.4	17.8	19.6	18.9	18.2	17.6	17.1	16.5	18.1	17.4	16.8	16.3	15.9	15.4
12000	-9°	20.6	19.9	19.1	18.6	18.0	17.5	19.2	18.5	17.8	17.2	16.7	16.1	17.6	17.0	16.4	15.9	15.5	14.9
14000	-13°	20.3	19.5	18.8	18.2	17.7	17.2	18.8	18.1	17.4	16.9	16.3	15.7	17.2	16.6	16.0	15.5	15.1	14.6
16000	-17°	19.9	19.2	18.5	17.9	17.4	16.9	18.5	17.8	17.1	16.5	16.0	15.4	16.9	16.3	15.7	15.2	14.7	14.2
18000	-21°	19.7	19.0	18.2	17.7	17.1	16.6	18.2	17.4	16.8	16.2	15.7	15.2	16.6	16.0	15.4	14.9	14.4	14.0
20000	-25°	19.5	18.7	18.0	17.4	16.9	16.4	17.9	17.2	16.5	15.9	15.4	14.9	16.4	15.8	15.1	14.6	14.1	13.6
22000	-29°	19.4	18.6	17.8	17.3	16.7	16.2	17.8	17.1	16.3	15.8	15.2	14.7	16.3	15.6	14.9	14.4	13.8	13.4
24000	-33°	19.4	18.5	17.7	17.1	16.5	16.0	17.9	17.1	16.3	15.7	15.1	14.5	16.4	15.6	14.8	14.2	13.7	13.2
26000	-37°	19.5	18.6	17.7	17.1	16.5	15.8	18.1	17.2	16.3	15.7	15.1	14.4	16.8	15.7	14.8	14.2	13.7	13.0
28000	-40°	----	----	17.8	17.2	16.5	15.7	----	----	16.5	15.7	15.2	14.3	----	----	14.8	14.3	13.7	12.9

NOTE: Add 1" M.P. for each 10°C OAT above Std. Day Temperature.
Subtract 1" M.P. for each 10°C OAT below Std. Day Temperature.
If OAT above Std. precludes obtaining the desired M.P., use the next higher RPM/M.P. with appropriate temperature correction to M.P.

LEAN TO PEAK-DO NOT EXCEED 1650 DEG. TIT



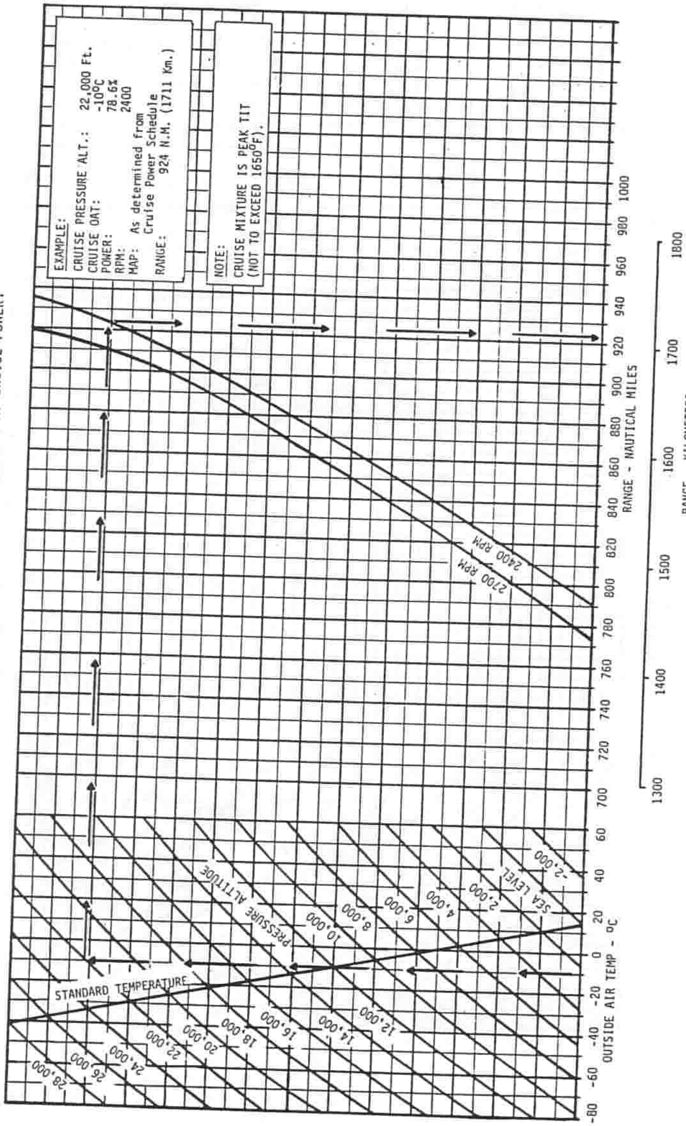
SPEED, POWER VS. ALTITUDE

GEAR UP, FLAPS UP, COWL FLAP CLOSED

RANGE - 78.6% POWER

2900 LBS/1315 KGS GROSS WEIGHT

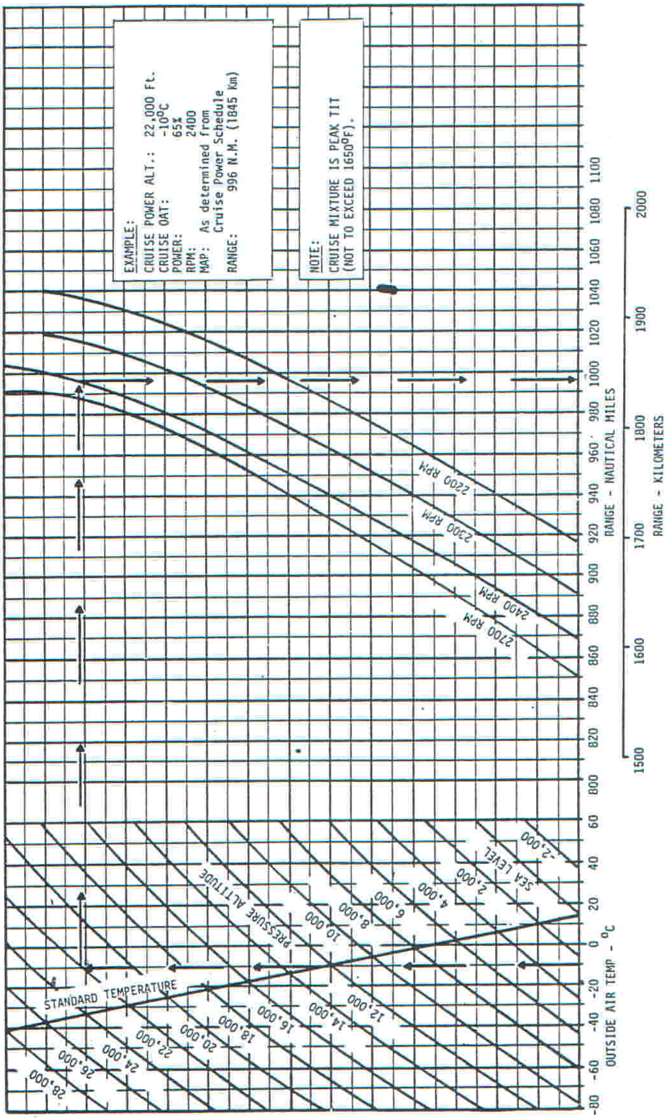
CLEAN CONFIGURATION, 75.6 GAL. (286.5 LITERS) (63 IMP. GAL.) USABLE FUEL
ZERO WIND, COWL FLAP CLOSED. RANGE INCLUDES WARMUP, TAXI, TAKEOFF,
MAX. POWER CLIMB, DESCENT PLUS 45 MINUTES RESERVE AT CRUISE POWER.



RANGE - 65% POWER

2900 LBS/1315 KGS GROSS WEIGHT

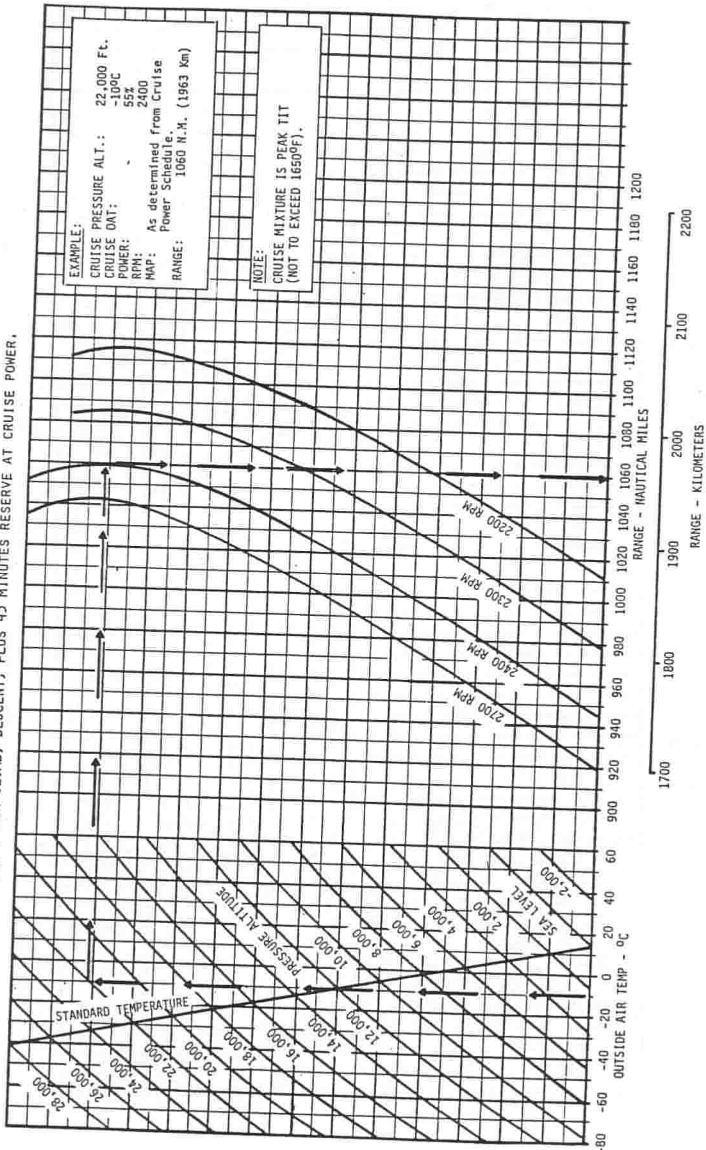
CLEAN CONFIGURATION, 75.6 GAL. (286.5 LITERS) (63 IMP. GAL.) USABLE FUEL
ZERO WIND, COWL FLAP CLOSED. RANGE INCLUDES WARMUP, TAXI, TAKEOFF,
MAX. POWER CLIMB, DESCENT, PLUS 45 MINUTES RESERVE AT CRUISE POWER.



RANGE - 55% POWER

2900 LBS/1315 KGS GROSS WEIGHT

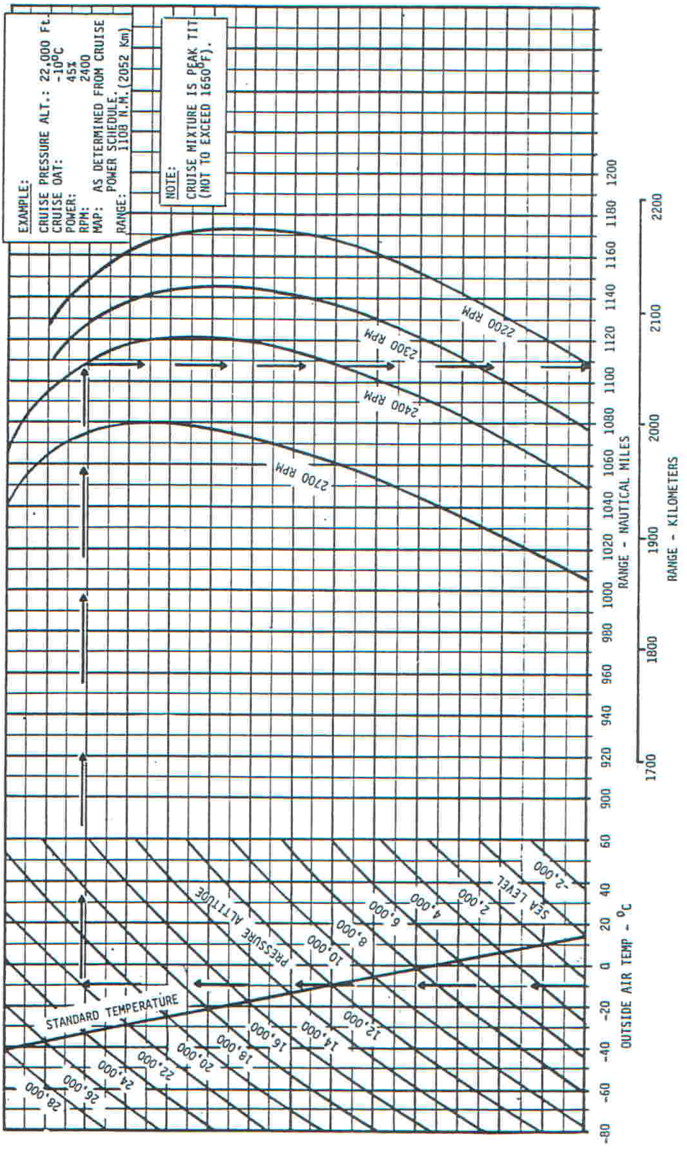
Clean Configuration, 75.6 Gal. (286.5 Liters) (63 Imp. Gal.) Usable Fuel
Zero Wind, Cowl Flap Closed. Range includes warmup, taxi, takeoff,
max. power climb, descent, plus 45 minutes reserve at cruise power.



RANGE - 45% POWER

2900 LBS/1315 KGS GROSS WEIGHT

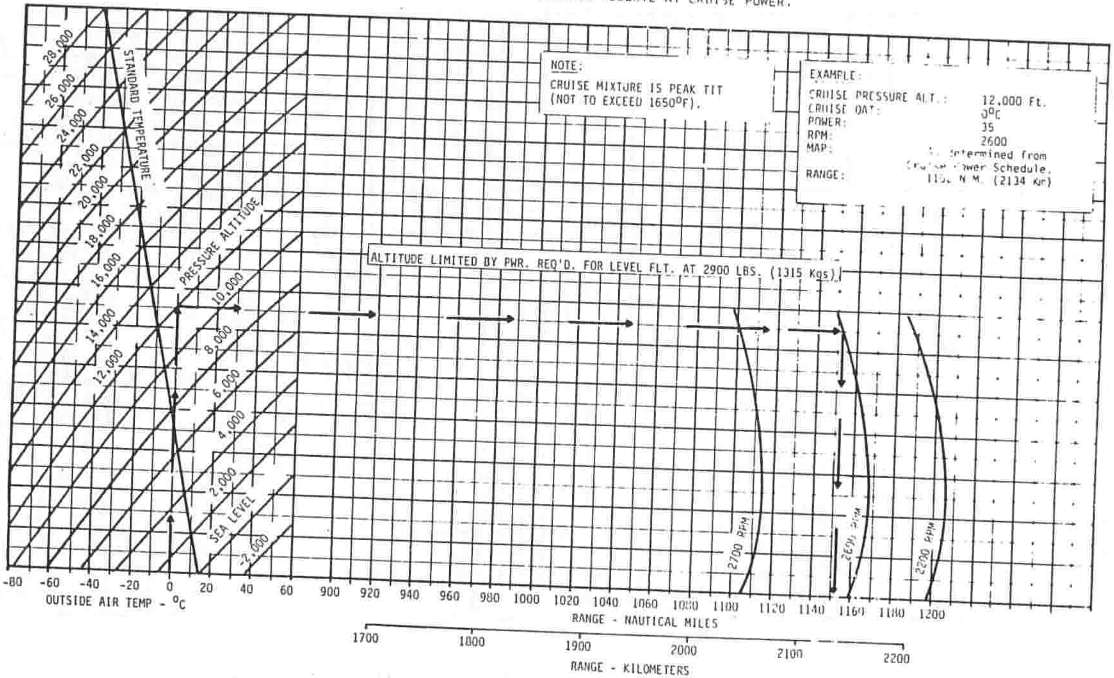
CLEAN CONFIGURATION, 75.6 GAL. (286.5 LITERS) (63 IMP. GAL.) USABLE FUEL
ZERO WIND, COWL FLAP CLOSED. RANGE INCLUDES WARMUP, TAXI, TAKEOFF,
MAX. POWER CLIMB, DESCENT, PLUS 45 MINUTES RESERVE AT CRUISE POWER.



RANGE - 35% POWER

2900 LBS/1315 KGS GROSS WEIGHT

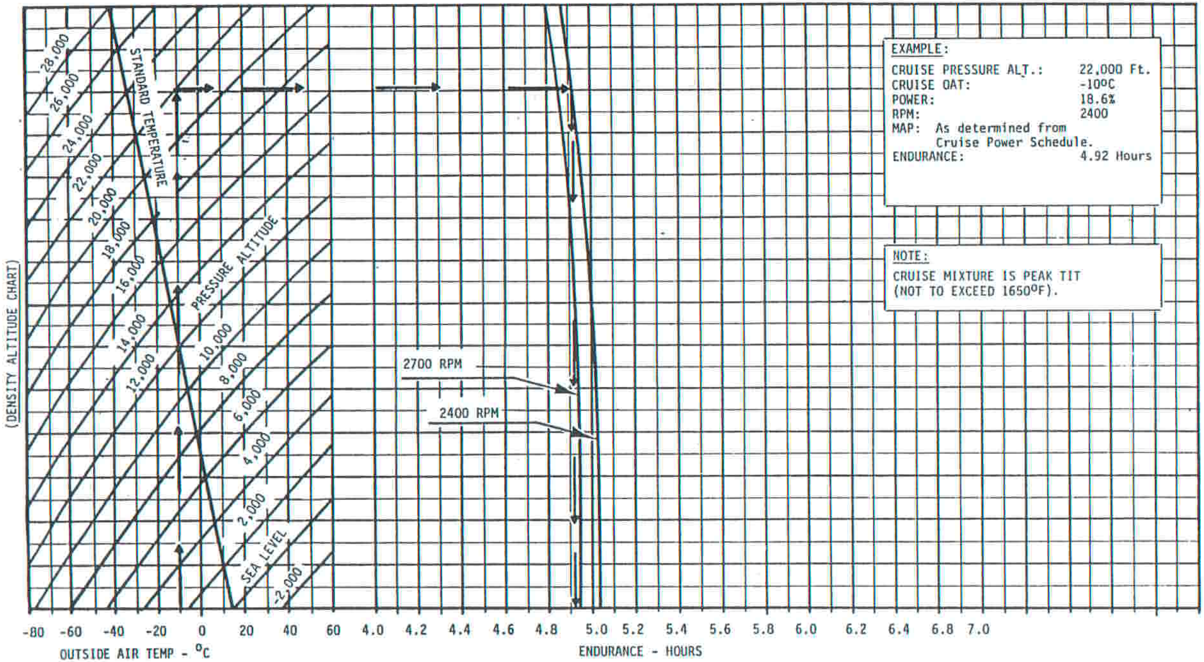
CLEAN CONFIGURATION, 75.6 GAL. (286.5 LITERS) (63 IMP. GAL.) USABLE FUEL
ZERO WIND, COWL FLAP CLOSED. RANGE INCLUDES WARMUP, TAXI, TAKEOFF,
MAX. POWER CLIMB, DESCENT, PLUS 45 MINUTES RESERVE AT CRUISE POWER.



ENDURANCE - 78.6% POWER

2900 LBS/1315 KBS GROSS WEIGHT

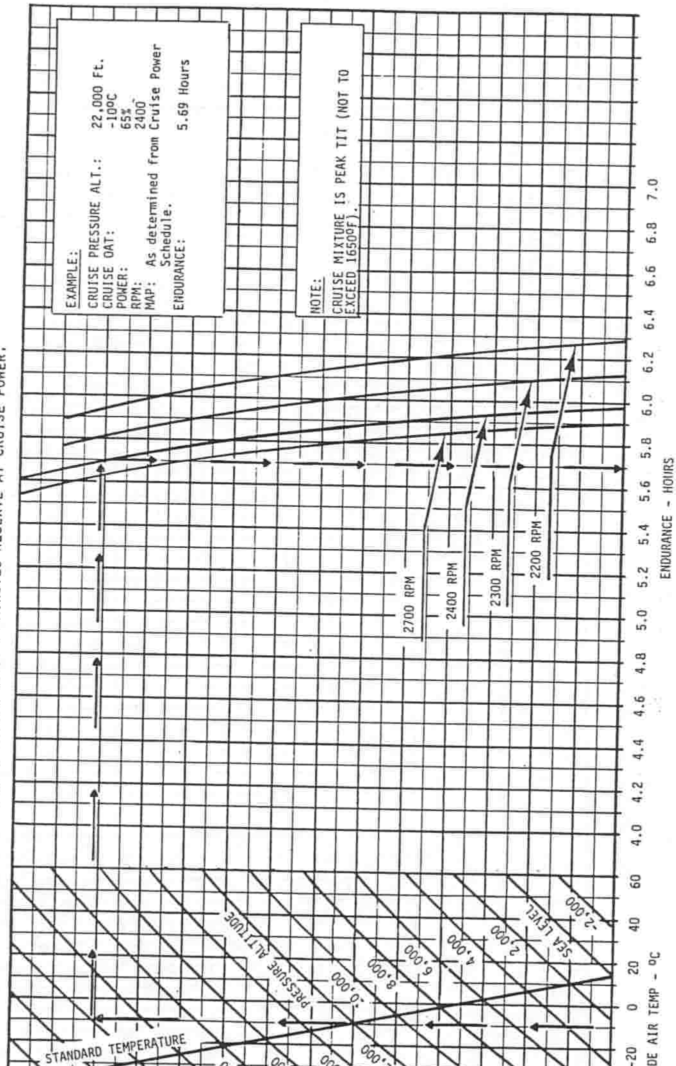
CLEAN CONFIGURATION, 75.6 GAL. (286.5 LITERS) (63 IMP. GAL.) USABLE FUEL
ZERO WIND, COWL FLAP CLOSED. ENDURANCE INCLUDES WARMUP, TAXI, TAKEOFF,
MAX. POWER CLIMB, DESCENT, PLUS 45 MINUTES RESERVE AT CRUISE POWER.



ENDURANCE - 65% POWER

2900 LBS/1315 KGS GROSS WEIGHT

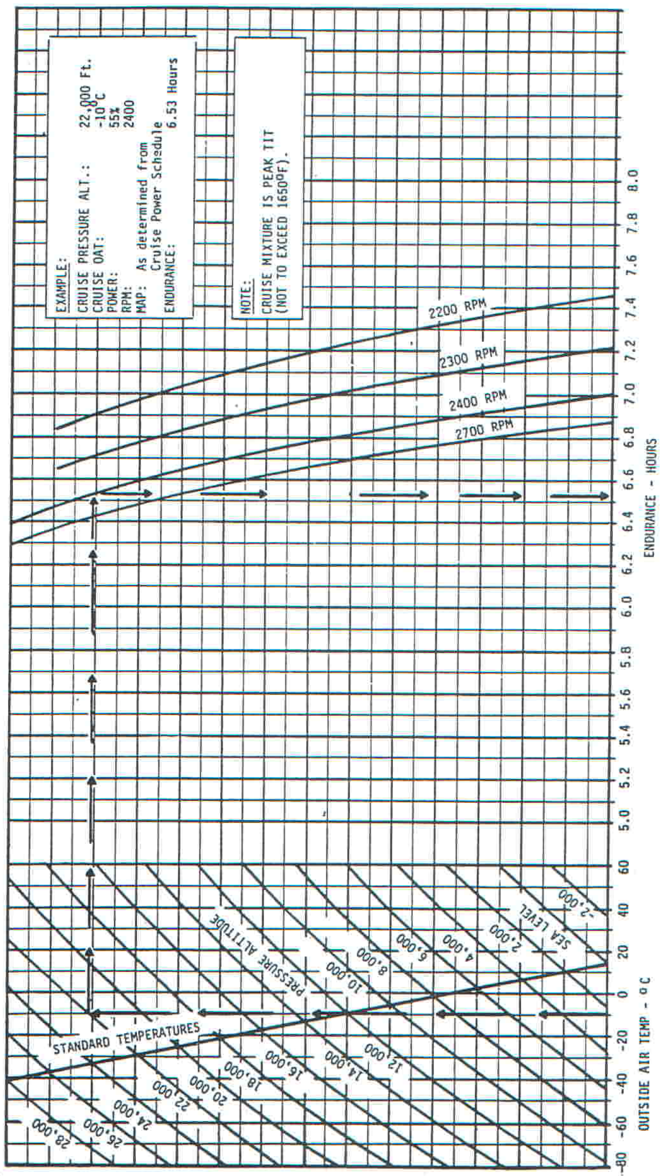
CLEAN CONFIGURATION, 75.6 GAL. (286.5 LITERS) (63 IMP. GAL.) USABLE FUEL
ZERO WIND, COWL FLAP CLOSED, ENDURANCE INCLUDES WARMUP, TAXI, TAKEOFF,
MAX. POWER CLIMB, DESCENT, PLUS 45 MINUTES RESERVE AT CRUISE POWER.



ENDURANCE - 55% POWER

2900 LBS/1315 KGS GROSS WEIGHT

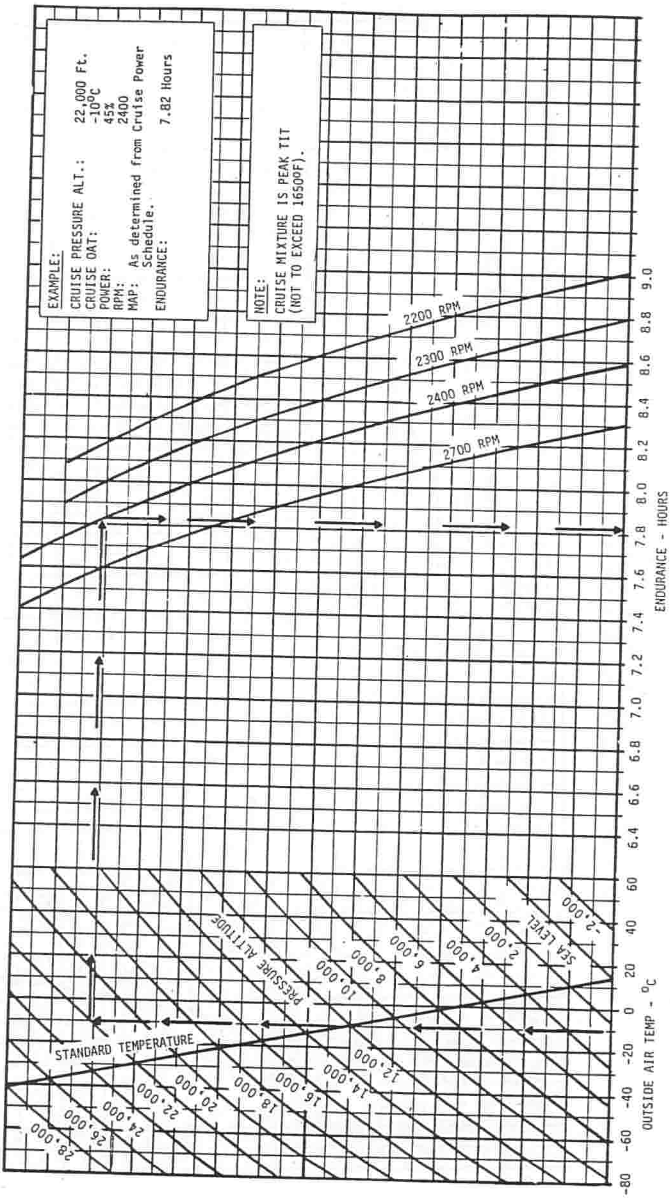
CLEAN CONFIGURATION, 75.6 GAL. (28.6 LITERS) (63 IMP. GAL.) USABLE FUEL
ZERO WIND, COWL FLAP CLOSED. ENDURANCE INCLUDES WARMUP, TAXI, TAKEOFF,
MAX. POWER CLIMB, DESCENT, PLUS 45 MINUTES RESERVE AT CRUISE POWER.



ENDURANCE - 45% POWER

2900 LBS/1315 KGS GROSS WEIGHT

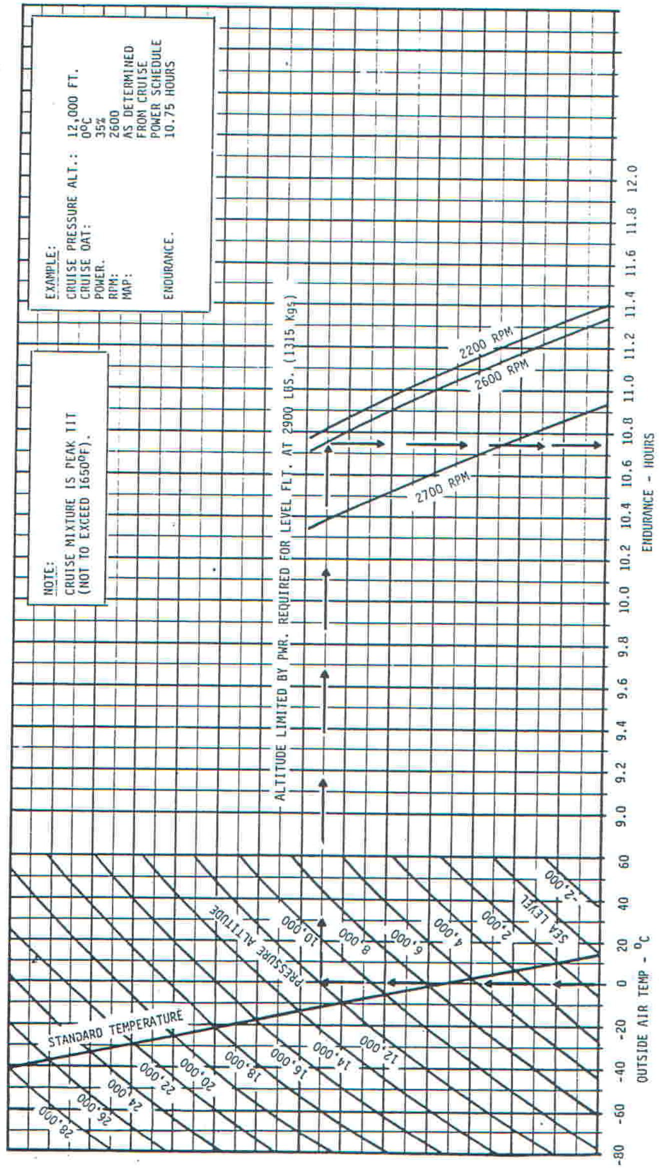
CLEAN CONFIGURATION, 75.6 GAL. (286.5 LITERS) (63 IMP. GAL.) USABLE FUEL
ZERO WIND, COWL FLAP CLOSED, ENDURANCE INCLUDES WARMUP, TAXI, TAKEOFF,
MAX. POWER CLIMB, DESCENT, PLUS 45 MINUTES RESERVE AT CRUISE POWER.



ENDURANCE - 35% POWER

2900 LBS/1315 KGS GROSS WEIGHT

CLEAN CONFIGURATION, 75.6 GAL. (286.5 LITERS) (63 IMP. GAL.) USABLE FUEL
ZERO WIND, COWL FLAP CLOSED. ENDURANCE INCLUDES WARMUP, TAXI, TAKEOFF,
AND POWER CLIMB, DESCENT, PLUS 45 MINUTES RESERVE AT CRUISE POWER.

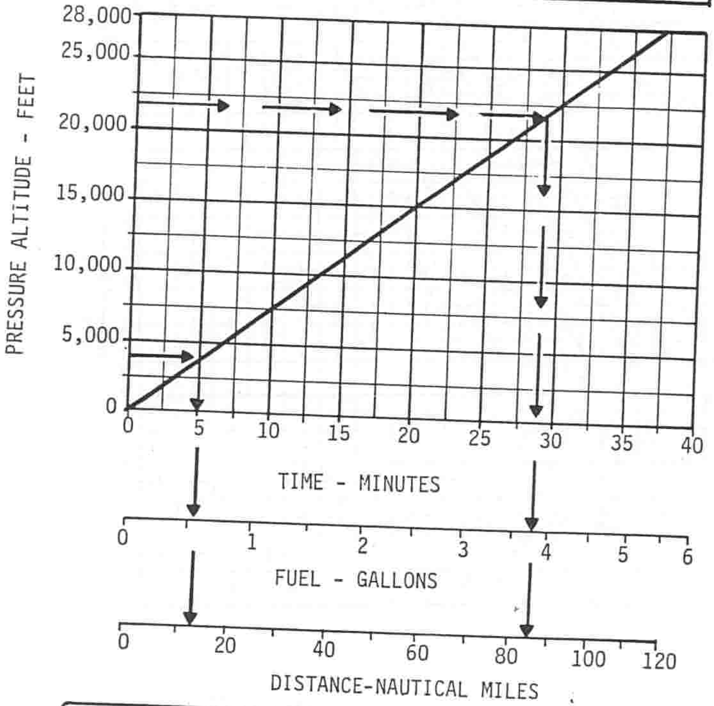


TIME - FUEL - DISTANCE TO DESCEND

150 KIAS DESCENT SPEED

ASSOCIATED CONDITIONS:

Power:	2200 RPM/MAP as req'd to maintain 750 FPM rate of descent.
Landing Gear:	Up
Flaps:	Up
Cowl Flaps:	Closed
Mixture:	Peak TIT (Do not exceed 1650° TIT)



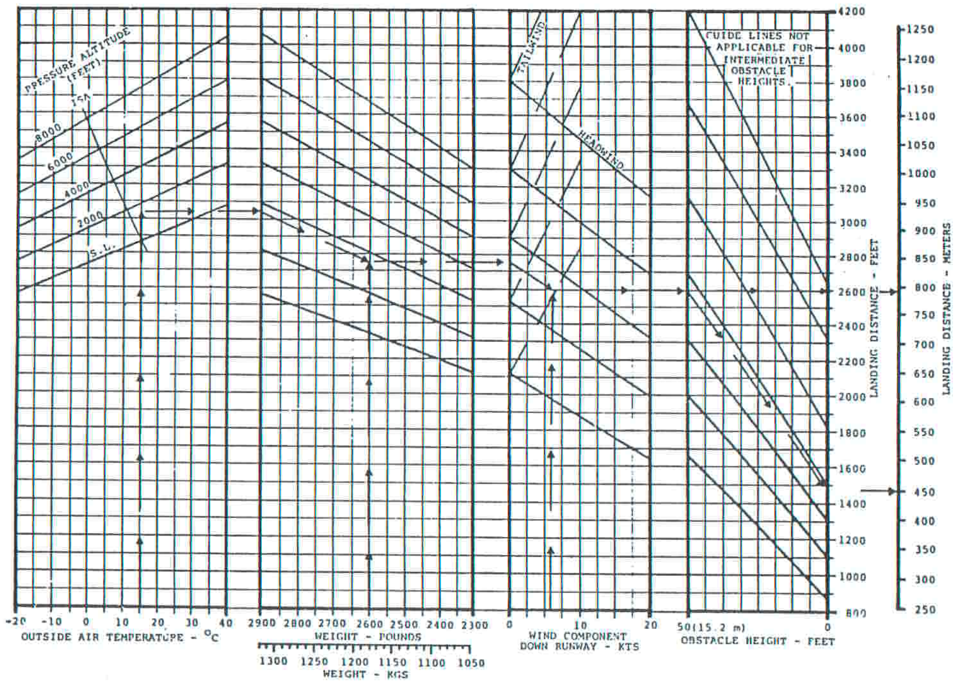
EXAMPLE:

Initial Pressure Alt.:	22,000 Ft.
Final Pressure Alt.:	4,000 Ft.
Time to Descend:	29.0-5.0 = 24.0 Minutes
Fuel to Descend:	3.8-.55 = 3.3 Gallons
Distance to Descend:	85.0-13.0 = 72.0 Naut. Mi.

LANDING DISTANCE - GRASS SURFACE

LANDING WEIGHT LBS (KGS)	APPROACH SPEED KIAS
2900 (1315)	75
2600 (1179)	71
2300 (1045)	66

NOTE: MAXIMUM DEMONSTRATED CROSSWIND VELOCITY IS 12 KNOTS.



ASSOCIATED CONDITIONS

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

EXAMPLE: →

OAT	15°C
PRESSURE ALTITUDE	1500 FT.
WEIGHT	2600 LBS (1179 KGS)
HEADWIND COMPONENT	6 KTS
GROUND ROLL DISTANCE	1480 FT. (451 m)
TOTAL LANDING DISTANCE (50 FT. OBSTACLE)	2600 FT. (792 m)

LANDING DISTANCE

LANDING WEIGHT - LBS (KGS)	APPROACH SPEED - KIAS
2900 (1315)	75
2600 (1179)	71
2300 (1043)	66

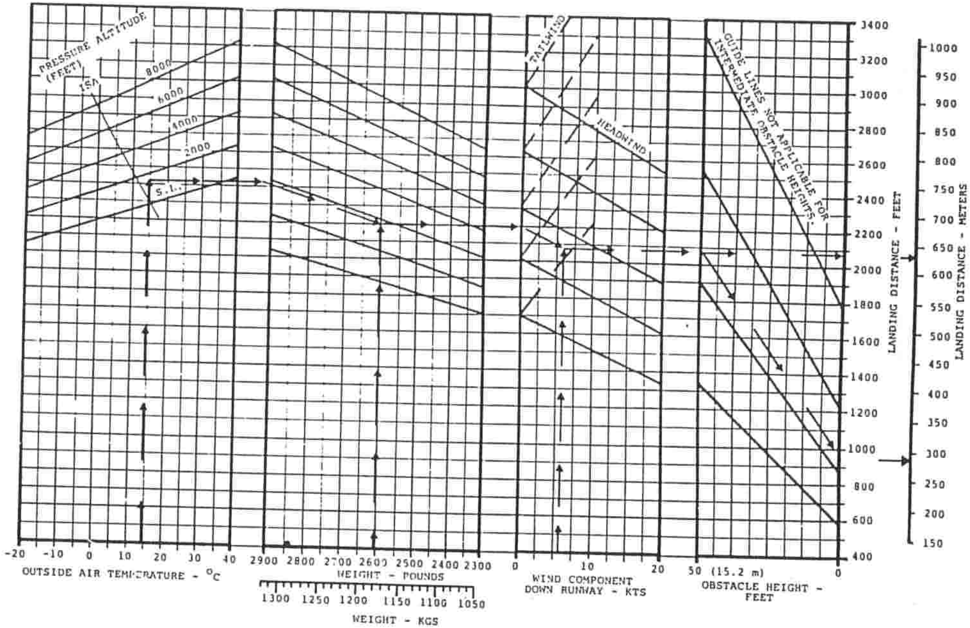
ASSOCIATED CONDITIONS:

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

EXAMPLE: →

OAT	15°C
PRESSURE ALTITUDE	1500 FT.
WEIGHT	2600 LBS. (1179 KGS)
HEADWIND COMPONENT	6 KTS.
GROUND ROLL DISTANCE	960 FT. (293 m)
TOTAL LANDING DISTANCE (50 FT. OBSTACLE)	2080 FT. (634 m)

NOTE: MAXIMUM DEMONSTRATED CROSSWIND VELOCITY IS 12 KNOTS.



SECTION VI
WEIGHT AND BALANCE

MOONEY M20K

TABLE OF CONTENTS

NOTE:

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

MODEL - M20K

AIRCRAFT SERIAL NO 25-1066

AIRCRAFT REGISTRATION NO. N252SS

9-23-86

Mooney Aircraft Corp. Approval Signature & Date

MOONEY M20K

INTRODUCTION

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

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

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

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

The maximum certificated gross weight for the Model M20K under all operating conditions is 2900 pounds (1315 Kg). Maximum useful load is determined by subtracting the corrected aircraft empty weight from its maximum gross weight. The aircraft must be operated strictly within the limits of the Center-of-Gravity Moment Envelope shown on page 6-8.

AIRPLANE WEIGHING PROCEDURE

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

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

1. Check for installation of all equipment as listed in the Weight & Balance Record Equipment List.
2. Top off both tanks with full fuel. Subtract useable fuel 75.6 gal. (286.4 liters, 63 Imp. Gal.) @ 6 lb/gal* =453.6 lbs. (205.7 Kg.) from total weight as weighed,

*(USE 5.82 lb/gal FOR 100LL FUEL)

OPTIONAL METHOD - Ground aircraft and defuel tanks as follows:

a. Disconnect fuel line at electric boost pump outlet fitting.

b. Connect to output fitting a flexible line that will reach fuel receptacle.

c. Turn fuel selector valve to the tank to be drained, and remove filler cap from fuel filler port.

d. Turn on boost pump until tank is empty. Repeat steps c. and d. to drain the other tank.

e. Replace 1.5 gal. (5.7 liters, 1.25 Imp. Gal.) fuel @ 6.0 lb./gal.* into each tank (unusable fuel).

*(USE 5.82 lb/gal. for 100LL FUEL).

f. Replace filler caps.

3. Fill oil to capacity-8 qts. (7.6 liters).
4. Position front seats in full forward

position.

5. Position flaps in full up position.

6. Position a 2000-pound (907.2 Kg.) capacity scale under each of the three wheels.

7. Level aircraft as previously described making certain nose wheel is centered.

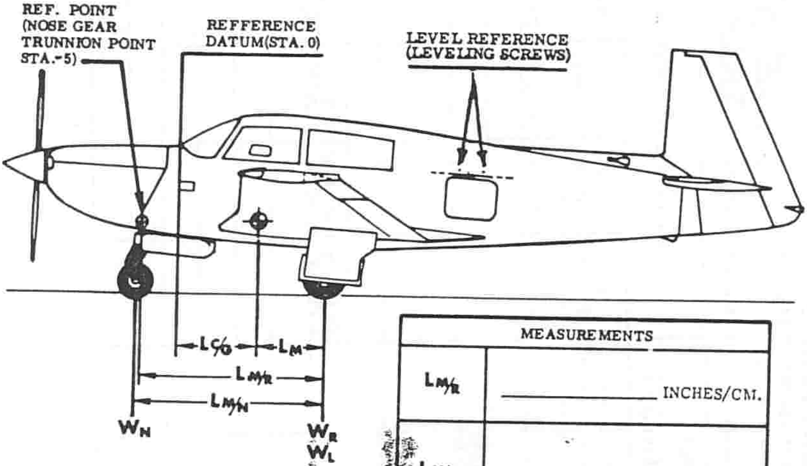
8. Weigh the aircraft and deduct any tare from each reading.

9. Find reference point by dropping a plumb bob from center of nose gear trunnion (retracting pivot axis) to the floor. Mark the point of intersection.

10. Locate center line of nose wheel axle and main wheel axles in the same manner.

11. Measure the horizontal distance from the reference point to main wheel axle center line. Measure horizontal distance from center line of nose wheel axle to center line of main wheel axles.

12. Record weights and measurements, and compute basic weight and CG as follows:



MEASUREMENTS	
$L_{M/R}$	______________ INCHES/CM.
$L_{M/N}$	______________ INCHES/CM

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

a. CG Forward of Main Wheels:

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

b. CG Aft of Datum (Station 0):

______ IN/CM Distance from Center Nose Gear Trunion to Center of Main Wheel Axles (Horizontal) ($L_{M/R}$) − 5 IN(12.7 CM) Distance from Nose Gear Trunion to Datum (Constant) − ______ IN/CM Result of Computation Above (L_M) = ______ IN/CM CG (FUS. STA.) Distance Aft of Datum. (Empty Weight CG) (L_{CG})

NOTE: Wing Jack Points are located at Fus. Sta. 56.658 in. Nose Jack Point is located at F.S. 3.415 in.

OWNERS WEIGHT AND BALANCE RECORD

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

AIRPLANE MODEL - M20 K | SERIAL NUMBER 25-1066 | FAA REGISTRATION NO. ~~N252SS~~ OE-KOG

DATE	DESCRIPTION OF MODIFICATION	WEIGHT CHANGE ADDED (+) Wt. (Pounds)	WEIGHT CHANGE ADDED (+) Arm (Inches)	WEIGHT CHANGE REMOVED (-) Wt. (Pounds)	WEIGHT CHANGE REMOVED (-) Arm (Inches)	RUNNING EMPTY WEIGHT Wt. (Pounds)	RUNNING EMPTY WEIGHT Moment /1000	RUNNING EMPTY WEIGHT Arm (Inches)	RUNNING EMPTY WEIGHT Useful Load
9-23-86	BASIC EMPTY WEIGHT AS DELIVERED (W) (Includes Full Oil - 8 QTS)	—		—	—	2056	89.15	43.4	844
	WEIGHT AND BALANCE SUPERCEDED BY AUTOPILOTS CENTRAL, INC. CRS-212-5 DATE 26 June 87								
25.7.91	Wägung					2119.7	93.18	43.96	780.2

AUTOPILOTS CENTRAL, INC.

WEIGHT AND BALANCE DATA

:RCRAFT MFG. Mooney MODEL M20K S/N 25-1066 N 252SS

NNER: Air Tulsa, Inc.

EQUIPMENT REMOVED	WEIGHT	ARM	MOMENT
evious Figures dated 9-23-86	2056.00	43.40	89150.00
5-80 RNAV System	- 6.00	15.00	- 90.00
:ADIO RACK MATERIAL			
IRING			

QUIPMENT ADDED			
S-81 RNAV	5.00	15.00	75.00
-62 DME	2.60	15.00	39.00
ADIO RACK MATERIAL			
IRING			
/C WEIGHT			
OTAL	2057.60	43.34	89174.00

SUPERCED 8-4-87

NEW EMPTY WEIGHT A/C 2057.60 E.C.G. 43.34 W.O. ____

DATE June 26, 1987

NEW USEFUL LOAD ____ APPROVED R. H. Berry

AUTOPILOTS CENTRAL, INC.

WEIGHT AND BALANCE DATA

RCRAFT MFG. Mooney MODEL M20K S/N 25-1066 N 252SS

INER: Air Tulsa Inc.

QUIPMENT REMOVED	WEIGHT	ARM	MOMENT
ADIO RACK MATERIAL			
IRING			

QUIPMENT ADDED			
10 Stormscope Processor W/Tray	5.30	98.4	521.52
10 " Display W/Tray	3.00	15.0	45.00
10 " Antenna W/Tray	2.00	108.4	216.80
10 " Cable Assembly	5.00	92.0	460.00
ADIO RACK MATERIAL			
IRING			
/C WEIGHT	2057.60	43.34	89174.00
OTAL	2072.9	43.62	90417.32

NEW EMPTY WEIGHT A/C 2072.9 E.C.G. 43.62 W.O. 11749

DATE August 4, 1987

NEW USEFUL LOAD

APPROVED James A. Maddrup

MOONEY M20K

PROBLEM FORM

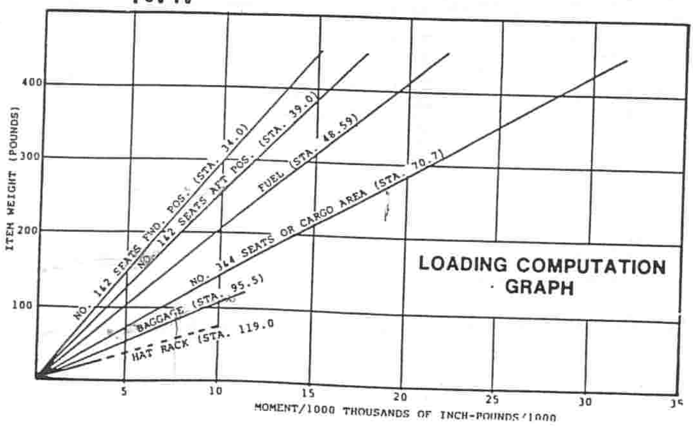
FAA REGISTRATION NO.______________ M20K SERIAL NO.______________

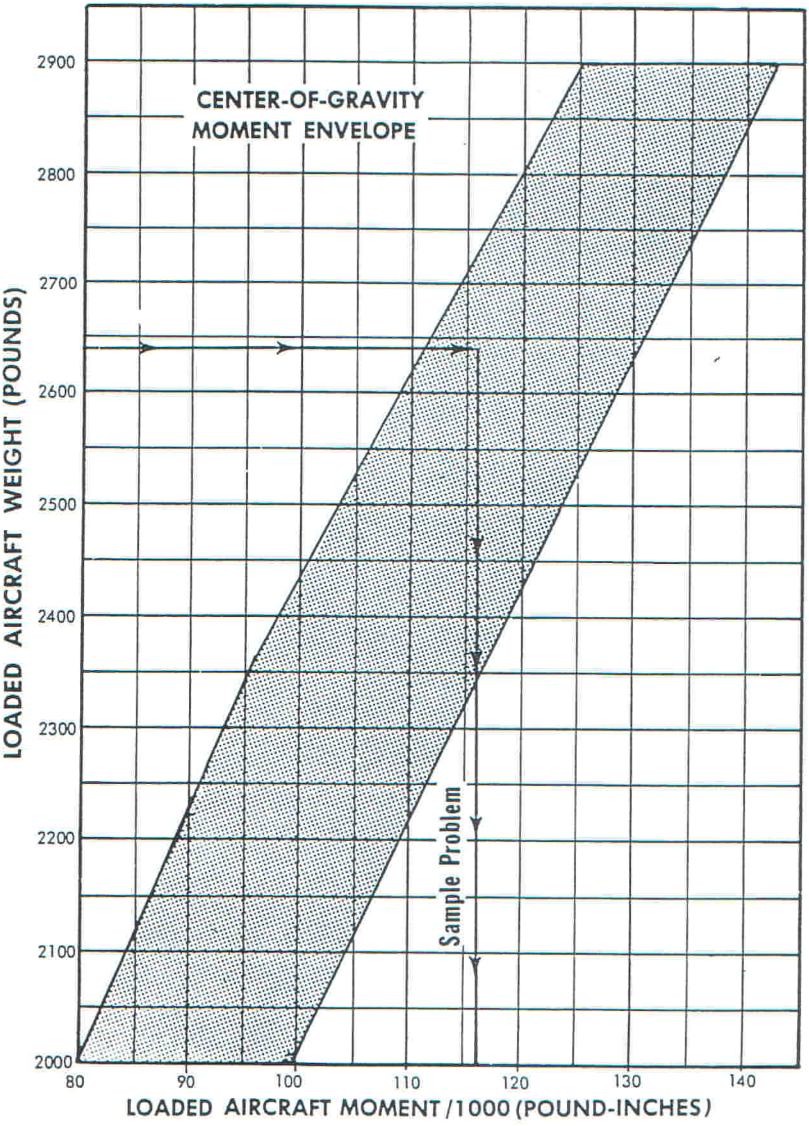
Step	ITEM	Sample Problem Pilot & Pass.		Your Problem	
		Weight (LBS)	Moment (LB-INS. /1000)	Weight (LBS)	Moment (LB-INS. /1000)
1	**Aircraft Basic Empty Weight, (W_T) (From Page 6-6) Includes Full Oil ----8 QT. @ 1.875 LBS/QT (Sta - 22.19) (Sump assumed full for all flights)**	1830	76.53		
2	Pilot Seat (#1)*	170.0	6.0 (2nd Pos.)		
	Copilot Seat (#2)*	170.0	5.78 (Fwd. Pos.)		
3	Left Rear Seat (#3) Or Cargo Area				
	Right Rear Seat (#4) Or Cargo Area				
4	Fuel (Max. Usable 75.6 Gal. 453.6 LBS @ sta 48.59)	360	17.49		
5	Baggage (Max. 120 LBS @ Sta 95.5)	110.0	10.51		
	Hat Rack (Max. 10 LBS @Sta 119.0)				
6	Loaded Aircraft Weight	2640	X		X
	Total Moment/1000	X	116.28	X	
7	**Refer to Page 6-8, Center-of Gravity Moment Envelope, to determine whether your aircraft loading is acceptable.**				

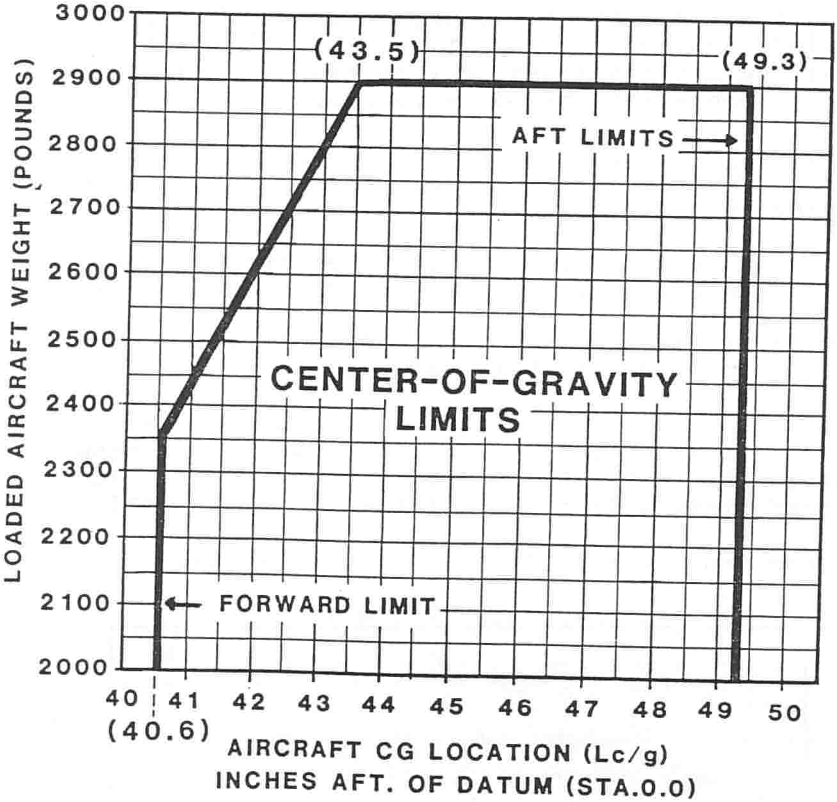
*Obtain the moment/1000 value for each seat position (FWD, MID, or AFT.) from loading computation graph below.

CAUTION

Cargo loaded in rear seat area, with seat backs folded down, should have center of gravity over fuselage station 70.7.




CENTER-OF-GRAVITY
MOMENT ENVELOPE
LOADED AIRCRAFT WEIGHT (POUNDS)
2900
2800
2700
2600
2500
2400
2300
2200
2100
2000
80
90
100
110
120
130
140
Sample Problem
LOADED AIRCRAFT MOMENT/1000 (POUND-INCHES)


3000
2900
2800
2700
2600
2500
2400
2300
2200
2100
2000
LOADED AIRCRAFT WEIGHT (POUNDS)
(43.5)
(49.3)
AFT LIMITS
CENTER-OF-GRAVITY LIMITS
FORWARD LIMIT
40
41
42
43
44
45
46
47
48
49
50
(40.6)
AIRCRAFT CG LOCATION (Lc/g)
INCHES AFT. OF DATUM (STA.0.0)

FIXED BALLAST

The M20K has provisions for a fixed ballast located in the tailcone at Fuselage Station 197.5. If additional equipment is to be installed, fixed ballast weight adjustment may be required to maintain the center-of-gravity envelope.

The aircraft should be weighed and a new center-of-gravity established as defined in the airplane weighing computation on page 6-5.

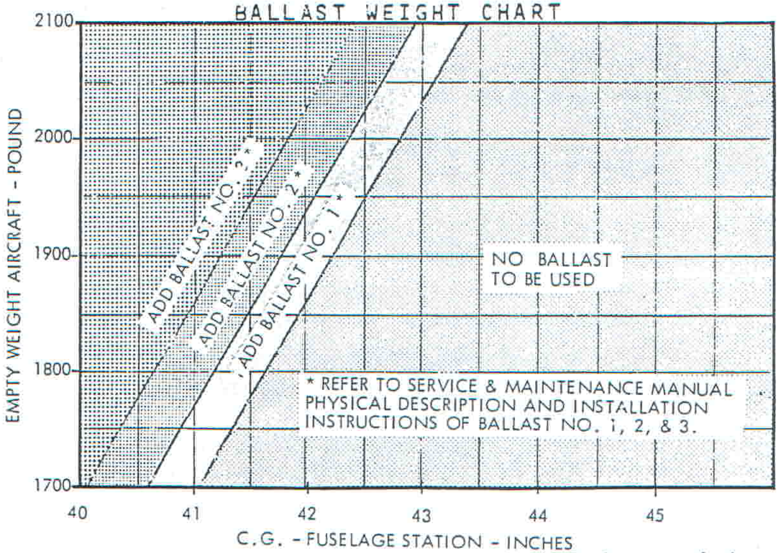
Check the weight and C.G. on the Fixed Ballast Weight Chart, below. Install or remove weights as required.

EXAMPLE: Airplane empty weighs 1845 lbs. with a C.G. at 41.55 inches.

	Wt.	Arm	Moment
Airplane As Weighed	1845	41.55	76660
+ Ballast No. 1 (-501)	+6	197.5	+ 1185
Licenced Empty Weight	1851 lbs		77845

Licenced empty Weight C.G. Location = 42.06.

BALLAST WEIGHT CHART



Refer to Equipment List, page 6-13 for Weight of Fixed Ballast.

MOONEY M20K

PILOT'S LOADING GUIDE

LOADING CALCULATION PROCEDURE

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

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

Step 1. Refer to the latest entry on page 6-6 for the current empty weight and moment.

NOTE

Since the engine oil is normally kept at the full level, the oil weight and moment is included in basic empty weight and is constant in calculating all loading problems.

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

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

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

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

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

Step 6: Total the weight columns. This total must be 2900 Pounds or less. Total the Moment/1000 column.

DO NOT FORGET TO SUBTRACT NEGATIVE NUMBERS.

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

EQUIPMENT LIST

The following equipment list is a listing of all items approved at the time of publication of this manual for the Mooney M20K.

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

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

NOTE

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

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

EQUIPMENT LIST

MO.	9		
DAY	23		
YEAR	84		

ITEM NO.	ITEM DESCRIPTION	REF. DRAWING	WEIGHT (POUNDS)	ARM (INCHES)	MARK IF INSTALLED		
	A. FIXED BALLAST						
1A	WEIGHT (-501 INSTL)	350203-501	6.0	197.50	X		
2A	WEIGHT (-503 INSTL)	350203-503	13.0	197.50			
3A	WEIGHT (-505 INSTL)	350203-505	19.0	197.50			

EQUIPMENT LIST

ITEM NO.	ITEM DESCRIPTION	REF. DRAWING	WEIGHT (POUNDS)	ARM (INCHES)	MARK IF INSTALLED MO. 9 DAY 23 YEAR 84	MO. DAY YEAR	MO. DAY YEAR
	B. POWERPLANT AND ACCESSORIES						
1B	ENGINE, CONTINENTAL TSIO-360-MB1 INCLUDES: STARTER, ALTERNATOR, OIL FILTER, OIL RADIATOR, PROPELLER GOVERNOR. TURBO, MANIFOLD'S INTERCOOLER, AND W/O OIL.	600407	428.3*	-19.94	X		
2B	VALVE, OIL QUICK DRAIN (NET CHANGE & ELBOW)	600407	.10	-22.19	X		
3B	~~PROPELLER - CONSTANT SPEED McCauley 2A34C221/90DHC 16E or -16EP, EXTENSION AND SPINNER~~	~~680032~~	~~60.0*~~	~~-45.01~~	X		
3B-2	PROPELLER - CONSTANT SPEED HARTZELL #BHC-J2YF-1BF/F8459A-11Q	680032	54.00	-45.01			
4B							

EQUIPMENT LIST

MO.	9		
DAY	23		
YEAR	84		

ITEM NO.	ITEM DESCRIPTION	REF. DRAWING	WEIGHT (POUNDS)	ARM (INCHES)	MARK IF INSTALLED		
	B. POWERPLANT AND ACCESSORIES (cont)						
5B	FUEL SELECTOR VALVE	610256	1.0	26.25	X		
6B	ALTERNATOR (OPT) No. 2	600407	13.2	-5.08	X		
	PROPELLER HTV-12-D/180-17	-	42,0	-45,01	X		

EQUIPMENT LIST

MO.	9		
DAY	23		
YEAR	86		

ITEM NO.	ITEM DESCRIPTION	REF. DRAWING	WEIGHT (POUNDS)	ARM (INCHES)	MARK IF INSTALLED		
	C. ELECTRICAL SYSTEM						
1C	BATTERY	800351	27.5	110.8	X		
2C	REGULATOR	800351	.6	4.00	X		
3C	HEATED PITOT	820252	1.15	41.35	X		
4C	CIGARETTE LIGHTER	800351	.17	19.5	X		
5C	ELECTRIC FUEL PUMP	610256	2.4	15.0	X		
6C	STALL WARNING INDICATOR	800351	1.00	50.0	X		
7C	GEAR WARNING INDICATOR	800351	1.00	50.0	X		
8C	WING TIP STROBE LIGHT INSTL.	800351	3.08	53.0	X		

MOONEY M20K

EQUIPMENT LIST

MO.	9		
DAY	23		
YEAR	84		

ITEM NO.	ITEM DESCRIPTION	REF. DRAWING	WEIGHT (POUNDS)	ARM (INCHES)	MARK IF INSTALLED		
	C. ELECTRICAL SYSTEM (cont)						
9C	TAIL STROBE LIGHT INSTL.	800351	0.8	215.52	X		
10C	HOUR METER INSTL.	950241	.29	18.5	X		
11C	LANDING LIGHTS	650243	1.0	-31.0	X		
12C	ACTUATOR,FLAP	750097	5.1	103.12	X		
13C	FUEL QTY TRANSMITTER, INBD (2 ea)	610256	.45	48.0	X		
14C	FUEL QTY TRANSMITTER, OUTBD(2 ea)	610256	.45	48.5	X		
15C	ACTUATOR, LANDING GEAR	560260	11.2	39.0	X		
16C	SAFETY SWITCH, AIRSPEED	880013	.20	15.0	X		
17C	E.L.T:	810152	2.1	121.0	X		

EQUIPMENT LIST

MO.	9		
DAY	23		
YEAR	86		

ITEM NO.	ITEM DESCRIPTION	REF. DRAWING	WEIGHT (POUNDS)	ARM (INCHES)	MARK IF INSTALLED		
	D. WHEELS TIRES & BRAKES						
1D	TWO MAIN WHEEL & BRAKE ASSYS	520029	13.72*	64.4	X		
	WHEEL ASSY (2)	520029	11.00	63.98	X		
	BRAKE ASSY (2)	520029	2.72	65.98	X		
2D	TWO MAIN TIRES (6-PLY RATING TIRES, 5.00x6 TYPE III WITH REGULAR TUBES)	520029	17.0	63.98	X		
3D	NOSE WHEEL ASSY	540000	2.60	-5.3	X		
4D	NOSE WHEEL TIRE ASSY 6-PLY RATING TIRES 5.00x5 TYPE III, WITH REGULAR TUBE	540000	7.00	-5.3	X		
5D	BRAKE MASTER CYL. (2 ea)	850109	3.0	8.3	X		
6D	HYDRAULIC RESERVOIR	850109	.3	108.75	X		

EQUIPMENT LIST

ITEM NO.	ITEM DESCRIPTION	REF. DRAWING	WEIGHT (POUNDS)	ARM (INCHES)	MARK IF INSTALLED MO. 9 DAY 23 YEAR 86	MARK IF INSTALLED MO. DAY YEAR	MARK IF INSTALLED MO. DAY YEAR
	D. WHEELS TIRES & BRAKES (cont.)						
7D	VALVE, PARKING BRAKE	850109	.6	-1.45	X		

EQUIPMENT LIST

					MO.	9		
					DAY	23		
					YEAR	84		
ITEM NO.	ITEM DESCRIPTION	REF. DRAWING	WEIGHT (POUNDS)	ARM (INCHES)	MARK IF INSTALLED			
	E. INSTRUMENTS							
1E	ATTITUDE GYRO	820071	2.28	17.46				
2E	DIRECTIONAL GYRO	820071	2.44	16.8				
3E	CLOCK - ELECTRIC	820071	.40	19.6	X			
4E	GAGE OAT	820071	.80	18.50	X			
5E	INDICATOR - VERTICAL SPEED	820071	.90	18.50	X			
6E	TURN COORDINATOR	820071	2.40	16.50	X			
7E	MANIFOLD PRESSURE	820071	1.00	18.48	X			
8E	ALTIMETER	820071	1.00	18.70				
9E	AIRSPEED INDICATOR	820071	.66	18.30	X			

EQUIPMENT LIST

MO.	9		
DAY	23		
YEAR	84		

ITEM NO.	ITEM DESCRIPTION	REF. DRAWING	WEIGHT (POUNDS)	ARM (INCHES)	MARK IF INSTALLED		
	E. INSTRUMENTS (cont)						
10E	MAGNETIC COMPASS	820230	.50	21.90	X		
11E	TACHOMETER, ELECTRIC	820071	.80	18.95	X		
12E	ALTERNATE STATIC AIR SOURCE	820252	.25	18.5	X		
13E	TIT GAUGE	820071	.50	17.5	X		
14E	FUEL FLOW	820071	.35	18.48	X		
15E	CLUSTER GAUGE	820071	1.16	19.3	X		
16E	ANNUNCIATOR PANEL	820071	.70	17.5	X		

EQUIPMENT LIST

MO.	9		
DAY	23		
YEAR	86		

ITEM NO.	ITEM DESCRIPTION	REF. DRAWING	WEIGHT (POUNDS)	ARM (INCHES)	MARK IF INSTALLED		
	F. VACUUM SYSTEM						
1F	VACUUM SYSTEM INSTL.	860052	6.30*	10.19	X		
	VACUUM PUMP	860052	2.0	-3.8	X		

EQUIPMENT LIST

MO.	9		
DAY	23		
YEAR	84		

ITEM NO.	ITEM DESCRIPTION	REF. DRAWING	WEIGHT (POUNDS)	ARM (INCHES)	MARK IF INSTALLED		
	G. CABIN ACCOMMODATIONS						
1G	SUN VISORS	130291	1.0	33.0	X		
2G	SHOULDER HARNESS, FRONT & BACK SET OF FOUR	140205	8.4	76.48	X		
3G	BELT ASSY. REAR OCCUPANT LAP (2)	130291	2.0	71.0	X		
4G	BELT ASSY. FRONT OCCUPANT LAP (2)	130291	2.0	35.0	X		

EQUIPMENT LIST

MO.	9		
DAY	23		
YEAR	84		

ITEM NO.	ITEM DESCRIPTION	REF. DRAWING	WEIGHT (POUNDS)	ARM (INCHES)	MARK IF INSTALLED		
	H. AVIONICS & AUTOPILOTS						
1H	KING KX 165	810150	5.7	+14.38	X		
2H	KING KY 196	810150	3.2	+14.0	X		
~~3H~~	~~KING KNS 80~~ removed 26 June 87	~~810150~~	~~6.0~~	~~+15.0~~	~~X~~		
4H	KING KI 206	810150	1.4	+15.0	X		
5H	KING KR 87 w/KI227	810150	5.9	+49.54	X		
6H	KING KT 76A	810150	3.1	+14.6	X		
7H	KING KMA 24	810150	1.7	+19.0	X		
8H	Autopilot KFC 150	830125	26.6	+73.9	X		
9H	KING KAS 297B w/KEA 130	830125	3.1	+11.7	X		

EQUIPMENT LIST

MO.	9		
DAY	23		
YEAR	86		

ITEM NO.	ITEM DESCRIPTION	REF. DRAWING	WEIGHT (POUNDS)	ARM (INCHES)	MARK IF INSTALLED		
	H. AVIONICS & AUTOPILOTS (cont.)						
10H	DRC Speed Brakes	950155	12.5	+70.0	X		
11H							
12H							
13H							
14H							
15H							
16H							
17H							
18H							

EQUIPMENT LIST

ITEM NO.	ITEM DESCRIPTION	REF. DRAWING	WEIGHT (POUNDS)	ARM (INCHES)	MARK IF INSTALLED		
				MO.	9		
				DAY	23		
				YEAR	86		
	H. AVIONICS & AUTOPILOTS (cont.)						
19H							
20H							
21H							
22H							
23H							
24H							
25H							
26H							
27H							

EQUIPMENT LIST

ITEM NO.	ITEM DESCRIPTION	REF. DRAWING	WEIGHT (POUNDS)	ARM (INCHES)	MARK IF INSTALLED		
				MO.	9		
				DAY	23		
				YEAR	84		
	I. AUXILIARY EQUIPMENT						
1I	TOW BAR (STOWED)	010001	2.12	95.5	X		
2I	JACK POINTS (STOWED)	010000	.10	119.0	X		
3I	WING TIE DOWN RINGS (STOWED)	010002	.10	119.0	X		
4I	FUEL SAMPLER CUP (STOWED)	610010	.05	119.0	X		
5I	ENGINE OPERATORS MANUAL (TCM)	010026	.25	119.0	X		
6I	AIRCRAFT P.O.H./A.F.M.	010026	1.62	119.0	X		
7I	CARGO "D" RINGS	010027	.16	119.0	X		
8I	CARGO RESTRAINT BELTS	140233	1.0	119.0	X		

EQUIPMENT LIST

				MO.	9		
				DAY	23		
				YEAR	86		
ITEM NO.	ITEM DESCRIPTION	REF. DRAWING	WEIGHT (POUNDS)	ARM (INCHES)	MARK IF INSTALLED		
	J. OPTIONAL EQUIPMENT						
1J	OXYGEN SYSTEM INSTL.	870007	28.56	125.0	X		
2J	CURTAINS	950163	2.90	64.0			
3J	HEADREST ASSY.-FRONT	140267	1.56	45.00	X		
4J	HEADREST ASSY.-REAR	140313	1.56	80.00	X		
5J	AUX. POWER RECEPTACLE - INSTL.	950254	2.6	111.0	X		
6J							
7J	ROTATING BEACON INSTL.	800351	1.68	168.0			
8J	BRAKE INSTL., DUAL	950239	3.0	15.00			
9J	FIRE EXTINGUISHER INSTL.	950251	5.25	60.5	X		
10J	FIXED STEP ASSY.	840071	2.16	108.0	X		
11J							

EQUIPMENT LIST

MO.	9		
DAY	23		
YEAR	86		

ITEM NO.	ITEM DESCRIPTION	REF. DRAWING	WEIGHT (POUNDS)	ARM (INCHES)	MARK IF INSTALLED		
	J. OPTIONAL EQUIPMENT (Cont.)						
12J	PROP DE-ICE BOOTS	690001	6.9	-30.85	X		
13J							
14J	SEAT, PILOT, VERTICAL ADJUST. NET CHG.	140215	+ 3.0	**			
15J	SEAT, COPILOT, VERTICAL ADJUST. NET CHG.	140215	+ 3.0	**			
16J	RUDDER PEDAL EXTENSION	720115	.5	15.00	X		
17J							
18J							
19J	OXYGEN REFILL HOSE ADAPTER	870025	4.5	***			
20J	AUX. POWER CABLE ADAPTER	880042	6.8	***			
21J	STANDBY VACUUM PUMP INSTL.	860060	12.04	98.4	X		

***ARM WILL VARY WITH LOCATION STORED. THE PILOT IS RESPONSIBLE TO COMPUTE WEIGHT AND BALANCE DATA IF THESE ITEMS ARE STORED IN THE AIRCRAFT DURING FLIGHT.

EQUIPMENT LIST

MO.	9		
DAY	23		
YEAR	86		

ITEM NO.	ITEM DESCRIPTION	REF. DRAWING	WEIGHT (POUNDS)	ARM (INCHES)	MARK IF INSTALLED		
	J. OPTIONAL EQUIPMENT (Cont.)						
22J							
23J	WING TIP RECOGNITION LIGHTS	210410	2.0	53.0	X		
24J	TOW BAR (FOLDING)	010034	2.6	95.5			
25J	INBOARD ARM REST INSTL	140295	.8	34.5	X		
26J	LUMBAR SUPPORT	140300	.75	35.0	X		
27J							
28J	SEAT, PILOT, VERTICAL ADJUST SPECIAL EDITION Net Chg	140235	+3.25	**	X		
29J	SEAT, COPILOT, VERTICAL ADJUST SPECIAL EDITION	140235	+3.25	**	X		

** ARM WILL VARY WITH SEAT POSITION BETWEEN STA. 34.0 AND 39.0.

EQUIPMENT LIST

ITEM NO.	ITEM DESCRIPTION	REF. DRAWING	WEIGHT (POUNDS)	ARM (INCHES)	MARK IF INSTALLED		
				MO.	[illegible]		
				DAY	23		
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	J. OPTIONAL EQUIPMENT (CONT.)						

SECTION VII
AIRPLANE AND SYSTEMS DESCRIPTION

MOONEY M20K

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SECTION VII
AIRPLANE AND SYSTEMS DESCRIPTION

MOONEY M20K

INTRODUCTION

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

AIRFRAME

The M20K is an all metal, low wing, high performance airplane. The fuselage has a welded, tubular-steel cabin frame covered with non-structural aluminum skins. Access to the cabin is provided by a door located on the right side of the fuselage. A door is provided aft of the rear seat for access to the baggage compartment. The aft fuselage is of semi-monocoque construction.

Seating in the cabin is provided for the pilot and three passengers.

The M20K has a tapered wing of a full-cantilever-laminar-flow type. The airfoil varies from a NACA 63(sub 2)-215 at the wing root to a NACA 64(sub 1)-412 at the wing tip.

An aerodynamic cover is attached to the wing tip and contains the wing navigation and anti-collision lights. The wing has full wrap-around skins with flush riveting over the forward top and bottom two thirds of the leading edge.

The empennage consists of the vertical and horizontal stabilizers and the rudder and elevator surfaces. The entire empennage pivots around attaching points on the aft fuselage to provide pitch attitude trim.

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

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

FLIGHT CONTROLS DESCRIPTION

The aircraft has dual flight controls and can be flown from either the pilot or co-pilot seat. Dual pairs of foot pedals control the rudder and nose wheel steering mechanisms. Push-pull tubes, rather than conventional cable systems, actuate the all- metal flight control surfaces. Rod-end bearings are used throughout the flight control systems. These bearings are simple and require little maintenance other than occasional lubrication. Specially designed aluminum-alloy extrusions, that permit flush skin attachment, form the leading edges of the rudder and elevators. A spring-loaded interconnect device indirectly joins the aileron and rudder control systems to assist in lateral stability during flight maneuvers. Longitudinal pitch trim is achieved through a trim control system that pivots the entire empennage at the tailcone attachment points. A variable down- spring located in the tailcone and a bobweight located forward of the control column help create desirable stability characteristics.

Aileron System

The ailerons are of all-metal construction with beveled trailing edges. Three hinges of machined, extruded aluminum attach the ailerons to the aft wing spar outboard of the wing flaps. The ailerons link to the control wheel through push-pull tubes and bellcranks. Lead counterweights balance the system.

Elevator System

Elevator construction is essentially the same as that of the ailerons. Both elevators attach to stabilizer at four hinge points. Push-pull tubes and bellcranks link the elevators to the control yoke. Lead counterweights balance the elevators.

Rudder System

The rudder attaches to the aft vertical fin spar at four hinge points. Push-pull tubes and bellcranks link the rudder to the rudder pedals.

Trim System

To provide pitch trim control, the entire empennage pivots around its main hinge points. The system consists of a manually operated actuator that operates a series of torque tubes and universal joints connected to a jack screw on the aft tailcone bulkhead. A trim control wheel, located between the pilot and co-pilot seats, allows the pilot to set stabilizer angle. Trim position is indicated by a pointer located on the lower console. This indicator is geared to the trim control wheel mechanism and indicates stabilizer position relative to the aircraft thrust line.

Wing Flaps

The wing flaps are electrically operated and interconnected through push-pull tubes and bellcranks. Total flap area is 17.93 square feet.

Nominal travel is 0 to 33 degrees and limit switches prevent travel above or below these limits. The flap position is controlled by a switch located on the lower control console. Also located on the control console is a flap position indicator which shows full up, takeoff (10 degrees) and full down positions. A cable attached to the flap jackshaft operates the flap position indicator.

Generally, aircraft trim requirements will change with use of the flaps. Lowering of the flaps will cause a nose down pitching condition which can be easily corrected by application of nose up trim. Conversely, retraction of the flaps from a trimmed flight condition will cause a nose up pitching condition.

Use of the flaps should always be within the operational limits established in Section II. The flaps are very effective in lowering landing speed and can be used to slow the aircraft to approach speeds.

INSTRUMENT PANEL

The instrument panel is designed to provide functional grouping of all flight, radio, engine instruments, switches and controls required to operate various systems. All flight instruments are grouped on the shock-mounted panel directly in front of the pilot. The radio console and annunciator panel is at the center of the instrument panel. Power plant instruments are grouped on the co-pilot's panel. Flap and stabilizer position indicators are on the lower center console.

FLIGHT PANEL & INSTRUMENTS

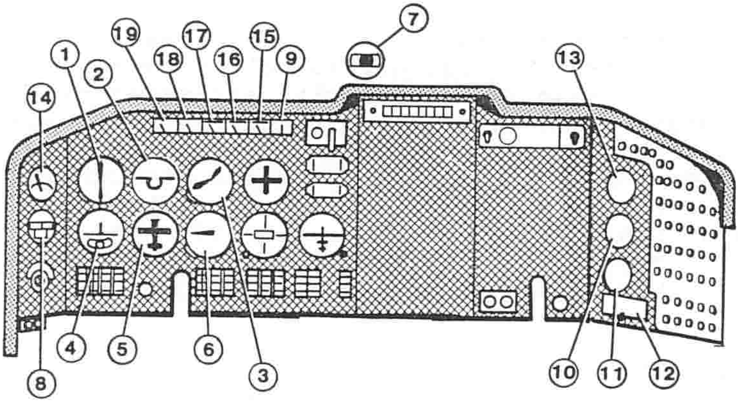

FIGURE 7-1

Flight instruments operate: (1) by air drawn into an evacuated case, (2) by barometric pressure or barometric-impact air pressure differences, (3) by variations in electric current due to mechanically varied resistance, or (4) by reference to the earth's magnetic field.

1. Airspeed Indicator
The airspeed indicator registers airspeed in knots. The air pressure difference between the pitot tube and static ports on each side of the tailcone operates the airspeed indicator.

2. Attitude Indicator (If installed)
The vacuum-powered attitude indicator indicates aircraft attitude relative to straight- and- level flight. Bank attitude is presented by a pointer at the top of the indicator relative to the bank scale which is marked in increments of 10 degrees, 20 degrees, 30 degrees, 45 degrees, 60 degrees and 90 degrees either side of the center mark. Pitch attitude is presented by an airplane silhouette in relation to the horizon bar. The knob at the bottom of the instrument is provided for adjustment of the silhouette to the horizon bar for a more accurate flight attitude indication. Vacuum pressure for satisfactory operation is 4.25 +/- .25 to 5.50 +.2/-.0 In Hg. Various styles may be installed at this position.

3. Altimeter
The altimeter operates by absolute pressure, and converts barometric pressure to altitude reading in feet above mean sea level. The altimeter has a fixed dial with three pointers to indicate hundreds, thousands, and tens-of- thousands of feet. Barometric pressure is sensed through the static ports. A knob adjusts a movable dial, behind a small window in the face of the main dial, to indicate local barometric pressure and to correct the altimeter reading for prevailing conditions.

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

5. Gyroscopic Heading Indicator (Directional Gyro) (If installed)
The directional gyro displays airplane heading on a compass card in relation to a fixed simulated airplane image and index. The directional indicator will precess slightly over a period of time. Therefore, the compass card should be set

in accordance with the magnetic compass just prior to takeoff, and occasionally readjusted on extended flights. A knob on the lower left edge of the instrument is used to adjust the compass card to correct for any precession. Vacuum pressure for satisfactory operation is the same as the artificial horizon.

6. Vertical Speed Indicator (If installed)
The vertical speed indicator converts barometric pressure changes in the static lines to aircraft ascent or descent rate readings in feet per minute. This indicator has a single needle and two adjoining scales that read from 0 to 2000 feet per minute. The recessed, slotted screw at the lower left of the instrument case is used to "zero" the indicator when the aircraft is on the ground.

7. Magnetic Compass
The magnetic compass dial is graduated in five-degree increments and is encased in a liquid-filled glass and metal case. It is equipped with compensating magnets adjustable from the front of the case. Access to the compass light and the compensating magnets is provided by pivoted covers. No maintenance is required on the compass except an occasional check on a compass rose with adjustment of the compensation, if necessary, and replacement of the lamp.

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

9. OAT (Outside Air Temperature)
The outside air temperature gauge provides the pilot with the free stream outside air temperature in degrees Celsius.

10. Tachometer
The tachometer is an electronic meter which counts pulses generated by a "Hall Effect" generator in the left magneto. The instrument is calibrated in revolutions per minute (RPM).

RADIO INSTRUMENTS

Refer to Section IX for the description of the radio configuration installed in this aircraft.

11. Manifold Pressure

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

12. Fuel Flow

The fuel flow gauge is an electric instrument which operates from information provided by a flow transducer. The gauge is digital and indicates fuel flow volume in the metered portion of the engine fuel system.

The FT-101 Fuel Gauge System has two functions: (1) Normal digital read out of fuel flow during engine operation in gallons per hour and (2) with test/used button pushed for 4 seconds or less will indicate the quantity of fuel used from the tanks since last filling. Do not push "Reset" while master switch is on until tanks are topped off again.

The optional Alcor fuel flow system depicts "fuel flow" and "gallons used" simultaneously.

The fuel flow gauge is not to be used as a reference for leaning the engine during manual operation, use the TIT gauge for this reference.

The fuel flow gauge is not to be used as the master gauge during engine adjustment and set-up. This set-up is done with calibrated gauges based on fuel weight, not volume.

13. TIT GAUGE

The TIT gauge is located to the right of the radio panels and above the engine tachometer. A thermocouple probe in the turbocharger turbine inlet transmits temperature variations to the indicator mounted in the instrument panel. The TIT indicator serves as a visual aid to the pilot when adjusting mixture. Turbine Inlet Temperature varies with fuel- to-air ratio, power and RPM.

14. Loadmeter
The loadmeter measures the % of output from the alternator(s),(no. 1 is standard and no. 2 is optional), the bus load and the bus voltage when the switch is pressed.

Two 5 amp fuses protect the two circuits, load and alternator output indication. These are located underneath the circuit breaker panel approximately 6 inches forward of the panel face.

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

16. Oil Pressure
This is an electrical instrument, using a transducer as a reference, which varies resistance with pressure.

17. Cylinder Head Temperature
The cylinder head temperature indications are controlled by an electrical resistance type temperature probe installed in the NUMBER 2 cylinder, and receives power from the aircraft electrical system. The instrument is calibrated in degrees F.

18 & 19. Fuel Quantity Indicators
The fuel quantity indicators are used in conjunction with float-operated variable-resistance transmitters in each fuel tank. The tank-full position of the transmitter floats produces a maximum resistance through the transmitters, permitting minimum current flow through the fuel quantity indicator and maximum pointer deflection. The instruments are calibrated in gallons of fuel.

NOTE

Spare fuses are located aft of and adjacent to the loadmeter fuses. They are 5 amp fuses to replace either loadmeter or instrument light control box fuses as needed.

MOONEY M20K

SWITCHES & CONTROLS

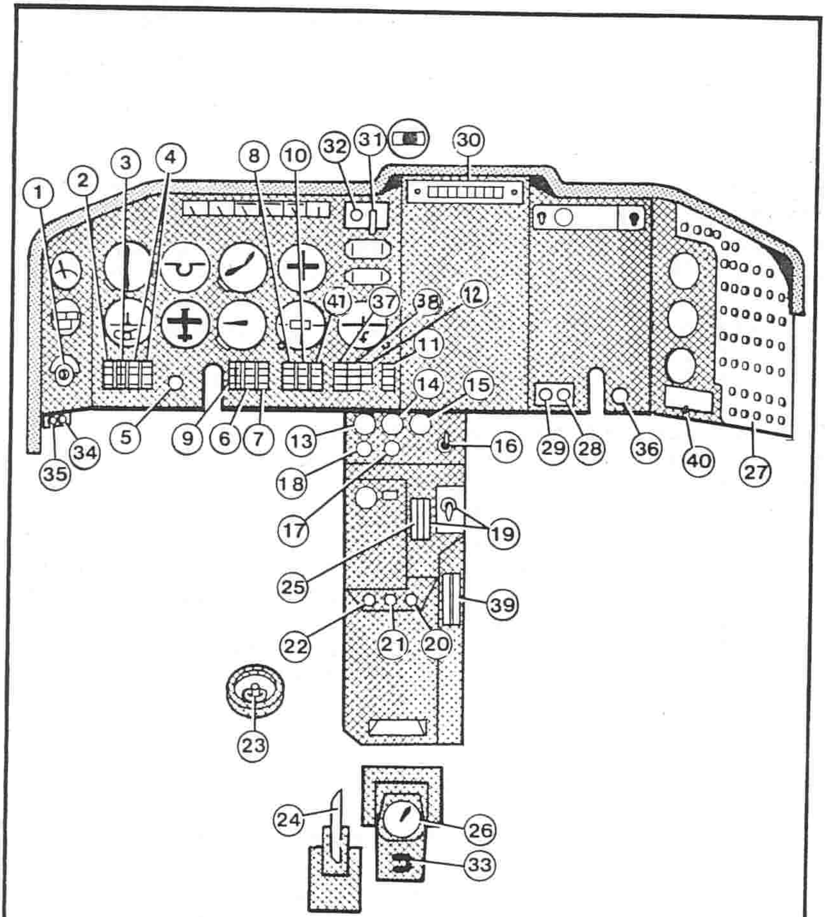

FIGURE 7-2

SECTION VII
AIRPLANE AND SYSTEMS DESCRIPTION

MOONEY M20K

1. Magneto/Starter Switch
The magneto/starter switch combines both ignition and starting functions. Turning the ignition key clockwise through R, L, and BOTH to the START MAG position and then pushing forward on the key and receptacle engages the starter. Releasing the key when the engine starts allows the switch to return, by spring action, to the BOTH position. In the OFF position both magnetos are grounded. At the R position the left magneto grounds. At the L position the right magneto grounds. At either START position or the BOTH position both magnetos are hot and the ignition system is ON.

2. Master Switch
The master switch operates the battery relay which controls battery power to the main ship bus bar. This cuts off all ship power except the cabin and baggage overhead lights and the electrical clock.

3. Alternator Switch (Split) These switches cut the alternator field power from main bus to either No.1 or No.2 (if installed) alternators.

4. Boost Pump HI and LOW Switches
Electric switches control operation of the electric fuel boost pump. The LOW BOOST switch connects to the pump through a voltage regulator for correct pump output. A guard on the HIGH BOOST switch prevents inadvertent operation and must be rotated clockwise for switch operation. (See Emergency Procedures and Normal Procedures sections for operation). Should a short occur the combination switch/circuit breaker will automatically trip to the OFF position.

5. Alternate Static Source Valve
Pulling the alternate static source valve to the full aft position changes the source of static air for the altimeter, airspeed indicator and rate-of-climb indicator from the outside of the aircraft to the cabin interior. Airspeed and altimeter readings are affected slightly when alternate static source is used (Refer to Section V).

6. Strobe Light Switch/Circuit Breaker
Pushing ON the strobe light combination switch circuit breaker turns on the wing tip and tail strobe lights. Should a short occur the combination switch/circuit breaker will automatically trip to the OFF position.

7. Navigation Light Switch/Circuit Breaker
Pushing ON the navigation light combination switch/circuit breaker turns on the wing tip and tail navigation lights. Should a short occur the combination switch/circuit breaker will automatically trip to the OFF position.

8. Recognition Light Switch/Circuit Breaker (If installed)
Pushing ON the recognition light combination switch/circuit breaker turns on the recognition light. Should a short occur the combination switch/circuit breaker will automatically trip to the OFF position.

9. Landing Light Switch-Pushing ON the landing light split switch turns on the left and right landing lights. Should a short occur the circuit breaker at the top of the circuit breaker panel will automatically trip to the OFF position. The landing lights should not be operated when the engine is not running to preclude overheating of the lamps.

10. Pitot Heat Switch/Circuit Breaker
(If installed) Pushing ON the pitot heat combination switch/circuit breaker turns on the heating elements within the pitot tube. Should a short occur the combination switch/circuit breaker will automatically trip to the OFF position.

11. Primer Switch
Pushing the momentary type rocker switch actuates a solenoid type valve on the engine and turns on the fuel boost pump which injects fuel into the induction system to aid in starting the engine.

12. Electric Trim Switch/Circuit Breaker
(If installed) This switch is normally left in the ON position and serves as both a circuit protector and as a master disconnect for the electric trim system in the event of a malfunction.

13. Throttle Control
Pushing the throttle control forward increases the manifold pressure thereby increasing the engine power. Pulling the control aft decreases the manifold pressure thereby decreasing the engine power.

14. Propeller Control
Pushing the propeller control forward increases engine RPM; pulling the control aft decreases the engine RPM. The control is of the vernier type and fine adjustments of RPM can be obtained by turning the knob clockwise to increase RPM and counterclockwise to decrease RPM. The knob should not be turned in any closer than 1/8" to the panel nut face.

15. Mixture Control
The mixture control allows the pilot to adjust the fuel-air ratio (mixture) of the engine. Pushing the control forward richens the mixture. Pulling the control full aft closes the idle cutoff valve shutting down the engine. The control is of the vernier type and fine adjustments of the mixture can be obtained by turning the knob clockwise to richen the mixture, and counterclockwise to lean. The knob should not be turned in any closer than 1/3" to the panel nut face.

16. Cowl Flap Switch
The cowl flap switch activates the electric cowl flap actuator to open and close the cowl flap door. Placing the switch in the lower position opens the cowl flap door. This allows additional airflow to properly cool the engine on the ground and during lowspeed, high power climbs. During cruise, placing the switch in the upper position closes the cowl flap door reducing the airflow through the engine. When full open or closed is selected the actuator will automatically shut off when the cowl flap has reached that position. The

switch will remain in that selected position. To keep oil and cylinder head temperatures within the normal operating ranges (green arc of the temperature gauges) the cowl flap may be positioned at any angle from closed to full open. This may be accomplished by momentarily positioning the switch in either the upper or lower position. When the cowl flap has reached a desired intermediate position, as shown on the indicator, place the switch to the center (OFF) position.

17. Parking Brake Control
Depressing the brake pedals and pulling the parking brake control sets the parking brake. Pushing in the parking brake control releases the parking brake.

18. Alternate Air Control (Manual Operation)
Pulling the alternate air control opens the engine alternate air door manually. THE ALTERNATE AIR DOOR WILL OPEN AUTOMATICALLY WHEN AIR FILTER IS BLOCKED. The alternate air door will remain open as long as the air filter is blocked. Operation of the manual control is overriden by the induction air system suction created by a blocked filter. If the filter becomes unblocked, the suction is eliminated and the door would close by gravity and be magnetically latched; provided the manual control is in the closed (full in position.

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

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~ CAUTION ~
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Pushing the switch to the UP position retracts the flaps completely.

Wing flap position is mechanically indicated thru a cable mounted directly to the flap jackshaft. A pointer in the flap position indicator indicates flap position. The intermediate mark in the pointer range is the flap TAKEOFF setting (10 degrees).

20. Cabin Vent Control (Fresh Air)
Pulling the cabin vent control aft opens the vent, located on the right side of the airplane. Optimum use of the cabin vent control is described in the Cabin Environment Section.

21. Cabin Heat Control
Pulling the cabin heat control turns on cabin heat. To lower cabin temperature the cabin heat control is pushed forward toward the OFF position. Optimum use of the cabin heat control is described in the Cabin Environment Section.

22. Defrost Control
Pulling the defrost control decreases air flow to the lower cabin and increases air flow to the windshield in the front of the glareshield area. Optimum use of the defrost control is described in the Cabin Environment Section. The optional blower motor switch is activated when the control is pulled aft. This turns on a fan within the ventilation system to move more air over the windshield.

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

24. Trim Control Wheel
Rotating the trim control wheel forward lowers the nose; rearward rotation raises the nose of the aircraft.

25. Trim Position Indicator
Stabilizer trim position indicator is mechanically activated thru a cable assembly attached to the trim wheel mechanism. Trim position indications are shown on the console.

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

27. Circuit Breaker Panel
Push-to-reset and push-pull circuit breakers automatically break the electrical current flow if a system receives an overload.

28. Radio Light Switch and Dimmer
Turning the radio light switch knob clockwise turns ON the radio and indicator lights. Continued turning clockwise increases light intensity. This control also operates the internal instrument lights.

29. Panel Light Switch and Dimmer
Turning the panel light switch knob clockwise turns ON the instrument lights located in the glareshield. Continued turning clockwise increases the lighting intensity.

30. Annunciator Panel
See description of functions elsewhere in this section.

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

NOTE

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

32. Gear Safety Override Switch (Gr Safety By Pass)
The gear safety override switch is a manual means of electrically bypassing the Airspeed Safety Switch. In the event the gear control switch is inadvertently placed in the gear-up position, the gear Airspeed Safety Switch prevents the gear being retracted before takeoff speed of approximately 65 +7, -4 KTS is reached. Should it be necessary to retract at a lower airspeed the GR SAFETY BY PASS switch may be pressed until the gear is completely retracted.

CAUTION

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

33. Gear Down Position Indicator (Floorboard)
The illuminated gear-down position indicator at the back of the fuel selector pan, aft of the center console, has two marks that align when the gear is down and illuminates when the green GEAR DOWN light is on. A red-white striped decal shows when landing gear is not in the down position.

34. Microphone Jack

35. Headset Jack

36. Cigar Lighter

37. Optional or Filler

38. Prop De-Ice Switch/Circuit Breaker (If installed)

39. Cowl Flap Position Indicator
Cowl flap position is indicated through a mechanical cable assembly attached to the electric actuator bellcrank linkage. The cowl flap position is indicated on the console.

40. Fuel Flow Memory Switch
The "Fuel Totalizer" memory is connected to the aircraft battery through the "Fuel Flow Memory" switch. This is normallly left in the "ON" position at all times so that "Fuel Used" information is retained from one flight to the next until reset. The memory switch may be turned OFF to prevent battery drain if the aircraft is to be stored for extended periods of time. Some optional "Fuel Totalizer" systems do not contain a memory switch.

41. Standby Vacuum Switch (If installed)

MOONEY M20K

ANNUNCIATOR & SWITCH PANEL

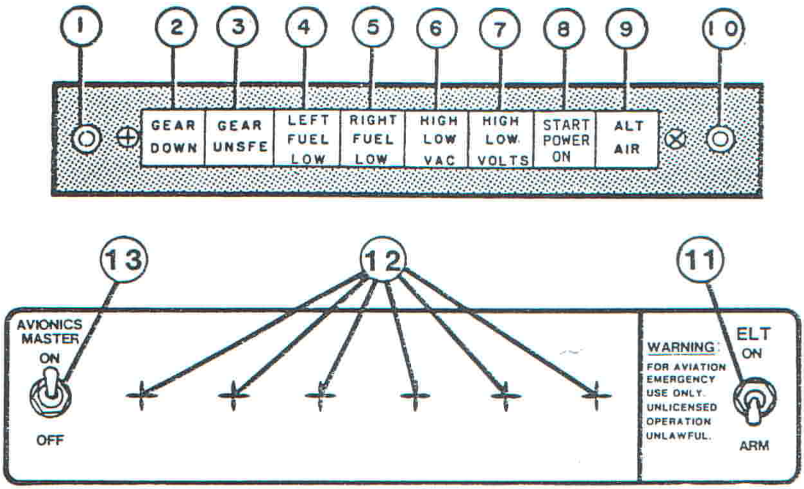


FIGURE 7-3

1. Press-to-Test Switch
Pressing the red press-to-test switch with the master switch ON will illuminate all light bulbs excluding START POWER ON indicator. Defective bulbs should be replaced prior to the next flight.

2. Gear Safety Indicator (GEAR DOWN)

3. Gear Safety Indicator (GEAR UNSFE)
The green GEAR DN light, a red GEAR UNSFE light, and a warning horn provide visual and audible gear position signals. The green light (GREEN DN) shows continuously when the gear is fully extended. With the navigation lights on, the GEAR DN light is dim for night operation. All gear lights are out when the gear is fully retracted.

4. FUEL LOW Indicator (Left Tank)

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

NOTE

Press-to-test switch must be held for 3-5 seconds for LOW FUEL warning circuit to activate.

6. Vacuum Malfunction Indicator (VAC-HIGH/LOW)
The red VAC annunciator light indicates a malfunction or improper adjustment of air suction system. Air suction is available for operation of the attitude gyro and also the directional gyro. The designated suction range is 4.25 +/- .25 to 5.5 +.2, -0.0 inches of mercury. The VAC light will blink when suction is below 4.25 inches of mercury and gives a steady light when suction is above 5.5 inches of mercury. In either case the gyros should not be considered reliable during this warning time.

7. Voltage Irregularity Indicator (VOLTS-HIGH/LOW)
The red VOLTS annunciator light comes on designating improper voltage supply. A red blinking light designates low, or no voltage from the alternator; a steady red light indicates over voltage or tripped voltage relay.

3. START POWER ON Indicator
The START POWER ON light illuminates when the starter switch or relay has malfunctioned and the starter is engaged while the engine is running. Shut the engine off as soon as practicable. This light does not come on when "Press-to-Test" switch is pushed.

9. Alternate Air
The "ALT AIR" light illuminates when the alternate air door is opened automatically or manually. In this situation, induction air for the engine is drawn from inside the cowling rather than through the side intake area.

NOTE

Use of alternate air will result in loss of power and will reduce the service ceiling.

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

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

12. Optional Equipment Control Switches
Refer to Section IX for description and operation of optional equipment installed in this aircraft.

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

GROUND CONTROL

NOSE GEAR STEERING

The nose gear steering system consists of steering horn on the gear leg linked to the rudder pedals by push-pull tubes and bellcranks. Gear retraction automatically disengages the steering mechanism from the nose wheel and centers the nose wheel for entry into the wheelwell.

TAXIING AND GROUND HANDLING

The aircraft can be easily taxied with minimum use of brakes. Minimum turning radius is 41 feet without use of brakes. A manual tow bar can be used to ground handle the aircraft. Care must be used to not swivel the nose wheel beyond 14 degrees from center. Adjustable steering stops are incorporated on nose gear leg assembly.

~ CAUTION ~

Exceeding the swivel angle limits may cause structural damage.

LANDING GEAR

CONSTRUCTION

The landing gear legs are constructed of chrome-molybdenum tubular steel, heat-treated for greater strength and wear resistance. Main gear attaching points have metal backings imbedded in the gear mounting box attached to the wing spar. The nose gear mounts on the cabin tubular steel frame. Rubber discs in all gear leg assemblies absorb the shock of taxiing and landing.

RETRACTION SYSTEM

The landing gear is electrically retracted and extended. The gear switch operates the landing gear actuator relay. Pulling the wheel-shaped knob out and moving it to the upper detent raises the gear. However, an Airspeed Safety Switch, mounted to the back of the airspeed indicator, is incorporated in the electrical system to prevent landing gear retraction while on the ground and until a safe takeoff speed is reached, (approximately 65 +7, -4 KIAS). The up limit switch will stop the gear in its retracted position. Moving the control knob to its lower detent lowers the gear. The properly rigged down limit switch will stop the gear actuating motor when proper force has been exerted to hold the landing gear in the down-and-locked position. Bungee springs preload the retraction mechanism in an overcenter position to hold the gear down. A landing gear safety by- pass switch override is provided next to the gear switch should the gear fail to retract. Depressing and holding this switch manually bypasses the airspeed safety switch and allows the gear to retract.

CAUTION

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

WHEEL BRAKES

The main gear wheels incorporate self-adjusting disc-type hydraulic brakes. The pilot's rudder pedals have individual toe-actuated brake cylinders linked to the rudder pedals. Depressing the toe pedals and pulling the parking brake control on the console sets the brakes. Pushing the parking brake control forward releases the brakes.
It is not advisable to set the parking brake when the brakes are overheated, after heavy braking or when outside temperatures are unusually high. Trapped hydraulic fluid may expand with heat and damage the system. Wheel chocks and tiedowns should be used for long-term parking.

EMERGENCY EXTENSION SYSTEM

An emergency gear extension mechanism is provided to allow manual lowering of the landing gear. The control mechanism is located between and aft of the pilot and co-pilot seats. The red lever must be released and pulled up (aft) to disengage the gear from the electric drive and engage the manual extension mechanism. The mechanism has a spring retracted pull cable which manually drives the electric gear actuator to extend the gear. 12-20 pulls are required to fully extend and lock the gear down. The electrical extension or retracting system will not operate if the manual extension lever is not properly positioned.

WARNING SYSTEM

The landing gear warning system consists of: 1) the landing gear condition lights, GREEN for "GEAR DOWN" and RED for "GEAR UNSFE", and 2) a warning horn activated when the gear is not down-and-locked and the throttle is set at 16 to 18 inches or less manifold pressure. The green light shows continuously when the gear is fully extended. The red light shows whenever the gear is in transit or not locked down but is off when the gear is fully retracted. A visual gear-position indicator, located on floorboard aft of the fuel selector, shows when the gear is down when the indicator marks align. The gear down light is dimmed when navigation lights are turned on.

STEERING

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

CAUTION

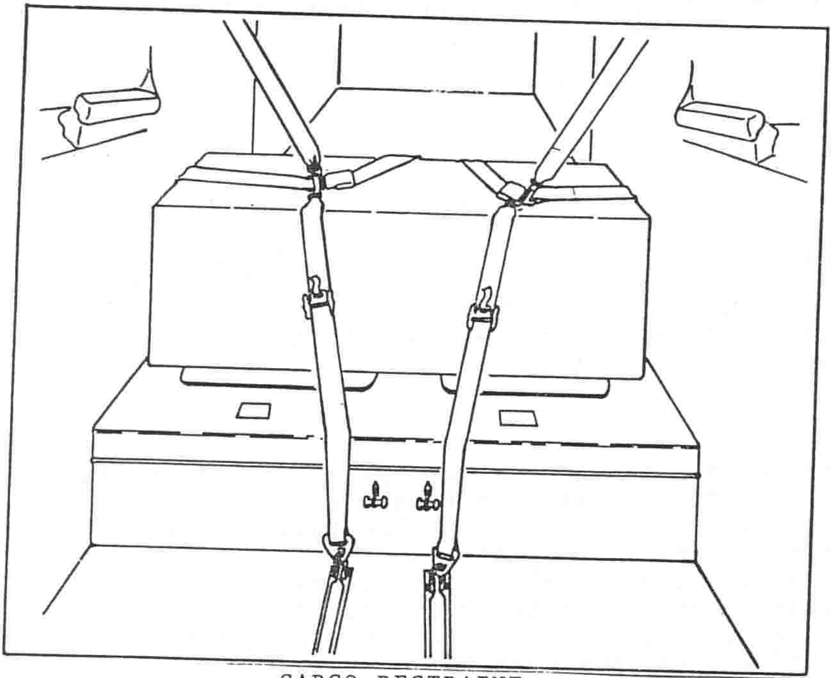
The nose wheel must not be swiveled beyond 14 degrees either side of center. To exceed these limits may cause structural damage.

CABIN

BAGGAGE COMPARTMENT

The baggage compartment is located aft of the rear passenger seat. The standard compartment has 17 cubic feet of baggage or cargo space. A maximum of 120 pounds may be loaded in this area. There are two pairs of floor tiedown straps provided. Children should not be allowed to occupy this space. Additional cargo space may be made available by rear seat back cushion (fold seat back forward and slide cover up and off frame-store as desired) then fold rear seat back down. Both seats can be folded down together or independent of each other. The hat rack compartment is restricted to 10 pounds.

The cargo tiedown rings are to be inserted in holes provided in web of front seat rails. The cargo belts attach to these rings and to standard seat belt harness to retain cargo. Refer to diagram below for typical restraint.



CARGO RESTRAINT

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

Proper loading and retention of cargo is mandatory. See Loading Computation Graph, page 6-7.

SEATS

The front seats are individually mounted and may be adjusted fore and aft to fit individual comfort preferences. The front seat back may be adjusted by turning hand crank until seat back is in desired position.

Both optional front seat configurations allow vertical seat height adjustment by turning a hand crank to raise or lower the entire seat assembly.

The rear seat backs have four (4) adjustment positions. Each seat can be adjusted independent of the other by pulling up on respective release handles located on left or right of aircraft centerline on forward spar. This allows adjustment from approximately 10 degree to 40 degree recline position.

SEAT BELTS

Safety belts, if worn properly, keep occupants firmly in their seats in rough air and during maneuvers. The belts are mechanically simple and comfortable to wear. They are attached to the seat, which can be moved without readjusting the belt. Shoulder harnesses are provided for front and rear seat occupants and MUST be fastened for take-off and landing operations.

SAFETY HARNESS

The single diagonal type harness is designed so the chest strap crosses diagonally from the outboard shoulder to an attachment point as low on the inboard hip as possible. Care should be taken to conform with this location in adjusting the chest strap and inboard belt length. This diagonal configuration places the body center-of-gravity inside the triangle formed by the chest strap and lap belt. The lap belt should be adjusted comfortably tight. As a result the body is restricted from rolling out toward the unrestricted shoulder, or "open" side of the harness, upon forward impact. Refer to Figure 7-4 for proper seat belt/harness adjustment.

FIGURE 7-4
SEAT BELT & SAFETY HARNESS ADJUSTMENT

DOORS, WINDOWS & EXITS

CABIN DOOR

Access to the cabin is provided by a door located on the right side of the fuselage. This door has inside and outside operating handles. The outside door handle can be locked with a key specifically provided for it. The door has two latching mechanisms, one located at the top of the door and one at the aft, center of the door. Should the door come open in flight the flying qualities of the aircraft will not be affected. Procedures for closing the door in flight are contained in Section III.

PILOT'S WINDOW

A fresh air pilot's window is located in the left main cabin window. This window is generally used for fresh air for prolonged ground operations. The window should not be opened in flight above 132 KIAS.

EMERGENCY EXITS

~~The cabin door is the primary emergency exit from the cabin. If an emergency exists where a probable crash landing will occur, the door should be unlatched to prevent jamming of the door during the landing.~~

~~The baggage compartment access door can be used as a means of auxiliary exit. The door can be opened from the inside even though locked. To open, pull off cover, pull the white knob and lift up red handle. To verify re-engagement of outside latch mechanism; open outside handle fully, close inside handle to engage pin in cam slide of latch mechanism; push in on white button until it snaps in place in hole. Replace cover. Operate outside handle in normal method.~~

SECTION IV THRU VI

NO CHANGE

SECTION VII

EMERGENCY EXITS

The cabin door is the primary emergency exit from the cabin. If a situation exists where a probable emergency landing will occur, the door should be unlatched to prevent jamming of the door during the emergency.

The baggage compartment access door can be used as a means of auxiliary exit. The door can be opened from the inside even though locked. To open, pull off small ABS cover, PULL out the latch pin and lift UP Red handle.
To verify re-engagement of latching mechanism: insert latching pin into hole to hold Red handle down. Replace ABS cover. Operate outside handle in normal manner.

SECTION VIII THRU X

NO CHANGE

ENGINE

GENERAL

The engine installed in this aircraft is a Teledyne Continental Motors model TSIO-360MB1. The designation describes this engine as follows:

TS.......................Denotes "turbosupercharged"
I..........................Denotes "fuel injected"
O.............Denotes "opposed", and refers to the horizontally opposed cylinder arrangement
360....Denotes piston displacement in cubic inches
M..............Denotes "specific engine model and configuration"
B.......................Denotes "heavy crankshaft"
1.............Denotes latest configuration changes

This engine is normal rotation (clockwise) as viewed from the rear of the engine. A detailed specification listing of the engine is contained in Section I.

ENGINE CONTROLS

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

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

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

The propeller and mixture controls are vernier type and fine adjustments can be made by turning the knobs clockwise or counter-clockwise. The vernier controls should not be turned closer than 1/8" to the panel nut face. The throttle has an integral friction device.

Engine cooling is controlled by use of the cowl flap switch located beneath the engine controls. Push the switch down to open the cowl flap. The cowl flap is located on the lower aft part of the engine cowl.

ENGINE INSTRUMENTS

Engine instruments operate electrically, except manifold pressure and tachometer, through variations in resistance caused by pressure or temperature changes, or by variations in current output caused by varying engine RPM or alternator output. The tachometer receives its signal from the magneto pulses via the ignition switch.

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

ENGINE OPERATION AND CARE

The life of the engine is determined by the care it receives. Maximum efficiency and engine service life can be expected when a good maintenance program is followed. Poor maintenance results in faulty engine performance and reduced service life. Efficient engine operation demands careful attention to cleanliness of air, fuel, oil and maintaining operating oil temperatures within the required limits. Servicing of the engine should be accomplished by qualified personnel. Refer to TCM Overhaul and Service Manuals.

The engine receives a run-in operation before leaving the factory. Therefore, no break-in schedule need be followed. Straight mineral oil (MIL-C-6529 Type II) should be used for the first oil change period (25 Hours).

The minimum grade aviation fuel for this engine is 100 or 100 LL. In case the grade required is not available, use a higher rating. Never use a lower rated fuel. Only aviation gasolines compounded to specifications ASTM-910 or MIL-G-5572E are approved.

Operational procedures for adverse environmental conditions can be found in the engine operator's manual.

OIL SYSTEM

REFER TO TELEDYNE CONTINENTAL MOTORS OVERHAUL & MAINTENANCE MANUAL FOR THE LUBRICATION SCHEMATIC.

FIGURE 7-5

The engine has a full-pressure wet sump oil system with an 8 quart (7.6 liters) capacity. A conventional dip stick is provided for determining the oil quantity. The oil system is depicted in figure 7-5. The propeller governor boosts engine oil pressure for operation of the propeller. It controls oil pressure going to the propeller hub to maintain or change propeller blade angles. This oil flows through the propeller shaft to reach the propeller.

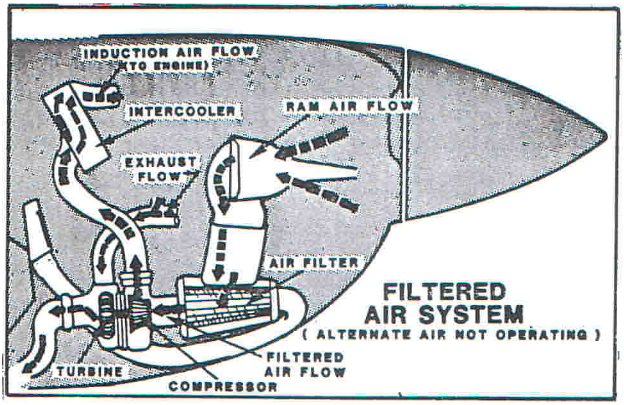
Areas within the engine receiving oil include the valve lifters, inner piston domes and lower cylinder walls. A tap supplies oil pressure for lubrication of the turbocharger bearings. This oil is carried to the turbocharger through an external line. After lubricating the turbocharger bearings, it is drawn into a scavenge pump and returned to the oil sump. Oil within the engine drains, by gravity, back into the sump. An air/oil separator is provided to separate oil/air vapors. It sumps the air over board and routes oil back into the sump.

IGNITION SYSTEM

Torque from the engine crankshaft is transmitted through the camshaft gear to the magneto drive gears, which in turn drives the magneto drive coupling. The magneto incorporates an impulse coupling. As the rubber bushings in the drive gear turns the coupling drive lugs, counterweighted latch pawls inside the coupling cover engage pins on the magneto case and hold back the latch plate until forced inward by the coupling cover. When the latch plate is released, the coupling spring spins the magneto shaft through its neutral position and the breaker opens to produce a high voltage surge in the secondary coil. The spring action permits the latch plate, magnet and breaker to be delayed through a lag angle of 30 degrees of drive gear rotation during the engine cranking period. Two lobes on the breaker cam produce two sparks per revolution of the drive shaft. After engine is running counter-weights hold the latch pawls away from the stop pins and the magneto shaft is driven at full advance.

The engine firing order is 1-6-3-2-5-4. Ignition harnesses are connected to the magnetos so that the right magneto fires the upper plugs on the right side and lower plugs on the left. The left magneto fires the upper plugs on the left and the lower plugs on the right. The magneto cases, spark plugs, harnesses and connections are shielded to prevent radio interference. The magnetos are pressurized from turbocharged induction system bleed air.

AIR INDUCTION SYSTEM



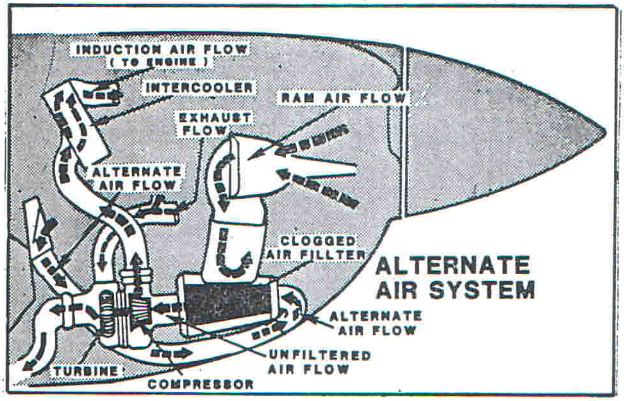


FIGURE 7-6
PATH OF AIR FLOW

The induction system components include air intake duct, air filter, alternate air box, turbocharger compressor, intercooler, throttle, manifold tube and cylinder intake ports. Air flows through these components in the order they are listed (Fig. 7-6).

Ram air enters the intake duct on the right side of cowling and passes through the can type air filter.

The air filter cleans incoming air prior to its entering the engine induction system. Should the air filter or intake duct become obstructed for any reason the alternate air door will open automatically to preclude engine stoppage.

The turbocharger is driven by exhaust gases passing over turbine blades. This drives the compressor side, by direct interconnection, providing high pressure and high volume air into the cylinders for combustion. The induction air is heated due to compression and then cooled by the intercooler prior to entering the cylinders.

The intake manifold system is a six-tube, air distribution system mounted on top of the engine. The intake manifold carries induction air to the individual cylinder intake ports.

The cylinder intake ports are cast into the cylinder head assembly. Air from the manifold tube is carried into the intake ports, mixed with fuel from the injector nozzles, and enters the cylinder as a combustible mixture when the intake valve opens.

Overboost protection is provided by a pressure relief valve located between the compressor and the throttle. The relief valve will open to prevent excessive manifold pressure and will close automatically when the manifold pressure is lowered within limits.

Continued operation of the induction system in the event of intake air being obstructed is provided by activation of the alternate air system. The alternate air is automatically controlled down stream of the air filter. When the door is opened, air from the engine compartment is admitted into the induction system upstream of the compressor.

FILTERING

The air filter is located in the induction system upstream of the turbocharger. The air filter is a dry media, washable paper filter.

TURBOCHARGER SYSTEM

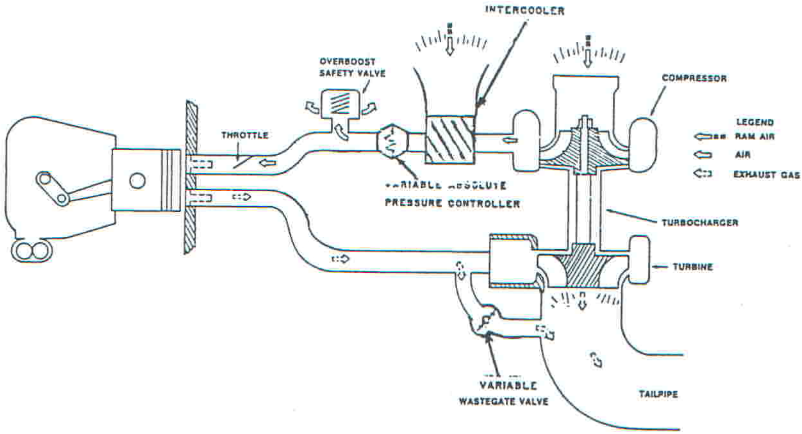


FIGURE 7-7

The complete turbocharger system consists of a turbine and compressor assembly, intercooler, variable absolute pressure controller, overboost valve, variable wastegate assembly, necessary hose, and ducting required for a functional installation (Figure 7-7).

The exhaust bypass assembly (wastegate valve) regulates the amount of exhaust gas going through the turbine.

TURBOCHARGER OPERATIONAL CHARACTERISTICS

When the aircraft is above critical altitude any change in engine speed will cause a change in manifold pressure, ie. a decrease in engine speed may produce an increase in manifold pressure. Above critical altitude any change in airspeed will result in a change in manifold pressure, ie. an increase in airspeed will produce an increase in manifold pressure due to ram air effects.

The variable absolute pressure controller is very sensitive to changes in oil vicosity caused by changes in oil temperature. Lower oil temperatures will tend to produce a manifold pressure slightly above 36.0" HG. This is a normal occurance and should be corrected by pulling back on the throttle. High oil temperatures will tend to reduce manifold pressure and can only be corrected by making mechanical adjustments on the engine. Mooney Aircraft recommends the use of multiviscosity engine oil to provide a more uniform manifold pressure through the seasonal ambient temperature changes.

EXHAUST SYSTEM

The exhaust system consists of a segmented, stainless steel manifold. This manifold also has provisions for a cabin heat exchanger. The exhaust system directs the exhaust gases thru the turbocharger and out the exhaust tailpipe.

FUEL INJECTION

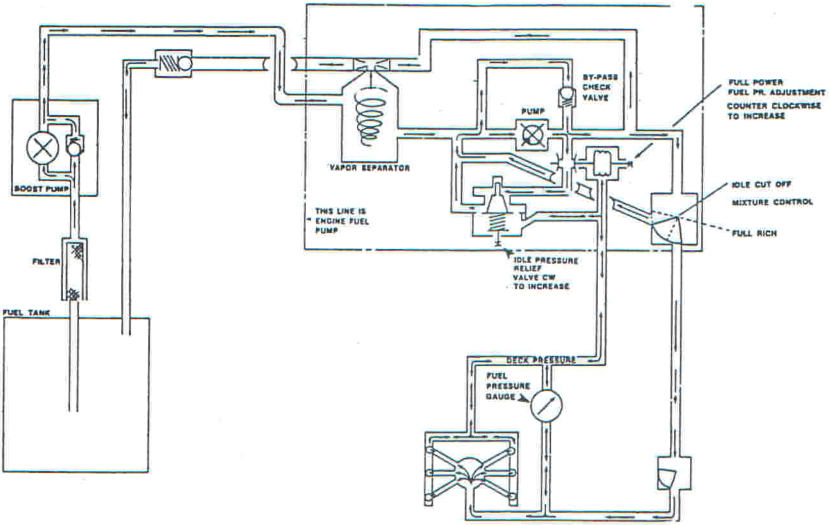


FIGURE 7-8

The fuel injection system is of the multi-nozzle, continuous flow type which controls fuel flow to match engine requirements (Figure 7-8). Any change in air throttle position, engine speed, deck pressure, or a combination of these causes changes in fuel pressure in direct relation to engine requirements. A manual mixture control is

provided for precise leaning at any altitude and power setting. An FT101 fuel gauge system is installed for digital readout of fuel flow in gallons per hour. However, the FT101 is not to be used as reference for manual leaning. Use the TIT gauge for this purpose.

The continuous-flow system permits the use of a typical rotary vane pump with integral relief valve. With this system there is no need for an intricate mechanism for timing fuel injection to the engine.

The fuel injector pump is equipped with a separator where the vapor is separated by a swirling augmentor system from the liquid fuel and returned to the tank selected. The fuel injector pump forces liquid fuel into the metering unit assembly.

The fuel metering unit/air throttle controls the amount of intake air admitted into the intake manifold and meters the proportionate amount of fuel to the fuel manifold valve. The assembly has three control units; one for air, in the air throttle assemoly, and two for the fuel control unit.

The manifold valve receives fuel from the metering unit. When fuel pressure reaches approximately 3.5 psi, a check valve opens and admits fuel to six ports in the manifold valve (one port for each fuel nozzle line). The manifold valve also serves to provide a clean cutoff of fuel to the cylinder when the engine is shut down.

The injector nozzle lines connect the manifold valve to the six fuel injector nozzles.

The injector nozzles (one per cylinder) are "air bleed" type fuel nozzles which spray fuel directly into the intake port of the cylinder. When the engine is running, flow through the nozzle is continuous and will enter the cylinder combustion chamber when the intake valve opens.

Since the size of the fuel nozzles are fixed, the amount of fuel flowing through them is determined by the pressure applied. For this reason, fuel flow may be accurately determined by measuring the pressure at the manifold valve.

ENGINE COOLING

The down-draft engine cooling system provides ground and inflight power plant cooling. Engine baffling directs air over and around the cylinders and out the cowl flap opening. Opening the cowl flap allows proper air flow on the ground and during low-speed high-power climbs. The cowl flap should be partially opened if necessary to maintain the oil and cylinder head temperature within the normal operating range.

ENGINE STARTING SYSTEM

Engine starting power is provided by a TCM 28 V starter. Ignition is provided by two impulse coupled magnetos. A starter engaged warning light (START POWER ON) is incorporated as standard equipment in the annunciator panel.

ACCESSORIES

VACUUM PUMP

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

ALTERNATOR

Electrical power is supplied by an engine driven TCM , 28 V, 70 ampere alternator.

An optional 70 amp second alternator is used to supply electrical power to the main load bus and is in parallel with the No. 1 Alternator. When both alternators are installed, Alt. No. 2 will normally carry the load until a high percentage is required at which time No.1 Alternator will begin sharing the load.

TURBINE INLET TEMPERATURE PROBE

The turbine inlet temperature (TIT) probe measures exhaust gas temperature as it enters the turbocharger turbine inlet. The TIT probe varies electrical current, based on exhaust gas temperature, supplied to the TIT gauge located on instrument panel. The TIT gauge is used as the primary aid to leaning the fuel mixture.

PROPELLER

The propeller is an all metal, two blade, constant speed unit. Constant propeller rotational speed (RPM) is maintained by a balance of air load and engine rotational forces. The propeller governor regulates the flow of engine oil to a piston in the propeller dome. The piston is linked by a sliding rod and fork arrangement to propeller blades. Governor oil pressure works against the piston and a spring to increase propeller blade pitch, thus decreasing propeller and engine RPM. Centrifugal twisting moments on the propeller blades work to decrease propeller blade pitch and increase RPM. Control of these and other forces to maintain a constant RPM is provided by the propeller control lever in the cockpit.

The propeller control lever, linked by cable to the propeller governor, determines a wide range of in-flight RPM. Pushing the lever forward selects higher RPM. Pulling the lever aft selects lower RPM. When in flight the RPM should not fluctuate significantly, regardless of throttle setting.

The propeller may be operated within the full range of RPM indicated by the tachometer, up to the red radial line. In cruise, always use the power setting charts provided. On cold days during run-up, exercise the propeller several times to flow warm oil into the propeller hub. This assures propeller governing for takeoff.

FUEL SYSTEM

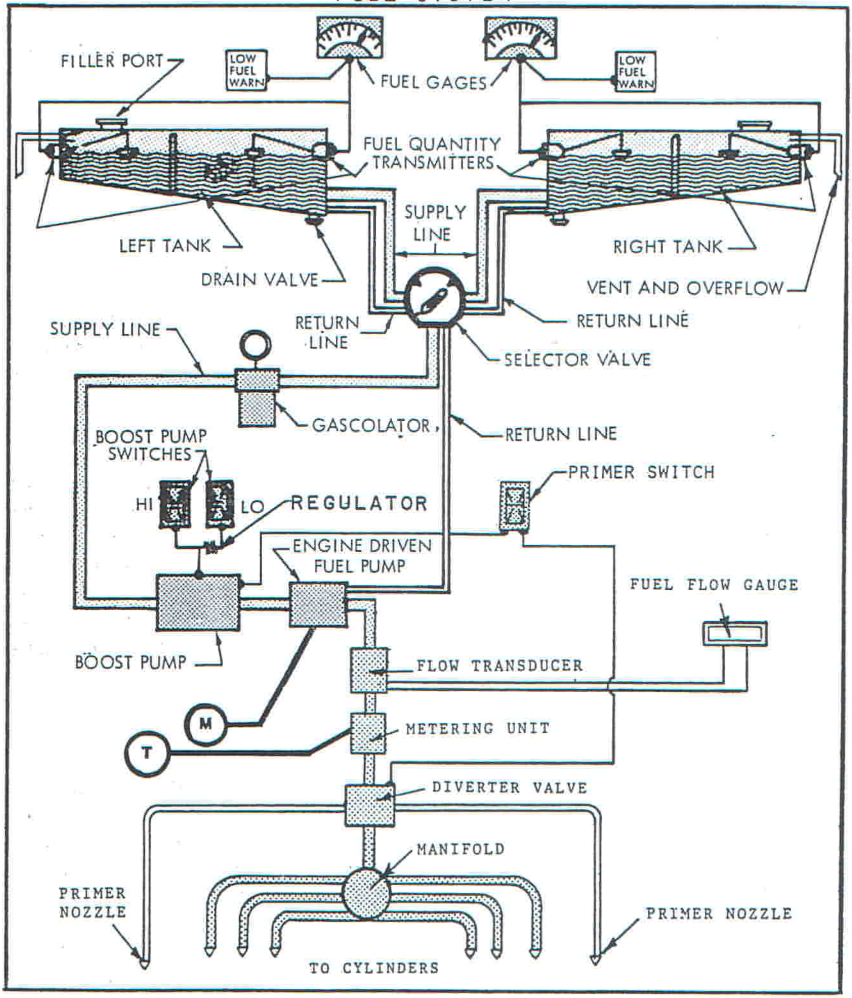


FIGURE 7-9

Fuel is carried in two integrally sealed sections of the forward inboard area of the wings. Total usable fuel capacity is 75.6 gallons (286.4 liters) (63 Imp. Gals.). There are sump drains at the lowest point in each tank for taking fuel samples to check for sediment contamination or condensed water accumulation.

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

Fuel feeds from one tank at a time to the selector valve and through the electric fuel pump (boost pump) enroute to the engine-driven pump and the fuel injector unit. The electric fuel pump is capable of supplying 14.1 U.S. GPH (at sea level) to provide approximately 76% horsepower should the engine driven pump fail. At 24000 ft. MSL, fuel flow is approximately 6.1 U.S. GPH & 41% horsepower will be available after leaning. Two electric fuel-level transmitters in each tank operate the appropriate fuel gauges. The master switch actuates the fuel quantity indicator system to maintain an indication of fuel remaining in each tank. Vents in each fuel tank allow for overflow and ventilation.

The optional, visual fuel quantity indicators located in each wing tank are to be used for PARTIAL FUEL LOADING only and not for preflight inspection purpose.

Fuel Flow is presented digitally and indicates volume of fuel being used in GPH (pounds or liters optional) and/or total fuel used. Optional fuel flow systems are available and each depicts its information differently. Refer to appropriate operational procedure for specific data. A "Fuel Flow Memory" switch (FT-101 System) is located in the top of the right hand radio panel to shut off the memory circuit if the aircraft is to be stored for long periods of time.

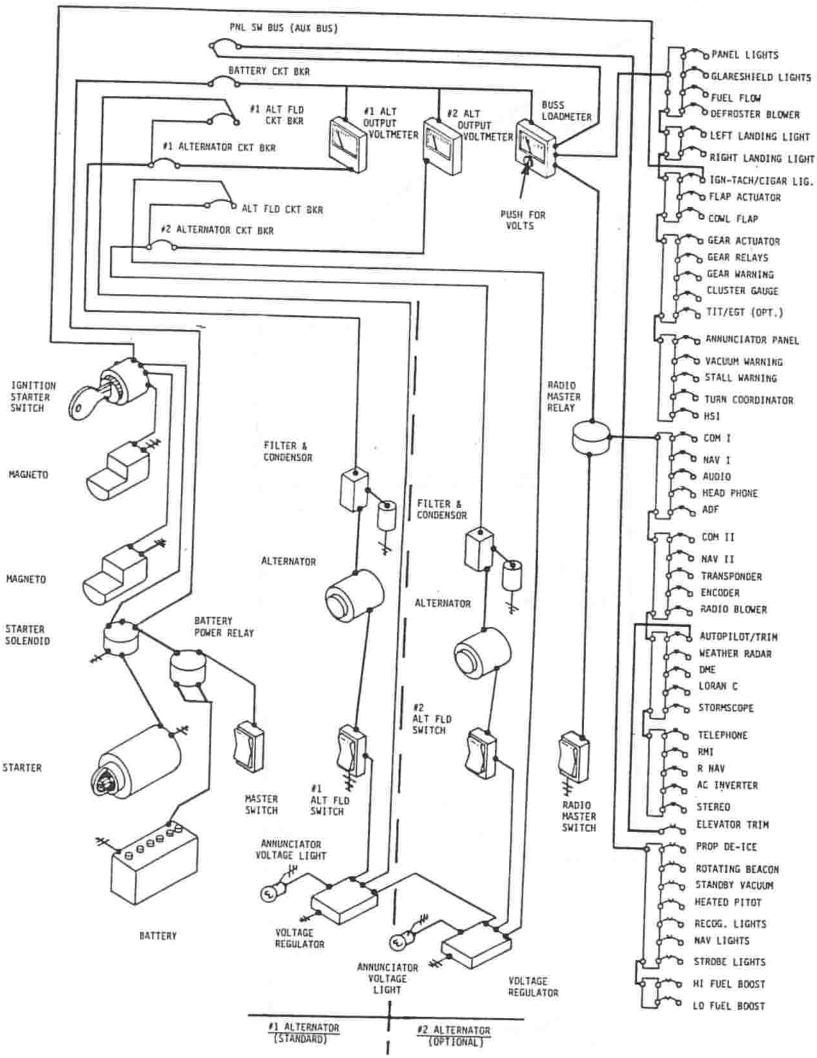
ELECTRICAL SYSTEM

ALTERNATOR(S) & BATTERY

A 24 volt, 22 ampere-hour storage battery (in the tailcone) and a 70 ampere self-rectifying,standard configuration, alternator supply electrical power for equipment operation. An indicator depicts % Alt 1 output, load and volts on separate scales. When an optional second Alternator,Alt 2, is installed, Alt 1 and Alt 2 % output is displayed on individual scales, and a common scale is provided for load or volts by pushing a selector switch.
A power loss in the alternator output or voltage regulator will be shown as a zero reading on the loadmeter; a discharged battery will be indicated by a high reading on alternator output with low bus load. When two alternators are installed No. 2 Alt carrys the basic equipment load(due to its higher RPM); No 1 Alt acts as the supplemental source for additional load requirements.
The voltage regulator adjusts alternator output to current load while maintaining a constant voltage level. A voltage warning light illuminates steadily when voltage limits are exceeded and flashes when the voltage is low.

CAUTION

Starting with an external power source should not by done while the battery is completely depleted. It will not accept the high charge rate from the alternator and electrical failure may result.



SCHEMATIC
FIGURE 7-10

CIRCUIT BREAKER PANEL

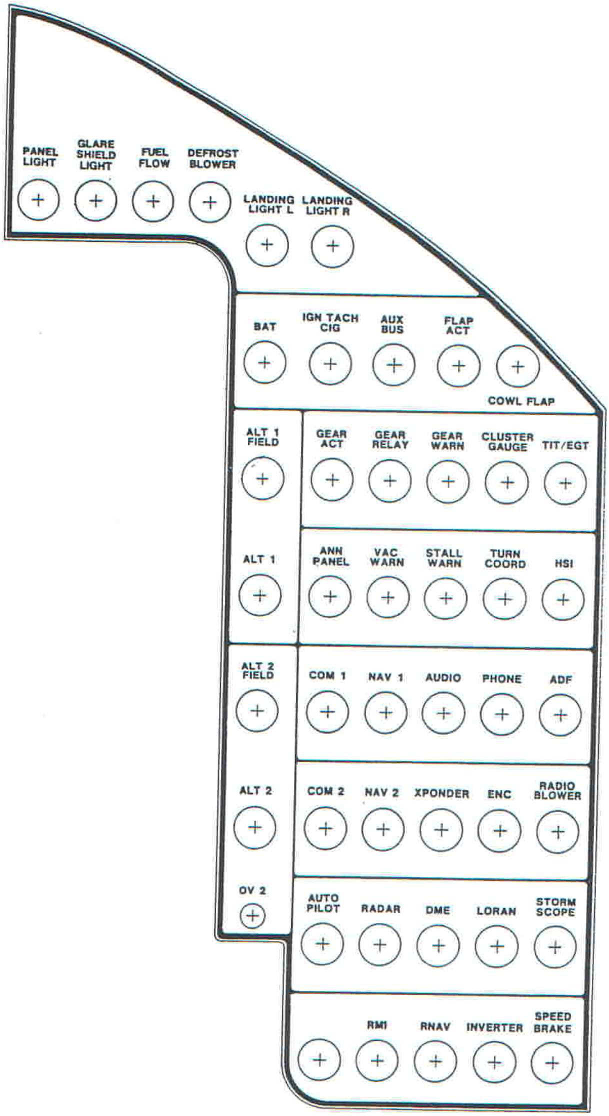


FIGURE 7-11

Push-pull, or rocker switch-circuit breakers automatically break the electrical current flow if the system or unit receives an overload, thus preventing damage to electrical wiring.

The main circuit breaker panel is in the extreme right panel. Figure 7-11 illustrates the main circuit breaker panel with its push-pull circuit breakers. All rocker switch-circuit breakers are at the bottom of the flight panel.

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

The alternator field has a push-pull circuit breaker to furnish an emergency break in the alternator field excitation circuit in the event of alternator or voltage regulator malfunction. If the regulator output voltage exceeds limits, the red voltage warning light illuminates steadily.

Turning OFF the radio master switch and then turning master switch OFF and ON will reset the voltage regulator. The overvoltage annunciator light should remain out. If the overvoltage light comes on again, pulling out the alternator-field circuit breaker cuts the alternator out of the power circuit. Once again the battery is the only source of electrical power; therefore, all electrical equipment not essential for flight should be turned off and the flight terminated as soon as practical to correct the malfunction.

NOTE

The circuit breakers installed in the panel may vary depending on installed equipment per customer order.

ANNUNCIATOR PANEL

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

ELT PANEL

The ELT Panel houses the remote ELT Switch and provides room for other switches as required for optional avionics installations. (See Section IX for Avionics Systems installed in this aircraft).

LIGHTING SYSTEM

INSTRUMENT & PLACARD LIGHTS

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

MAP LIGHT

The map light switch is located on the center of the pilot's control wheel (co-pilot's optional). The right hand rheostat controls the map light intensity.

CABIN LIGHTING (CONNECTED DIRECTLY TO BATTERY)

Four headliner lights illuminate the cabin. The forward lights are controlled by the BRIGHT-OFF-DIM switch located in the headliner above the co-pilot. The rear cabin lights are controlled by another BRIGHT-OFF-DIM switch located above the rear seat, easily accessible from the baggage door for assistance with night loading.

EXTERIOR LIGHTING

Conventional navigation and high intensity strobe lights are installed on the wing tips and on the rudder trailing edge. Landing and taxi lights are installed in the center of the lower engine cowling. All exterior lights are controlled by rocker type switches on the lower right hand portion of the pilots panel.

The high intensity wing tip and tail strobe lights are required for night operation, but should be turned off when taxiing near other aircraft, or flying in fog or clouds. The conventional position lights must be used for all night operations.

Optional recognition lights may be installed in the wing tips for use when requested by ATC.

CABIN ENVIRONMENT

HEATING & VENTILATION SYSTEMS

Three ventilating systems provide cabin environmental conditions controlled to individual pilot and passenger preferences. Fresh air heated by the engine exhaust muff and cool air from an airscoop on the co-pilot side, can be individually controlled and mixed to the desired temperature. The side fresh-air system has adjustable outlets near the pilot's and co-pilot's knees.

The cabin overhead ventilating system works independently of the cabin heating and ventilating system. Fresh air enters an intake on the dorsal fin and is controlled by individual outlets above each seat. A master air vent control regulates flow of air through the individual overhead outlets. This control is located above the pilots seat back on the overhead panel.

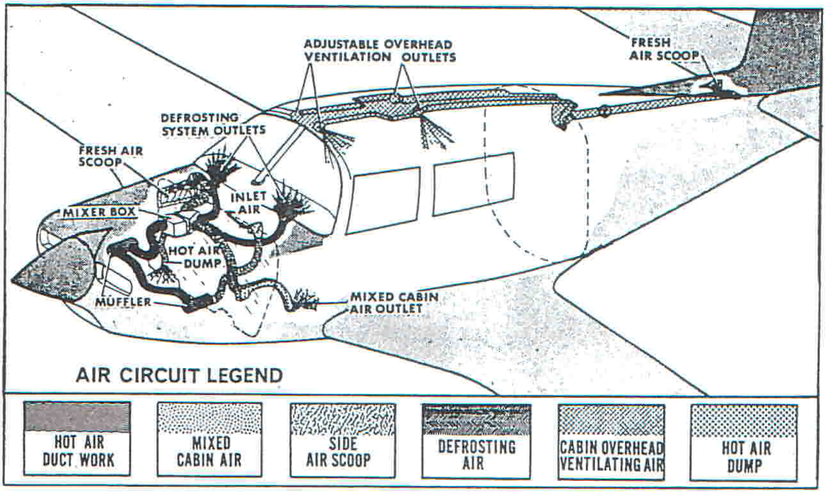


FIGURE 7-12

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

WINDSHIELD DEFROSTING SYSTEM

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

PITOT PRESSURE & STATIC SYSTEM

A pitot tube, mounted on the lower surface of the left wing, picks up airspeed indicator ram air. A heated pitot prevents pitot tube icing when flying in moisture-laden air. A pitot system drain valve is located on the forward bottom skin of the left wing to fuselage fillet. Static ports on each side of the tailcone supply static air pressure for the altimeter, the airspeed indicator, and vertical speed indicator. A static system drain valve is located on the fuselage bottom skin below the tailcone access door. An alternate static pressure source valve is installed in the flight panel just to the left of the pilots control column. Alternate static air is taken from the cockpit and will affect flight instrument readings. Performance variation charts in Section V depict the difference between primary and alternate static indications.

STALL WARNING SYSTEM

The electrical stall warning system uses a vane-actuated switch, installed in the left wing leading edge, to energize stall warning horn located in the cabin. The stall warning switch is adjusted to provide aural warning at 4.4 to 8.7 Knots before the actual stall is reached and will remain on until the aircraft flight attitude is changed toward a non-stalled condition.

NOTE

Do not attempt to adjust prestall warning speed by bending the vane. This part has been heat treated and cannot be bent without damaging or breaking the vane.

EMERGENCY LOCATOR TRANSMITTER

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

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

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

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

NOTE

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

E.L.T. REMOTE SWITCH OPERATION

A pilot's remote switch, located above the radio panel, is provided to allow the transmitter to be controlled from inside the cabin. The pilot's remote switch is placarded "ON", "ARM". The unit will start transmitting with switch in "ON" position and will stop when remote switch is returned to "ARM" position during cockpit checkout.

NOTE

If for any reason a test transmission is necessary, the operator must first obtain permission from a local FAA FCC representative (or other applicable Authority) or in accordance with current regulations. Test transmission should be kept to a minimal duration. Testing of ELT should be conducted only during the first five (5) minutes after any hour and no longer than three (3) audible sweeps.

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

SECTION VIII
HANDLING, SERVICE AND MAINTENANCE

MOONEY M20K

TABLE OF CONTENTS

SECTION VIII
HANDLING, SERVICE AND MAINTENANCE

MOONEY M20K

INTRODUCTION

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

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

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

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

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

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

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

SECTION VIII
HANDLING, SERVICE AND MAINTENANCE

MOONEY M20K

Should an extraordinary or difficult problem arise concerning the repair or upkeep of your Mooney, consult the Customer Service Department, Mooney Aircraft Corporation, P.O. Box 72, Kerrville, TX. 78029-0072, Telephone,Area Code 512-896-6000.

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

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

GROUND HANDLING

TOWING

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

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

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

TIEDOWN

As a precaution against wind damage, always tie down the aircraft when parked outside. Removable wing tiedown eye-bolts, supplied with the loose equipment, screw into wing receptacles marked HOIST POINT just outboard of each main gear.

Replace these eyebolts with jack point fixtures when it is necessary to lift the aircraft with jacks. The tail tiedown point is part of the tail skid.

To tie down the aircraft:

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

JACKING

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

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

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~ CAUTION ~

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

NOTE

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

SERVICING

REFUELING

Integral sealed tanks in the forward inboard sections of the wings carry the fuel. With the aircraft standing on level ground, service each fuel tank after flight with 100 octane or 100LL aviation grade gasoline. An anti-siphon valve plate is located in each fuel tank filler neck. This valve plate should be pushed down to open when refueling or checking fuel quantity. The visual quantity gauge located on top of each tank should be used as a reference for partial refueling only.

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

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~ CAUTION ~

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

Fuel samples from the sump drain of each tank should be taken before the first flight of the day to check for water or sediment contamination. Fuel samples taken immediately after refueling may not show water or sediment due to mixing action of refueling process.

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

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

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

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

ENGINE LUBRICATION

Operate the new engine at full power within the limitations given in Section II. Before every flight, check the engine oil level and replenish as necessary.

Check engine oil level after engine has been stopped long enough for oil to drain back into sump. The oil filler cap access door is located in the top cowling. Any lubricating oil, either straight mineral or compounded, must conform with Continental Specifications to be acceptable for use in engines. New or newly overhauled engines should be operated on aviation grade straight mineral oil during the first 25 HOURS of operation or until oil consumption has stabilized. The aircraft is delivered from Mooney with multi-viscosity straight mineral oil.

The engine is equipped with an external oil filter and the engine oil change intervals may be extended from 50 HOUR to 100 HOUR INTERVALS providing the external filter element is changed at 50-HOUR INTERVALS.

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~ CAUTION ~

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If an engine has been operating on straight mineral oil for several hundred hours, a change to additive oil should be undertaken with caution.

If the engine is in an extremely dirty condition, the switch to additive oil should be deferred until after engine has been overhauled. When changing from straight mineral oil to additive or compounded oil, after several hundred hours of operation on straight mineral oil, take the following precautionary steps:

a. DO NOT MIX additive oil and straight mineral oil. Drain straight mineral oil from engine, change filter and fill with additive oil.
b. DO NOT operate engine longer than FIVE HOURS before again changing oil.
c. Check oil filter for evidence of sludge or plugging. CHANGE oil and REPLACE oil filter element every 10 HOURS if sludge is evident. Resume normal oil drain periods after sludge conditions improve.

Your Mooney Service Center will change the engine oil in addition to performing all other service and inspection procedures needed when you bring your airplane in for its 50-hour; 100-hour, or annual inspections.

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~ CAUTION ~
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> Excessive oil sludge buildup indicates that the oil system needs servicing at less than 50-hour intervals.

When changing or adding oil Mooney recommends the following grades of oil:

Multi-Viscosity 15W-50 or 20W-50

*Refer to the latest edition of Continental Service Instructions for approved brands of oil.

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

INDUCTION AIR FILTER SERVICING

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

1. To clean the dry-type induction air filter:
   a. Remove the engine cowling.
   b. Remove filter element.
   c. Direct a jet of air from inside of filter out (opposite normal airflow). Cover entire filter area withe air jet.

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

d. After cleaning, inspect filter for damage. Discard if filter or gasket is damaged.

NOTE

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

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

NOTE

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

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

GEAR & TIRE SERVICE

The aircraft is equipped with 6-ply standard-brand tires and tubes. Keep the main gear tires inflated at 42 PSI and the nose tire at 49 PSI for maximum service life. Proper inflation will minimize tire wear and impact damage. Visually inspect the tires at preflight for cracks and ruptures, and avoid taxi speeds that require heavy braking or fast turns. Keep the gear and exposed gear retraction system components free of mud and ice to avert retraction interference and binding.

The gear warning horn may be checked in flight by retarding the throttle with the gear up. The gear horn should sound with an intermittent note at about 16 to 18 inches manifold pressure.

BATTERY SERVICE

The 24 volt 22-ampere-hour electrical storage battery is located in the tailcone, aft of baggage compartment bulkhead, accessible through tailcone access panel. Check battery fluid level every 25 FLIGHT HOURS or each 30 DAYS whichever comes first.

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

Check the fluid specific gravity for a reading of 1.265 to 1.275. A recharge is necessary when the specific gravity is 1.240 or lower. Start charging at four amperes and finish at two amperes; do not allow battery temperature to rise above 120 degrees
F. during recharging. Keep the battery at full charge to prevent freezing in cold weather and to prolong service life.

CAUTION

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

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

HYDRAULIC BRAKE RESERVOIR SYSTEM

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

MAINTENANCE

ENGINE PERFORMANCE CHECKS

When the aircraft leaves the factory the Continental TSIO-360-MB1 engine has been properly tuned and will perform at optimum efficiency. To insure that the engine is continuing to perform properly certain checks should be performed during 100 HOUR or ANNUAL inspection or whenever it is suspected that engine performance is not correct. These checks can easily be accomplished by the owner and the results verified by service personnel for proper engine performance. The following are the checks to be performed and results can be recorded:

Idle Mixture Check-
Check-With the engine oil temperature between 160 degrees F. to 180 degrees F. adjust the engine speed to 700 +25/-0 RPM. Slowly, but positively, move the mixture control from full rich. The engine speed should increase 50 +/- 25 RPM before dropping. Record the RPM rise.

Critical Altitude Flight Check-
At an altitude above 10,000 ft. pressure altitude (altimeter set to 29.92" Hg) establish a 96 KIAS climb and full throttle operation not to exceed 36.0" Hg MP and 2700 RPM. Record the altitude, outside air temperature, and fuel flow at the point the MP can no longer maintain 36.0". Refer to SERVICE AND MAINTENANCE MANUAL for specific actions.

PROPELLER CARE

The high stresses to which propeller blades are subjected makes their careful inspection and maintenance vitally important. Check the blades for nicks, cracks, or other damage before each flight. Nicks tend to cause highstress concentrations in the blades which, if ignored, may result in cracks. It is very important that all nicks and scratches be polished out prior to next flight. It is not unusual for the propeller blades to have some end play or fore and aft movement as a result of manufacturing tolerances in the parts. This has no adverse effect on propeller performance or operation and is no cause for concern if the total movement at the blade tip does not exceed .12 inches. With the first turn, centrifugal force firmly seats the blades against the retention bearing in the propeller hub.
Preflight inspection of the propeller blades should include, in addition to the foregoing, an occasional wiping with an oily cloth to clean off grass and bug stains. NEVER USE AN ALKALINE CLEANER ON THE BLADES. Remove grease and dirt with tetrachloride or Stoddard solvent. McCauley recommends the propeller be removed and overhauled every 1500 HOURS of operation. Hartzell recommends the optional propeller be removed and overhauled every 1500 HOURS of operation.

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

EXTERIOR CARE

As with any paint applied to a metal surface, an initial curing period is necessary for developing the desired qualities of durability and appearance. Therefore, DO NOT APPLY WAX TO THE NEW AIRCRAFT EXTERIOR UNTIL TWO OR THREE MONTHS AFTER DELIVERY. Wax substances will seal paint from the air and prevent curing. Wash the exterior to prevent dirt from working into the curing paint. Hold buffing to a minimum until curing is complete and there is no danger of disturbing the undercoat.

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~ CAUTION ~
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Before washing the exterior, be certain the brake discs are covered, a pitot cover is in place, and all static-air buttons are masked off.

Remove grease or oil from the exterior by wiping with a cotton cloth saturated in kerosene. Flush away loose dirt and mud deposits before washing the exterior with an aircraft-type washing compound mixed in warm water. Use soft cleaning cloths or a chamois, and USE ONLY MILD LIQUID TYPE DETERGENTS, avoid harsh or abrasive detergents that might scratch or corrode the surface. It is essential that ALL CLEANING COMPOUNDS AND APPLICATION CLOTHS BE FREE OF ABRASIVES, GRIT, OR OTHER FOREIGN MATTER. Use a prewax cleaner to remove a heavy oxidation film. For nonoxidized or precleaned surfaces, apply a good exterior finish wax recommended for protection of urethane enamel finishes. Carefully follow the manufacturer's instructions. A heavier coating of wax on the leading edge of the wings, empennage, and nose section will help reduce drag and abrasion in these areas.

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

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

INTERIOR CARE

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

CAUTION

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

Do not saturate fabrics with a solvent which could damage the backing and padding materials. To minimize carpet wetting, keep foam type cleaners as dry as possible and gently rub in circles. Use a vacuum cleaner to remove foam and to dry the materials.

Use a damp cloth or a mild soap solution to clean interior plastic, vinyl trim and metal surfaces.

SECTION VIII
HANDLING, SERVICE AND MAINTENANCE

MOONEY M20K

AIRPLANE FILE

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

1. To be displayed in the airplane at all times:
   a. Aircraft Airworthiness Certificate (FAA Form 8100-2).
   b. Aircraft Registration Certificate (FAA Form 8050-3).
   c. Aircraft Radio Station License, if transmitter installed (FCC Form 556).
2. To be carried in the airplane during all flight operations:
   a. Pilot's Operating Handbook (including FAA Approved Flight Manual).
   b. Weight and Balance, and associated papers (latest copy of the Repair and Alteration Form. FAA Form 337, if applicable).
   c. Equipment List.

NOTE

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

3. To be made available upon request:
   a. Airplane Log Book.
   b. Engine Log Book.

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

MOONEY M20K

SUPPLEMENT INSERTED	DATE
DRC Speedbrakes	6-12-86
Standby Vacuum	6-12-86
Prop De-Ice	11-13-85
Oxygen	5-9-86
KAS 297B Vert. Speed	1-30-84
KFC 150 Autopilot	8-5-85
~~KNS 80 RNAV~~	~~3-29-83~~
KNS-81 RNAV	6-26-87
3 BLATT - VERSTELLPROPELLER MTV-12-D/180-17	------
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SECTION IX
SUPPLEMENTAL DATA

MOONEY M20K

INTRODUCTION

FAA approved data pertaining to Limitations, Normal Procedures, Emergency Procedures, and effects on performance for certain optional equipment installed in the airplane are contained in this section. Commonly installed items of optional equipment whose function and operation do not require detailed instructions are described by Section VII.

FAA APPROVED

AIRPLANE FLIGHT MANUAL SUPPLEMENT

FOR

MOONEY MODEL M20B, M20C, M20E,
M20F, M20G, M20J & M20K
WITH

PRECISE FLIGHT DESCENT RATE CONTROL
WITH SWITCH OPERATION

REG. NO. N2525S

SER. NO. 25-1066

This Supplement must be attached to the applicable FAA Approved Airplane Flight Manual when the Precise Flight Descent Rate Control (DRC), with switch operation, is installed in accordance with Mooney Aircraft Corporation Drawing Number 950155. The information contained herein supplements or supercedes the basic manual only in those areas listed. For limitation, procedures and performance information not contained in this Supplement, consult the Basic Airplane Flight Manual.

FAA APPROVED:

Don P. Watson, Manager
Aircraft Certification Division
FEDERAL AVIATION ADMINISTRATION
Southwest Region
Ft. Worth, Texas 76101

Revision B: 6-12-86

DATE: 1-28-85

MOONEY AIRCRAFT CORPORATION
P. O. Box 72
Kerrville, Texas 78028

LOG OF REVISIONS

Revision Number	Revised Pages	Description of Revision	FAA Approved*	Date
A	2 & 4 3	Added and Revised Data Deleted & Revised Data	C L Stone	11-13-85
B	2 & 3 4	Added, Deleted & Revised Data Revised Data (Changes made as a result of latest Revision to Vendor's Supplement)	C L Stone	6/12/86

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

*Don P. Watson, Manager, Airplane Certification Division

PRECISE FLIGHT DESCENT RATE CONTROL SYSTEM

SECTION I - GENERAL

A. Descent Rate Control (DRC) kit may be installed to provide the following: expedited descents at low approach speeds, "lift dumping" in the landing roll and a measure of protection against excessive speed buildup in inadvertent spiral dives.

This kit consists of wing mounted speedbrakes with dual closure springs in each wing, a suction bellows below rear seat(belly area),a push button switch on pilot's control yoke, an amber light on pilot's panel and a cable activation system.

The DRC push button switch located on the left horn of pilot's control wheel features a push (ON) retained position to deploy the speedbrakes. To retract, push one additional time and release to (OFF) position.

Activating this switch closes an electrical circuit to a solenoid valve which, in turn, permits suction from the vacuum system to reach the DRC suction bellows. In the event of an electrical malfunction, the DRC circuit breaker may be pulled to remove electrical power from the heavily spring-loaded solenoid.

SECTION II - OPERATING LIMITATIONS

1. Airspeeds - Same limitations as basic airplane .
2. Descent in icing conditions - DRC OFF.

SECTION III - EMERGENCY PROCEDURES

1. Forced landing after engine failure - operate DRC switch as required to modulate speedbrakes (and glide path) with engine suction provided by windmilling propeller. DRC - OFF(amber light not illuminated)
2. Spins - DRC OFF.
3. Ditching - DRC OFF.
4. Disabled elevator system - DRC OFF.

SECTION IV - NORMAL OPERATING PROCEDURES

Before Takeoff

1. Speedbrake Push Button Switch IN-OUT (ON)
   Check Speedbrakes - DEPLOYED(amber light-illuminated)

2. Speedbrake Push Button Switch IN-OUT-(OFF)
   Check Speedbrakes - DOWN(amber light-not illuminated)

Takeoff: DRC-OFF (amber light-not illuminated)

Enroute

For expedited descents, select 2200 RPM and approximately 22 inches manifold pressure to keep the engine warm.

Push Switch -- (ON) to deploy speedbrakes.

Push Switch -- (OFF) to retract speedbrakes.

Final Approach

Fly a high base leg and final approach, extend wing flaps as desired and actuate the DRC Switch intermittently as required to modulate the glide path. Maintain an 85 knot approach speed by establishing a fairly steep nose down attitude.

NOTE

Lower the nose in anticipation of increased aircraft drag.

Landing

Initiate the landing flare at a slightly higher altitude and rotate the aircraft more rapidly than usual to perform a tail low touchdown.

/////////////
//CAUTION//
/////////////

If rate of descent is excessive, place DRC switch (OFF) to retract speedbrakes ; add power as required to reduce the rate of descent.

Section IV Cont.

Balked Landing (GO-AROUND)

Advance throttle and place DRC Switch (OFF);
retract wing flaps per basic Airplane Flight Manual instructions.

Securing Aircraft

Perform a normal shutdown sequence - DRC Switch (OFF).

SECTION V thru X

No change.

MOONEY AIRCRAFT CORPORATION

P.O. Box 72

Kerrville, Texas 78028

FAA APPROVED

AIRPLANE FLIGHT MANUAL SUPPLEMENT

FOR

MOONEY AIRCRAFT MODELS

M20J (14 Volt or 28 Volt) Aircraft
M20K (14 Volt or 28 Volt) Aircraft

WITH

STANDBY VACUUM PUMP INSTALLATION

MODEL NO. M20K

REG. NO. N252SS

SERIAL NO. 25-1066

This supplement must be attached to the applicable FAA Approved Airplane Flight Manual and/or Pilots Operating Handbook (AFM/POH) when the Standby Vacuum Pump is installed in accordance with Mooney Drawing Number 860060. The information contained herein supplements the information of the basic AFM/POH.

FAA APPROVED: for Don P. Watson, Manager
Airplane Certification Division
FEDERAL AVIATION ADMINISTRATION
Department of Transportation
Southwest Region
P.O. Box 1689
Fort Worth, TX 76101

Rev. B: 6-12-86

DATE: 9-27-83

MOONEY AIRCRAFT CORPORATION
P. O. Box 72
Kerrville, Texas 78028

LOG OF REVISIONS

Revision Number	Revised Pages	Description of Revision	FAA Approved*	Date
	Title Page	Revised Data		
A	2 of 6	Revised and added data		
	4 of 6	Revised Graph to reflect 28,000 ft. values	C L Stone	1-6-86
B	Title Page	Revised Data Added 28 Volt App. for M20J A/C.	C L Stone	6/12/86

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

*Don P. Watson, Manager, Airplane Certification Division

STANDBY VACUUM PUMP INSTALLATION

SECTION I - GENERAL

The standby dry air vacuum pump installation is designed to provide an alternate vacuum source for the attitude gyro and directional gyro instruments in the event of a malfunction in the primary engine driven vacuum pump system. The standby vacuum pump is driven by a DC electric motor, and the combination pump/motor assembly is mounted on the radio racks behind the aft cabin bulkhead in the tailcone. The standby pump can be operated at any time by activating a circuit breaker/rocker switch labeled "STBY VAC" mounted on the lower instrument subpanel in front of the pilot. A separate panel mounted amber annunciator labeled "STBY VAC ON" and a vacuum gage are provided for monitoring proper operation of the standby system. The vacuum gage will indicate vacuum, in inches of mercury, for both the engine driven pump when operating normally, and for the standby vacuum pump system.

SECTION II - LIMITATIONS

This supplement advises that use of the standby vacuum pump system may impose a limit on the installed equipment in operation.

NOTE

Weather radar will be inoperative with only the standby vacuum pump system in operation.

1. The maximum allowable continuous current drain for all optional electrical equipment in alternator equipped aircraft is 39.0 amperes, day flight, and 32.0 amperes, night flight (14V);46.0 amps day,& 36.0 amps night (28V).

CAUTION

If operation of optional electrical equipment exceeds these ratings, this equipment must be selected OFF to prevent exceeding the maximum allowed alternator load.

2. The standby vacuum motor will require 15 amps at sea level and 11 amps at 15,000 ft.(14V); 8 amps S/L & 6 amps 15,000 ft. (28V). This amperage reduction is basically linear as altitude increases.

CAUTION

When standby vacuum pump system is activated the ammeter should be monitored for a current discharge indication. If a discharge is observed

SECTION II - LIMITATIONS Cont...

turn off any non-essential electrical equipment until a discharge indication no longer exists on the ammeter.

3. Placards.

CAUTION - When "STBY VAC" is ON - LOW VAC light inop.

Located adjacent to annunciator panel.

SECTION III - EMERGENCY PROCEDURES

Any time that the red "LOW VAC" annunciator flashes indicating the engine driven vacuum pump is providing insufficient vacuum for the gyro instruments, the standby vacuum pump system should be operated in the following manner:

1. "STBY VAC" switch - ON.
2. Flashing "LOW VAC" Annunciator - Verify EXTINGUISHED.
3. "STBY VAC ON" Annunciator - ILLUMINATED.
4. All non-essential electrical equipment - OFF.
5. Vacuum Gage - Monitor for proper standby vacuum pump operation.

NOTE

Minimum vacuum required for satisfactory gyro instrument operation is a function of aircraft pressure altitude. Use the graph on page 4 to verify adequate standby vacuum pump output for the particular operating altitude.

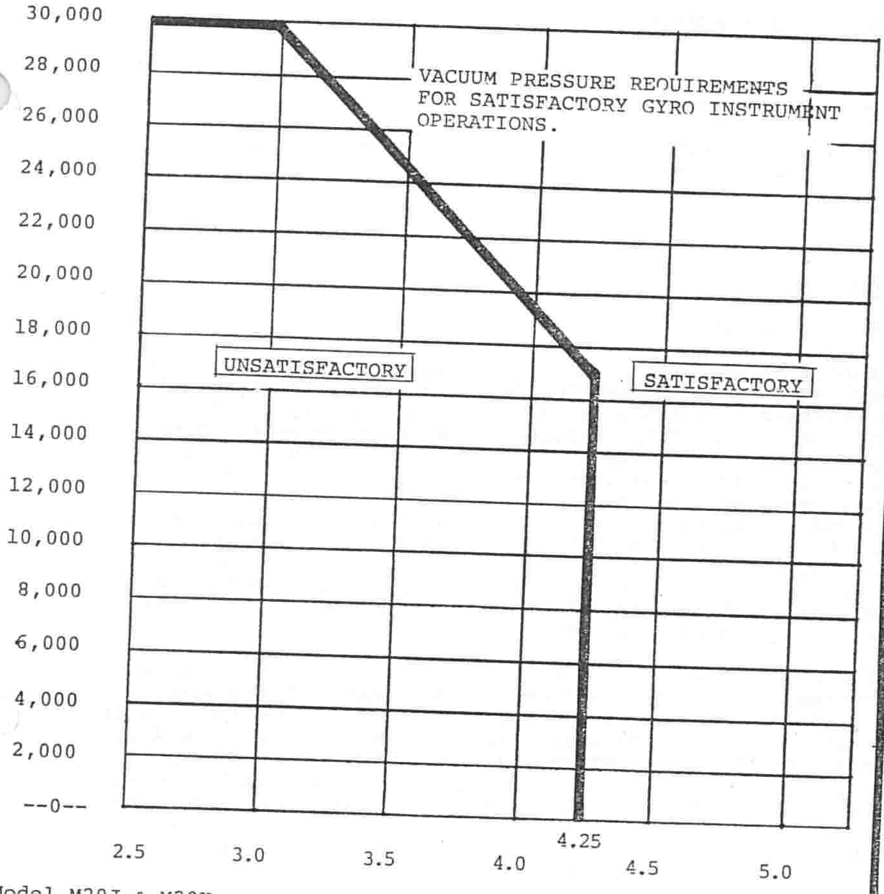
6. Continue flight and upon landing inspect engine driven vacuum pump system for cause of malfunction.

SECTION IV - NORMAL PROCEDURES

Before Starting Check

The following pre-engine start check should be performed on the standby vacuum system before each flight where use of standby system may be desired.

SECTION III -EMERGENCY PROCEDURES- cont. ...



SECTION IV - NORMAL PROCEDURES Cont...

1. Master Switch - ON.
2. "LOW VAC" Annunciator Light - FLASHING.
3. "STBY VAC" Switch - ON.
4. Flashing "LOW VAC" Annunciator Light - OFF.
5. "STBY VAC ON" Annunciator Light - ILLUMINATED.
6. Vacuum Gage - Monitor for proper standby vacuum pump operation.
7. "STBY VAC" Switch - OFF.
8. Continue with remainder of "Before Starting Checklist".

SECTION V - PERFORMANCE

No change.

SECTION VI - WEIGHT AND BALANCE

Refer to revised empty weight and center of gravity data for effect on loading instructions.

SECTION VII - SYSTEMS

Standby Vacuum Pump System

The standby vacuum system consists of an electric motor driven dry air vacuum pump mounted in the radio racks behind the aft cabin bulkhead. System plumbing for this pump is routed along the left-hand side of the aircraft to a manifold/check valve/regulator assembly mounted on the cabin side of the firewall. The manifold/check valve/regulator assembly provides both isolation and interconnect functions between the main engine driven and the standby electrically driven vacuum pumps. A circuit breaker/rocker switch labeled "STBY VAC" is provided for activation of the standby pump. When activated, operation of the standby vacuum pump is verified by the illumination of annunciator light labeled "STBY VAC ON". Standby pump output is monitored by a panel mounted vacuum gage.

Operationally, a malfunction in the normal engine driven vacuum pump system is noted by the flashing red "LOW VAC" annunciator light located in the center annunciator panel. This annunciator light will flash whenever engine driven vacuum drops below $4.25^{+.2}_{-.2}$ inches of mercury. Activating the circuit breaker/rocker switch labeled "STBY VAC" to the ON position will supply electrical power to the electric motor driving the standby vacuum pump and electrically extinguish the red flashing "LOW VAC" annunciator light.Verification of proper standby vacuum system operation is determined by the illumination of the amber "STBY VAC ON"

SECTION VII - SYSTEMS Cont...

annunciator and monitoring the panel mounted vacuum gage for adequate standby vacuum pump output.

The standby vacuum pump system can be used wnenever a malfunction is suspected in the primary engine driven vacuum pump system. Should a short occur in the standby electrical system, the conbination switch/circuit breaker will automatically trip to the OFF position.

SECTION VIII thru X

No change.

MOONEY AIRCRAFT CORPORATION
P.O. Box 72
Kerrville, Texas 78028

FAA APPROVED
AIRPLANE FLIGHT MANUAL SUPPLEMENT
FOR
MOONEY MODEL M20K and M20J
WITH
PROPELLER DE-ICE SYSTEM

REG. NO. N25255

SER. NO. 25-1066

This supplement must be attached to the applicable Airplane Flight Manual when the de-ice system has been installed by Mooney Aircraft Corporation. The information contained herein supplements or supersedes the basic manual only in those areas listed herein. For limitations, procedures and performance information not contained in the supplement, consult the basic Airplane Flight Manual.

FAA APPROVED: D. D. Castle

for Don P. Watson, Chief
Engineering & Mfg. Branch
FEDERAL AVIATION ADMINISTRATION
Southwest Region
Fort Worth, TX

DATE: 10-8-79

REVISION C
DATE: 11-13-85
REVISION A
DATE: JAN 16 1981
REVISION B
DATE: SEP 4 1981

MOONEY AIRCRAFT CORPORATION
P. O. Box 72
Kerrville, Texas 78028

LOG OF REVISIONS

Revision Number	Revised Pages	Description of Revision	FAA Approved*	Date
A	Page 3	Added info. concerning location of placard.	D D Castle	JAN 16 198[illegible]
B	Page 1 Page 4	Added M20J Application to Supplement. 1) Added M20J Performance Data to Supplement. 2) Changed 105 MPH IAS to 92 KIAS and M20K only effectivity.	D.L. Castle	SEP 4 198[illegible]
C	Page 2	Revised data to reflect 12 Volt vs. 24 Volt configuration.	C L Stone	11-13-85

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

*Don P. Watson, Chief, Engineering & Manufacturing Branch

SUPPLEMENT

PROPELLER DE-ICE SYSTEM

SECTION I - GENERAL

The propeller de-ice system is intended for use if unexpected icing conditions are encountered. The system is operated by a rocker switch/circuit breaker located in the pilot's panel. When the switch is placed in the "ON" position, current flows to a timing device which supplies power to the heating elements in the propeller boots. Each propeller blade boot contains heating elements which are turned alternately on and off by the timer. A de-ice ammeter located in the instrument panel is provided to monitor operation of the de-ice system.

SECTION II - LIMITATIONS

There is no change to the airplane limitations when the propeller de-ice system is installed. Flight into known icing conditions is prohibited, regardless of installed ice protection equipment. (Placard "This A/C Not Certified For Flight Into Known Icing Conditions" is standard in all aircraft equipped with Prop De-Ice; location: top of panel). Placard: Prop De-Ice (located on prop de-ice ammeter).

NOTE

No reduction in propeller diameter is permitted with de-ice boots installed.

SECTION III - EMERGENCY PROCEDURES

There is no change to the airplane emergency procedures.

SECTION IV - NORMAL PROCEDURES

Flight into known or forecast icing conditions is prohibited. If unexpected icing conditions are encountered, the following procedure is recommended:

1. "PROP DE-ICE" switch - ON.
2. "PROP DE-ICE" ammeter - CHECK in green arc (8 to 12 amps,12 Volt system) or (8 amps, 24 Volt system).

NOTE

Ammeter should flicker every 90 seconds as heating elements are switched.

CAUTION

An unusually high or low ammeter reading is an indication that a malfunction has occurred and it is imperative that the system be turned off. Uneven de-icing may result, causing propeller unbalance.

CAUTION

Prolonged use of the landing light with prop de-ice, pitot heat and all other electrical systems operating will cause battery discharge.

SECTION V - PERFORMANCE (M20K ONLY)

With the de-ice boots installed, a slight reduction in performance occurs, a 6 KT. loss in true airspeed during cruise conditions and a 30 FPM reduction in sea level climb performance. During a climb above critical altitude in the M20K, increase climb speed to 92 KIAS to ensure adequate engine cooling (this will result in an additional 45 FPM loss in climb performance above critical altitude).

SECTION V - PERFORMANCE (M20J ONLY)

With the de-ice boots installed, a slight reduction in performance occurs, a 6 KT. loss in true airspeed during cruise conditions and a 30 FPM reduction in sea level climb performance.

SECTION VIII - HANDLING AND SERVICE

Jacking: DO NOT place jack directly on prop-deice boots, cushion with firm rubber between jack and boot.

ENTWICKLUNG GMBH & CO. KG

Postfach 0720 D-8440 Straubing
Telefon (0 94 29) 12 01 / 12 02 81 11
Telex 65 599 mtpro-d
Telefax (0 94 29) 84 32

LBA I-C 66
I-E 634

No. E - 197

ANHANG ZUM FLUGHANDBUCH FÜR

3 - Blatt - Verstellpropeller **MTV-12-D/180-17**

AN MOONEY M20K , OE- KOG
S/No. 25-1066

STRAUBING, DEN 05.10.1988

LBA - ANERKANNT : 28. 2. 8 ....

mt-propeller

ENTWICKLUNG GMBH & CO. KG

Postfach 0720 D-8440 Straubing
Telefon (0 94 29) 12 01 / 12 02 81 11
Telex 65 599 mtpro-d
Telefax (0 94 29) 84 32

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05.10.1988
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Anhang zum Flughandbuch No. E-197 für Mooney M20K

TEIL V: **Flugleistungen**

5.1 STARTSTRECKE:
Durch den verbesserten Standschub verringert sich die Startstrecke um ca 5%.
Die Angaben im Flughandbuch bleiben davon unberührt und **unverändert** gültig.
Dies bedeutet erhöhte Sicherheit.

5.2 STEIGGESCHWINDIGKEIT:
Die Steigleistung ist geringfügig verbessert.
Die Motorkühlung ist gleich gut.
Die Angaben im Flughandbuch werden sicher erreicht, und bleiben als Leistungsangabe **unverändert** gültig.
Es sind keine geänderten Flugverfahren anzuwenden.

5.3 ZEIT, STRECKE UND KRAFTSTOFF IM STEIGFLUG:

Die Steigleistungen sind geringfügig verbessert.
Der Kraftstoffverbrauch ist geringfügig erhöht.
Die Änderungen sind kleiner als 2%, so daß die Angaben im Flughandbuch **unverändert** gültig bleiben.

5.4 REISEFLUGLEISTUNG:

Die erreichbaren Fluggeschwindigkeiten, der Kraftstoffverbrauch und die vorzunehmenden Leistungseinstellungen sind unverändert.
Die Angaben im Flughandbuch bleiben **unverändert** gültig.

5.5 GESCHWINDIGKEIT, LEISTUNG ZU HÖHE:

Die erreichbaren Fluggeschwindigkeiten, der Kraftstoffverbrauch und die vorzunehmenden Leistungseinstellungen sind auch in verschiedenen Höhen unverändert.
Die Angaben im Flughandbuch bleiben **unverändert** gültig.

5.6 REICHWEITE bei verschiedenen Leistungseinstellungen:

Durch die konstant gebliebenen Fluggeschwindigkeiten und den unveränderten Kraftstoffverbrauch bleiben die Reichweiten gleich.
Die Angaben im Flughandbuch bleiben **unverändert** gültig.

/3

mt-propeller

ENTWICKLUNG GMBH & CO. KG

Postfach 0720 D-8440 Straubing
Telefon (0 94 29) 12 01 / 12 02 / 81 11
Telex 65 599 mtpro-d
Telefax (0 94 29) 84 32

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Anhang zum Flughandbuch No. E-197 für Mooney M20K

TEIL I: **Allgemeines**

1.1 PROPELLER:

Typ:	MTV-12-D/180-17
Blattzahl:	3
Durchmesser:	**zulässig** 180cm - 177 cm
Bauart:	Verstellpropeller, konstante Drehzahl
Verstellung:	hydraulisch durch Motoröl
Blattwinkel:	bei Referenzstation 63 cm
	kleine Steigung: 13,5 Grd ±0,2
	große Steigung : 35,0 Grd ±1,0
Masse:	20,9 kg

1.2 PROPELLERREGLER:
unverändert
(nach Mooney Ausrüstungsliste)

1.3 PROPELLER-SPINNER:
MT-Propeller-Zeichnungsnummer: P-205

1.4 ENTEISUNSANLAGE:
Goodrich-Kit 67-615
oder gleichwertige Anlage

Die übrigen Angaben in Teil I bleiben unverändert gültig.

TEIL II: **Betriebsgrenzen**

2.1 Die Propeller-Betriebsgrenze bleibt unverändert: 2700 RPM

2.2 Der Lärmpegel ist bei Montage des Propellers MTV-12-D/180-17 um 0,2 dB(A) reduziert.

Die übrigen Angaben in Teil II bleiben unverändert gültig.

TEIL III: **Notverfahren**

Die Angaben in Teil III bleiben **unverändert** gültig.

Teil IV: **Normale Verfahren**

Die Verfahren für Steigflug, Reiseflug, Sinkflug und Landeanflug bleiben unverändert.
Das Verfahren beim Durchstarten bleibt ebenso unverändert. Eine Angabe zur Steigleistung beim Durchstarten ist im Flughandbuch nicht enthalten.
Die übrigen Angaben in Teil IV bleiben unverändert gültig.

Postfach 0720 D-8440 Straubing
Telefon (0 94 29) 12 01 / 12 02 81 11
Telex 65 599 mtpro-d
Telefax (0 94 29) 84 32

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05.10.1988
fw

Anhang zum Flughandbuch No. E-197 für Mooney M20K

5.7 HÖCHSTFLUGDAUER bei verschiedenen Leistungseinstellungen:

Durch die konstant gebliebenen Fluggeschwindigkeiten und den unveränderten Kraftstoffverbrauch bleibt die Höchstflugdauer gleich.
Die Angaben im Flughandbuch bleiben **unverändert** gültig.

5.8 LANDESTRECKE:
Die Angaben im Flughandbuch bleiben **unverändert** gültig.
Es sind keine geänderten Flugverfahren anzuwenden.

TEIL VI: **Gewicht und Ladedaten**

Der Propeller MTV-12-D/180-17 ist 6 kg leichter als der McCauley 2-Blatt Propeller. Das Massenmoment des Propellers ändert sich um - 0,699 kgm.
Das Leermassenmoment des Flugzeuges ändert sich lediglich um 0,07%.
Die Angaben im Flughandbuch bleiben von dieser geringen Änderung unberührt und **unverändert** gültig.

TEIL VII: **Beschreibung des Flugzeuges und der Anhang:**

Die Angaben in Teil VII bleiben **unverändert** gültig.

TEIL VIII: **Handhabung am Boden, Betriebsmittelergänzung und Wartung**

8.1 PROPELLER:

Die tägliche Kontrolle und Pflege des Propellers MTV-12-D/180-17 ist in der Betriebs- und Einbauanweisung Nr. E-124 beschrieben.
Die übrigen Angaben in Teil VIII bleiben unverändert gültig.

TEIL IX: entfällt

TEIL X: **Sicherheitsratschläge**

Die elektrische Propellerenteisung soll im Stand möglichst nicht eingeschaltet werden, da sich die Enteisungsgummis (Boots) überhitzen können.

Die übrigen Angaben in Teil X bleiben unverändert gültig.

ENTWICKLUNG GMBH & CO. KG

Airport Straubing-Wallmühle
D-8441 Atting / Germany
Telefon (0 94 29) 84 33
Telex 65599 mtprod
Telefax (0 94 29) 84 32

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LBA I-EC34
17.03.1989

ANHANG ZUM FLUGHANDBUCH

Nr. E - 209

Für das deutsche Flughandbuch der Mooney M-20-J und M-20-K, ausgerüstet mit der elektrischen Propeller-Enteisungsanlage Goodrich-Kit 67-xxx.

Flugzeug - Kennzeichen: ....OE-KOG....

Werk - Nr. : ....25-1066....

Dieser Anhang zum Flughandbuch muß in das zutreffende Flughandbuch eingefügt werden, wenn eine elt. Propeller-Enteisungsanlage gem. B.F. Goodrich - Einbauanweisung installiert wurde.
Die hierin enthaltenen Informationen erweitern oder ändern das Original-Flughandbuch nur in den Bereichen, die in diesem Anhang aufgeführt sind. Für Betriebseinschränkungen, Verfahren und Leistungsangaben, auf die in diesem Anhang nicht verwiesen wird, gilt weiterhin das Original-Flughandbuch.

LBA - ANERKANNT am:

LBA - Lizenziert - Ausweis-Nr. 1086 - Klasse 1

Straubing, den 17.03.1989
MT - Propeller Entwicklung GmbH & Co KG

Gerd Mühlbauer

m1-propeller

ENTWICKLUNG GMBH & CO. KG

Airport Straubing-Wallmühle
D-8441 Atting / Germany
Telefon (0 94 29) 84 33
Telex 65599 mtpro-d
Telefax (0 94 29) 84 32

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ANHANG ZUM FLUGHANDBUCH Nr. E - 209
Elt. Propeller-Enteisungsanlage

Abschnitt I - Allgemeines

Die Verwendung der Propeller-Enteisungsanlage ist vorgesehen, wenn unerwartete Vereisungssituationen eintreten. Die Anlage wird mittels eines Kippschalters/Sicherung, welche(r) sich im Instrumentenbrett befindet, eingeschaltet. Wenn der Schalter in "ON"-Position gedrückt wird, fließt Strom zu einem Zeitschalter, welcher den Heizelementen in den Enteisungsgummis an den Propellerblättern Leistung zuführt. Jeder Enteisungsgummi enthält Heizelemente, welche durch den Zeitschalter abwechselnd ein- und ausgeschaltet werden (bei 12/14 VDC Bordnetz), bzw. werden die Gummis an allen Blättern abwechselnd ein- und ausgeschaltet (24/28 VDC Bordnetz). An einem Enteisungs-Amperemeter im Instrumentenbrett kann die Funktion der Anlage beobachtet werden.

Abschnitt II - Betriebsbegrenzungen

Durch die Installation der elt. Propeller-Enteisungsanlage ergeben sich keine Betriebsbegrenzungen. Flüge in bekannte Vereisungsbedingungen sind verboten, unabhängig davon, welches Enteisungsystem installiert ist.
Ein Hinweisschild "Dieses Flugzeug ist nicht für Flüge in bekannte Vereisungsbedingungen zugelassen" muß in allen Flugzeugen, die mit einer solchen Anlage ausgeüstet sind, angebracht werden; Ort: Oberes Instrumentenbrett.
Ein weiteres Hinweisschild "Propeller-Enteisung" muß in der Nähe des Enteisungs-Amperemeters angebracht werden.

Bemerkung

Ist eine Propeller-Enteisungsanlage installiert, darf der Propeller-Durchmesser bei Metall-Propellern nicht gekürzt werden!

Abschnitt III - Notverfahren

Es gibt keine Änderung der Notverfahren.

Abschnitt IV - Normalverfahren

Flüge in bekannte oder vorhergesagte Vereisungsbedingungen sind verboten. Treten unerwartet Vereisungen auf, wird das folgende Verfahren empfohlen:

Airport Straubing-Wallmühle
D-8441 Atting · Germany
Telefon (0 94 29) 84 33
Telex 65599 mtpro-d
Telefax (0 94 29) 84 32

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ANHANG ZUM FLUGHANDBUCH Nr. E - 209
- Propeller-Enteisungsanlage

Abschnitt IV Fortsetzung

1. "PROP-DE-ICE" - Schalter: Ein (On)

2. "PROP-DE-ICE" - Amperemeter (Ammeter): Prüfen, ob Anzeige im grünen Bereich:
   8-12 A für 12/14 VDC-Bordnetz, 8 A für 24/28 VDC bei 2-Blatt-Propellern
   13-17 A für 12/14 VDC und 24/28 VDC-Bordnetz bei 3-Blatt-Propellern

Bemerkung

Das Ammeter zuckt alle 90 sec, um die Umschaltung des Zeitschalters anzuzeigen (bzw. 90 sec "Ein" und 90 sec "Aus")

Vorsicht

Ungewöhnlich hohe oder niedrige Anzeige am Ammeter ist das Anzeichen einer Störung und es ist zwingend, daß die Anlage abgeschaltet wird. Ungleichmäßiges Abtauen kann eintreten, was zur Unwucht des Propellers führt.

Vorsicht

Überlanges Einschalten des Landescheinwerfers zusammen mit der elt. Propeller-Enteisung, Staurohr-Heizung und allen anderen elektrischen Verbrauchern, kann zu einer Entladung der Batterie führen. Dieser Zustand wird wird am Instrumentenbrett angezeigt (Ladekontrolle). Soviele unnötige Verbraucher ausschalten, bis die Anzeige der Ladekontrolle wieder im zulässigen Bereich ist.

Abschnitt V - Leistungsdaten (M-20-K)

Mit Enteisungsgummis an den Blättern tritt eine geringe Verminderung der Leistung auf. Ca. 6 kt weniger TAS in Reisekonfiguration und ca. 30 fpm geringere Steigleistung in Meereshöhe. Beim Steigflug mit der M-20-K über die kritische Höhe muß die Fluggeschwindigkeit auf 92 KIAS erhöht werden, um ausreichende Triebwerkskühlung zu erreichen (Dies ergibt z tzliche 45 fpm Verminderung der Steigleistung über der kr ischen Höhe).

Airport Straubing-Wallmühle
D 8441 Atting / Germany
Telefon (0 94 29) 84 33
Telex 65599 mtpro-d
Telefax (0 94 29) 84 32

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ANHANG ZUM FLUGHANDBUCH Nr. E - 209
Elt. Propeller-Enteisungsanlage

Abschnitt V - Leistungsdaten (M-20-J)

Mit Enteisungsgummis an den Blättern tritt eine geringe Verminderung der Leistung auf. Ca. 6 kt weniger TAS in Reisekonfiguration und ca. 30 fpm geringere Steigleistung in Meereshöhe.

Abschnitt VIII - Handhabung am Boden

Aufbocken: Vermeide jedes direkte drücken auf die Enteisungsgummis.
Schütze die Gummis durch gutes Polster aus Gummi oder Abstützung an anderer Stelle.

Liste der eingearbeiteten Änderungen

Lfd. Nr.	Ausgabedatum	Seite	Kurzbeschreibung

KING

King Radio Corp.
400 N. Rogers Road
Olathe, Kansas 66062

FAA APPROVED

RNAV FLIGHT MANUAL

AIRCRAFT MAKE Mooney

AIRCRAFT MODEL M20K

AIRCRAFT SERIAL NO. 25-1066

AIRCRAFT REG. NO. N252 $$

This document must be carried in the aircraft at all times. It describes the operating procedures for the KNS 81 Digital Area Navigation System when it has been installed in accordance with King Installation Manual 006-0185-00, Rev. 2 or later revision, AC 90-45A or later revision, and FAA Form 337 dated 26 June 87.

When the KNS 81 is installed in an aircraft that does not have an FAA approved Airplane Flight Manual, this document serves as the FAA approved RNAV Flight Manual. For aircraft with a Pilot's Operating Handbook and/or FAA approved Airplane Flight Manual this document serves as the FAA approved RNAV Flight Manual Supplement.

The information contained herein supplements or supersedes the basic Airplane Flight Manual only in those areas listed herein. For limitations, procedures, and performance information not contained in this document, consult the basic Airplane Flight Manual (if applicable).

FAA APPROVED: ______________________

Chief, Wichita Engineering
and Manufacturing District Office
Wichita, Kansas

Date: ______________________

KING

King Radio Corp.
400 N. Rogers Road
Olathe, Kansas 66062

FAA APPROVED

RNAV FLIGHT MANUAL SUPPLEMENT

AIRPLANE FLIGHT MANUAL SUPPLEMENT

LOG OF REVISIONS

Rev. No.	Page Number(s)	Description	Date of Revision
1	1	Changed revision level shown for 006-0185-00 manual.	4-20-81
	3,4,6,7	Added description of new model unit with ten waypoint capability.	

KING

King Radio Corp.
400 N. Rogers Road
Olathe, Kansas 66062

RNAV FLIGHT MANUAL

TABLE OF CONTENTS

KING

King Radio Corp.
400 N. Rogers Road
Olathe, Kansas 66062

SECTION I

GENERAL

This manual is to acquaint the pilot with the operation of the KNS 81 Navigation System. The airplane must be operated within the limitations herein specified.

1. SYSTEM DESCRIPTION

The King KNS 81 is a navigation system combining a 200 channel VOR/Localizer receiver, a 40 channel glideslope receiver & a digital RNAV computer with a capability of preselection and storage of 10 VOR/LOC frequencies & 10 sets of RNAV waypoint parameters. (Some early models have only 9 waypoint storage capability.) A DME System must be used in conjunction with the KNS 81.

The KNS 81 can be operated in any one of three basic modes: VOR, RNAV, or ILS. To change from one mode to another the rotary MODE selector knob on the left side of panel is rotated, except that the ILS Mode is entered automatically whenever an ILS frequency is channeled as the ACTIVE frequency. The display will annunciate the mode by lighting a message beside the WPT display, except in the ILS mode in which case the RAD & DST displays are blanked to denote the ILS mode. In addition to the standard VOR & RNAV enroute (RNV) modes, the KNS 81 has a constant course width or parallel VOR mode (VOR-PAR) and an RNAV approach mode (RNV APR). The same rotary MODE selector knob is used to place the unit in either of these secondary modes.

All waypoint information, station frequency, waypoint distance and waypoint radial are entered with the increment/decrement rotary switch on the right side of the panel and displayed in their respective displays. The small knob affects the least significant digits while the large knob changes the most significant digits. The tenth's position of waypoint radial and distance can be changed by pulling the small knob to the out position. The type of data being selected is indicated by the illuminated carets (><) located by either FRQ, RAD or DST. Frequency, radial or distance information for a waypoint can be selected sequentially by pressing the "DATA" push button. The increment/decrement switch changes only the information being displayed with the carets.

The waypoint number of the data being displayed is located above the message WPT. The waypoint number is changed by rotating the WPT selector knob (small center knob) on the left side of the panel. If the waypoint in use is different from the displayed Waypoint (WPT blinking), pressing the USE button will cause the displayed WPT to become the waypoint in use.

2. DISPLAYS

A. FRQ, RAD, DST Display

1) FRQ Display

Displays frequency from 108.00 to 117.95 MHz in increments of .05 MHz. Least significant digit displays only zero or five.

2) RAD Display

Displays ground station radial on which waypoint is located from 0.0 to 359.9 degrees.

Section I (Continued)

3) DST Display

Displays the offset distance of the waypoint from the ground station over a range of 0.0 to 199.9 NM.

B. VOR, PAR, RNV, RNV APR Displays

System mode lights

C. WPT Display

Displays waypoint number (0 thru 9) of data being displayed. (Some earlier models do not have waypoint 0 and only display waypoint number 1 thru 9.)

D. Carets (><) Display

Indicates which waypoint data (FRQ, RAD or DST) the increment/decrement rotary switch will change.

E. DME Indicator (Remote)

Displays NM to/from the waypoint/station, KT ground speed & MIN time to the waypoint/station. Also, the waypoint radial is displayed whenever the KNS 81 RAD Button is pressed. Consult the DME Manual for additional information.

F. RMI Display (Optional)

Displays the bearing to the waypoint/station.

3. Controls

A. WPT/Mode Control

Dual concentric knobs.

1) The outer knob selects the MODE of unit operation. Turning the knob clockwise causes the mode to sequence thru VOR, VOR PAR, RNV, RNV APR and then back to the VOR mode.

2) The center knob selects the WPT to be displayed. Turning the knob causes the displayed waypoint to increment by one thru the waypoint sequence of 0,1,2,.....8,9,0.

B. USE Button

Momentary pushbutton which, when pressed, causes the active waypoint to take on the same value as the displayed waypoint.

C. RTN Button

Momentary pushbutton which, when pressed, causes the active waypoint to return to the display.

D. RAD Button

Push on, push off button which, when pushed on, causes the radial from the waypoint & "F" to be displayed on the remote DME display.

E. CHK Button

Momentary pushbutton which, when pressed, causes the raw radio data from the NAV Receiver & DME to be displayed. The radial from the VOR Ground Station will be displayed on the RAD display & the distance from the station will be displayed on the DST display. There is no effect on any other data output.

Section I (Continued)

F. DATA Button

Momentary pushbutton which, when pressed, causes the caret (><) display to change from FRQ to RAD to DST and back to FRQ.

G. OFF/PULL ID Control

Rotary switch/potentiometer which, when turned clockwise, applies power to the KNS 81 and increases NAV audio level. The switch may be pulled out to hear VOR ident.

H. DATA INPUT Control

Dual concentric knobs with the center knob having an "in" and "out" position.

1) Frequency Data

The outer knob varies the 1 MHz and 10 MHz digits and the center knob varies the frequency in .05 MHz increments with carry to/from the .1 MHz digit regardless of whether the switch is in its "in" or "out" position.

2) Radial Data

The outer knob varies the 10 degree digit with a carryover occuring from the tens to hundreds position. The center knob in the "in" position varies the 1 degree digit and in the "out" position varies the 0.1 degree digit.

3) Distance Data

The outer knob varies the 10 NM digit with a carryover occuring from the tens to hundreds place. The center knob in the "in" position varies the 1 NM digit and in the "out" position varies the 0.1 NM digit.

SECTION II

LIMITATIONS

1. The Area Navigation mode may be used as the primary navigation system under IFR conditions on approved approach procedures, approved airways, and random area navigation routes only when approved by Air Traffic Control.

2. The Area Navigation or VOR PAR mode can only be used with colocated facilities (VOR & DME signals originate from the same geographical location).

SECTION III

EMERGENCY PROCEDURES

CAUTION

DME MAY UNLOCK DUE TO LOSS OF SIGNAL WITH CERTAIN COMBINATIONS OF DISTANCE FROM STATION, ALTITUDE AND ANGLE OF BANK.

1. If NAV flag appears while in the Area Navigation mode, use CHK Button to check for validity of Raw DME & VOR Data.

Section III (Continued)

2. If VOR or DME information is intermittent or lost, utilize remaining operational navigation equipment as required.

3. If NAV flag appears and/or DME information is lost during an approach, execute published missed approach and utilize another approved facility.

SECTION IV

NORMAL PROCEDURES

1. PREFLIGHT

AREA NAVIGATION FUNCTIONAL TEST

The following procedure applies only to airports equipped with, or in range of, a colocated VOR/DME station.

1) Place the KNS 81 in VOR mode.

2) Find and record the angle from the VOR station by centering the course deviation needle with the TO/FROM flag giving a "FROM" indication.

3) Program a waypoint radial angle equal to the OBS value determined in Step 2.

4) Program a waypoint distance equal to the indicated DME value.

5) Place the KNS 81 in RNV.

The KNS 81 is operating properly if the distance to waypoint is 0 + 1.0 NM & the course deviation needle is within a dot of being centered.

2. PROGRAMMING

Pertinent information (waypoint number, station frequency, waypoint radial, and waypoint distance) for up to ten waypoints (some early models have only 9 waypoints) is entered into the memory. Programming may be completed prior to takeoff or during the flight. Any combination of navigational facilities (RNAV waypoint, VOR/DME, ILS) may be loaded into the computer; however, it is desirable that each facility be numbered and loaded in the sequence it is to be used.

A. RNAV WAYPOINTS

1) Turn the system on by rotating the ON/OFF switch clockwise.

2) Put waypoint 0 in the WPT window by turning the WPT knob. Turn the knob in either direction to get "0".

3) Select the waypoint 0 frequency using the data input controls which are the two concentric knobs on the right.

4) Select the waypoint 0 radial by depressing the DATA button. This will move the >< (caret) from FRQ to RAD. Select the new radial with the data input controls.

5) Select the waypoint 0 distance by again depressing the DATA button. This will move the >< from RAD to DST. Select the new distance with the data input controls.

Section IV (Continued)

6) This completes the programming for the first waypoint. Follow these procedures for all selected waypoints up to a maximum of ten (only nine waypoints on some early models).

B. CONVENTIONAL VOR

1) The programming technique for conventional navigation directly toward or away from a VOR facility without a colocated DME is similar to that for RNAV waypoints. Inputting the waypoint number and frequency into the memory is accomplished in the same manner. The RAD and DST displays will display dashes during VOR and VOR PAR operation.

C. ILS APPROACH (Front course and Back course)

1) Programming an ILS approach is accomplished in the same manner as programming conventional VOR.

D. MISSED APPROACH

1) If the published missed approach utilizes an RNAV waypoint or VOR facility, it may be entered into the memory any time prior to the approach. This is accomplished in the same manner set forth in CONVENTIONAL VOR and RNAV WAYPOINTS in this section.

E. INFLIGHT

1) Preset waypoints may be recalled from memory and put into active use as required.

Turn the WPT knob as required to select the desired waypoint. The preset waypoint number, frequency, radial & distance will appear in their respective displays. The WPT display will blink to indicate that the waypoint displayed is other than the active waypoint.

2) Verify that the data is correct.

NOTE

REVISIONS TO THE WAYPOINT DATA CAN BE PROGRAMMED AT THIS TIME BY ENTERING THE NEW WAYPOINT PARAMETERS.

3) When return to the active waypoint is desired press the RTN button. The active waypoint along with its data will be displayed.

4) When navigation to the displayed (blinking WPT) waypoint is desired, press the USE button. The WPT display will cease blinking & the displayed waypoint becomes the active waypoint.

5) The raw VOR & DME data can be checked at any time by pressing the CHK button. The radial from the VOR will be displayed above RAD & the DME distance will be displayed above DST.

3. RNAV OPERATION

If the system is receiving valid signals from a colocated VOR-DME facility, it will supply linear deviation information to the Horizontal Situation Indicator (or Course Deviation Indicator). Enroute (RNV) sensitivity, available by turning the MODE selector knob until RNV is displayed, provides a constant course width of ±5 NM full scale.

Section IV (Continued)

Approach (RNV APR) sensitivity, available by turning the MODE selector knob until RNV APR is displayed, provides a constant course width of ± 1 1/4 NM full scale. Approach sensitivity should be selected just prior to final approach course interception. Time and distance to the waypoint, and computed groundspeed are displayed on the DME display.

4. CONVENTIONAL VOR OPERATION

VOR or VOR-PAR modes are selected by turning the MODE selector knob until VOR or VOR PAR is displayed. In VOR mode the remote DME is automatically tuned when the KNS 81 is selected as the tuning source. Upon lock-on, distance, groundspeed and time to the VORTAC station will be displayed on the DME display. The HSI (CDI) will display conventional angular crosstrack deviation from the selected course (±10° full scale). In VOR-PAR mode, operation is identical to VOR except the HSI (CDI) will display crosstrack deviation of ±5 NM full scale from the selected course. Course width will be constant irrespective of distance from the VORTAC.

Anytime the RAD button is engaged, the radial from the waypoint/station will be displayed on the DME knots display along with an "F" on the DME time to station display.

NOTE

THE RAD SWITCH IS NOT THE MOMENTARY TYPE, THEREFORE, THE SWITCH MUST BE PRESSED AGAIN FOR THE NORMAL DME INFORMATION TO BE DISPLAYED.

5. ILS OPERATION

Whenever an ILS Frequency is put "IN USE" the mode display will remain the same (either VOR, VOR-PAR, RNAV, RNAV APR displayed) but the RAD & DST displays will be blanked. Absence of the LOC/GS functions is annunciated by the NAV and GS flags in the HSI (CDI). Only angular deviation is provided in the ILS Mode.

6. RNAV APPROACH

The RNAV Approach (RNV-APR) mode may be used for runway location (by placing a waypoint at the approach end of the runway) during an approach to an airport. Turn the MODE selector knob to select RNV-APR. In RNV-APR the deviation needle on the HSI (CDI will display crosstrack deviation of ± 1 1/4 NM full scale). All other aspects of the RNV-APR mode are identical to the RNV mode.

SECTION V

PERFORMANCE

No change

MOONEY AIRCRAFT CORPORATION
P. O. Box 72
Kerrville, Texas 78029-0072

FAA APPROVED
AIRPLANE FLIGHT MANUAL SUPPLEMENT
FOR
MOONEY MODEL M20K S/N
25-1000 THRU 25-TBA
WITH
OXYGEN SYSTEM

Reg. No. N252SS

Ser. No. 25-1066

This supplement must be attached to the applicable Airplane Flight Manual when the Oxygen System has been installed by Mooney Aircraft Corporation. The information contained herein supplements or supersedes the basic manual only in those areas listed herein. For limitations, procedures and performance information not contained in the supplement, consult the basic Airplane Flight Manual.

FAA APPROVED: ____________________
for Don P. Watson, MGR.
AIRCRAFT CERTIFICATION DIVISION
FEDERAL AVIATION ADMINISTRATION
Southwest Region, Fort Worth, TX

DATE: 12-16-85

MOONEY AIRCRAFT CORPORATION
P. O. BOX 72
Kerrville, Texas 78029

LOG OF REVISIONS

Revision Number	Revision Pages	Description of Revision	FAA Approved*	Date
A	3,4,5,6,&8	Added 115.7 cubic ft. oxygen system data. Added 115.7 Ft^3 chart as page 8.	C L Stone	5/9/86

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

*Don P. Watson, Manager, Airplane Certification Division

OXYGEN SYSTEM

SECTION I GENERAL

A four-place oxygen system provides the supplementary oxygen necessary for continuous flight at high altitude. An oxygen cylinder is located in the equipment bay, accessible through a removable panel on the aft wall of the baggage compartment, or through the standard external panel. A combined pressure regulator/shutoff valve, attached to the cylinder, automatically reduces cylinder pressure to the delivery pressure required for the operating altitude. The oxygen cylinder filler valve is located under a spring loaded door aft of the baggage door.

A pilot's oxygen panel on the side wall near the pilot's arm rest contains a cylinder pressure gage (effectively a quantity gage - see Fig. 2 or 3) and a control knob which is mechanically connected to the shutoff valve at the cylinder. The supply of oxygen can thus be shut off from the cockpit when not required. When the control is in the "ON" position sufficient oxygen flow is available at the maximum airplane operating altitude (See Section II Limitations) while at lower altitudes the reducing valve automatically economizes the flow to conserve oxygen for longer duration or for future availability, without requiring any action by the pilot. (See Fig. 2 or Fig. 3).

Four oxygen outlets are provided: three in the left sidewall behind the pilot's seat for the convenience of passengers and one in the pilot's oxygen panel. Oxygen flows from the outlets only when a mask hose is connected. Four partial re-breathing type masks are provided, each with vinyl plastic hoses and flow indicators. The three passenger masks are of the disposable type. The pilot's mask is a permanent type with a built-in microphone for ease of radio communication while using oxygen. To use the mask-microphone, connect its lead to the microphone jack located left of the instrument panel, in place of the aircraft microphone lead, and key the switch on the control yoke.

The oxygen cylinder, when fully charged, contains 76 ft.^{3} (steel), 77.1 ft.^{3} (composite) or 115.7 ft.^{3} (composite) of aviator's breathing oxygen (Spec No. MIL-O-27210) under a pressure of 1850 PSI at 21°C (70°F). Filling pressures will vary, however, due to ambient temperature in the filling area, and the rise of temperature resulting from compression of the oxygen. Because of this, merely filling to 1850 PSI will not result in a properly filled cylinder. Fill to pressures indicated on Figure 1 for ambient temperatures.

WARNING

Oil, grease or other lubricants in contact with oxygen create a serious fire hazard, and such contact must be avoided when handling oxygen equipment.

AMBIENT TEMPERATURE F°	FILLING PRESSURE PSIG	AMBIENT TEMPERATURE F°	FILLING PRESSURE PSIG
0	1650	50	1875
10	1700	60	1925
20	1725	70	1975
30	1775	80	2000
40	1825	90	2050

FIGURE I. Oxygen Filling Pressures

NOTE:

The oxygen cylinder should not be run down to less than 100 p.s.i. Below this pressure atmospheric contamination of the cylinder may occur, requiring valve removal and cylinder cleaning and inspection at an FAA approved repair station.

For FAA requirements concerning supplemental oxygen, refer to FAR 91.32. Supplemental oxygen should be used by all occupants when cruising above 12,500 feet. It is often advisable to use oxygen at altitudes lower than 12,500 feet under conditions of night flying, fatigue, or periods of physiological or emotional disturbances. Also the habitual and excessive use of tobacco or alcohol will usually necessitate the use of oxygen at less than 10,000 feet.

The oxygen duration chart (Fig. 2 or 3) should be used in determining the usable duration (in hours) of the oxygen supply in the airplane for the chosen cruising altitude. The following procedure outlines the method of finding the duration from the chart:

1. Note the available oxygen pressure shown on the pressure gage.

2. Locate this pressure on the scale on the left side of the chart. Then go across the chart horizontally to the right until intersecting the diagonal line which represents the number of persons on board. From that intersection drop vertically down to the heavy line, marked 30,000'.

3. From this point on the heavy line, follow the trend of the curved lines, down to the horizontal line representing cruise altitude. Then drop vertically down to the bottom of the chart and read the duration in hours given on the scale.

4. As an example of the above procedure, 1400 PSI of pressure will safely sustain the pilot and one passenger for 4 hours and 10 minutes (Fig. 2) or 5 hours and 35 minutes (Fig. 3) at 28,000 ft.; however, cruising at 20,000 ft. would permit an oxygen duration of 5 hours and 40 minutes (Fig. 2) or 8 hours and 35 minutes (Fig. 3).

Light crew loads and relatively low altitudes will permit oxygen durations off the chart. Such durations can be calculated by determining the duration at 30,000 feet (by steps 1 and 2 above) and multiplying by the "duration multiplier" shown on the right of the appropriate cruising altitude. Example, (Fig. 2 only) pilot only at 1600 PSI has 8.5 hours duration at 30,000 ft., times 1.5 duration multiplier for 20,000 ft., gives 12 hours and 45 minutes duration at 20,000 ft. Oxygen durations off the chart obviously exceed the airplanes duration. However, judicious choices of altitude for the number of persons on board can permit flight planning for several fuel stops, without need for recharging the oxygen system at each stop.

SECTION II LIMITATIONS

There is no change to the Airplane Limitations when oxygen equipment is installed.

Placards: 1) "Use aviators oxygen only" - Location: at filler port.
2) "Oxygen - No Smoking When in Use" - Location: at oxygen outlets.

NOTE:

Only masks which have end fittings marked with a green band are acceptable for use with this system.

SECTION III EMERGENCY PROCEDURES

There is no change to the Airplane Emergency Procedures when oxygen equipment is installed. In the event of oxygen loss above 20,000 ft. refer to AFM EMERGENCY DESCENT PROCEDURES.

SECTION IV NORMAL PROCEDURES

Prior to flight, check to be sure that there is an adequate oxygen supply for the trip, by noting the oxygen pressure gage reading, and refering to the oxygen duration chart (Fig.2or3). Also check that face masks and hoses are accessible and in good condition.

WARNING

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

WARNING

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:

1. Mask and Hose -- SELECT. Adjust mask to face and adjust metallic nose strap for snug mask fit.
2. 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.

3. Oxygen supply control knob -- ON.
4. Face Mask Hose Flow Indicator -- CHECK. Oxygen is flowing if the indicator is being forced toward the mask.
5. Delivery Hose -- UNPLUG from outlet when discontinuing use of oxygen. This automatically stops the flow of oxygen.
6. 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 monitor closely 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.2or3) for safe operational quantities.

SECTION V PERFORMANCE

There is no change to the Airplane Performance when oxygen equipment is installed.

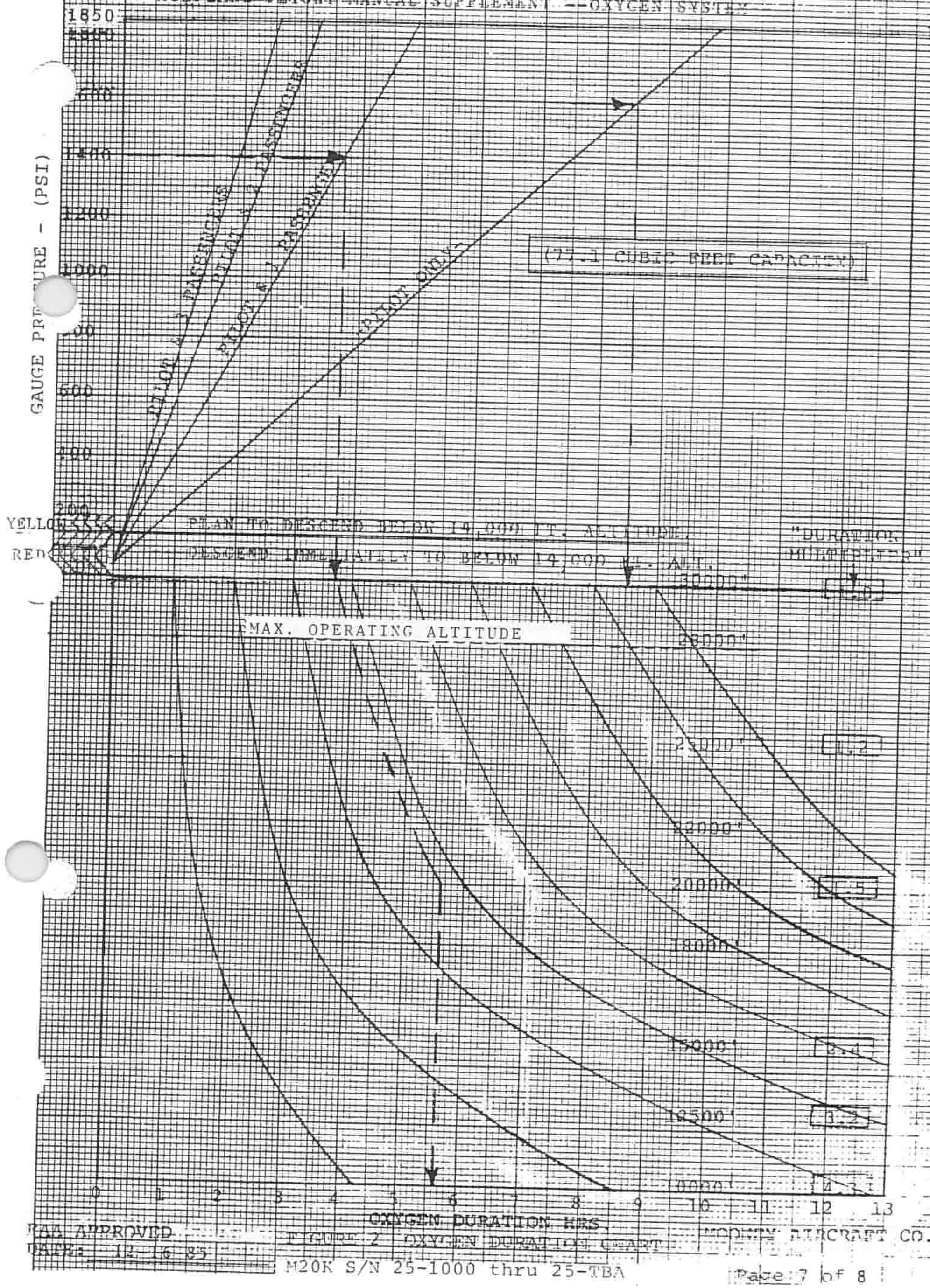
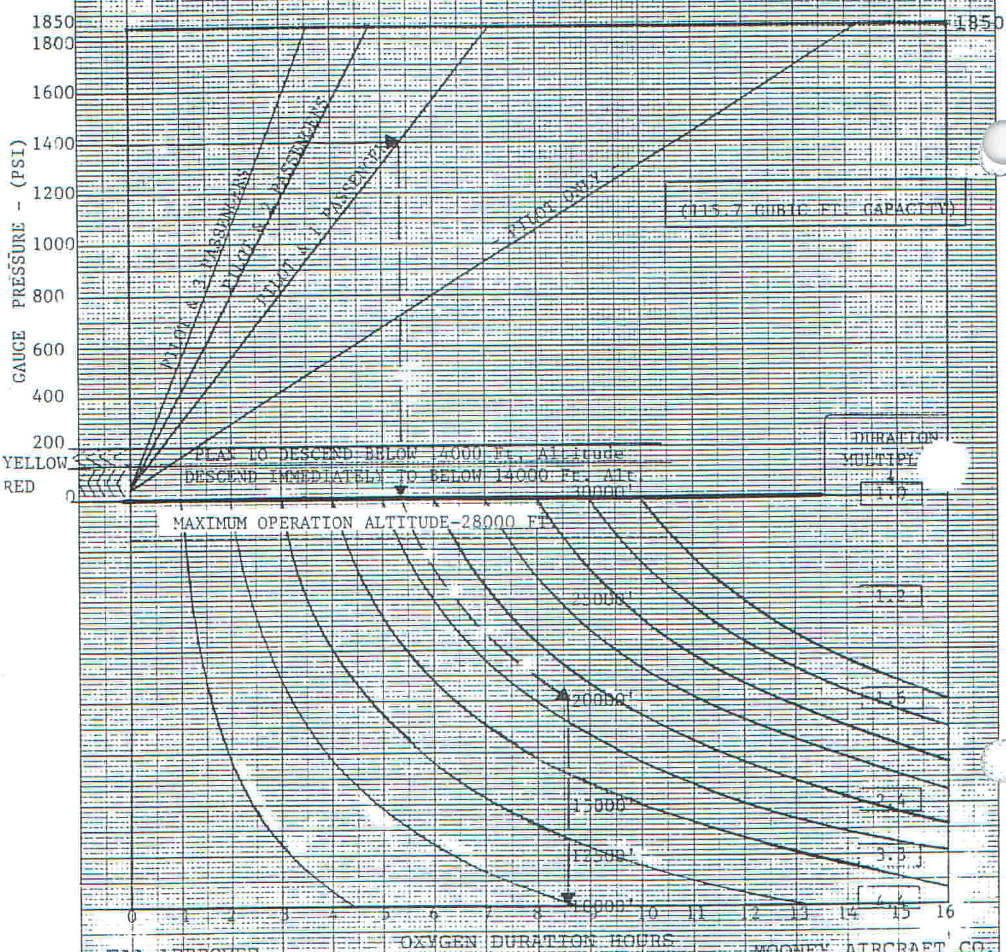


FIGURE 2 OXYGEN DURATION CHART

AIRPLANE FLIGHT MANUAL SUPPLEMENT --OXYGEN SYSTEM--



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REV.A 5-9-86

FIGURE 3 OXYGEN DURATION CHART
M20K S/N 25-1000 thru 25-TBA

MOONEY AIRCRAFT CORPORATION

P.O. Box 72

Kerrville, TX 78028

FAA APPROVED

AIRPLANE FLIGHT MANUAL SUPPLEMENT

FOR

MOONEY MODELS M20J AND M20K

WITH

KING KAS 297B VERTICAL SPEED AND ALTITUDE SELECTOR

REG. NO. N252SS

SER. NO. 25-1066

MODEL NO. M20K

This supplement must be attached to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual (AFM) when the KAS 297B Vertical Speed and Altitude Selector is installed in accordance with Mooney Drawing No. 830125. The information contained herein supplements or supersedes the Mooney, King KFC Series AFCS Supplement and the basic AFM in those areas listed. For limitations, procedures, and performance information not contained in this supplement, consult the Mooney, King KFC Series AFCS Supplement and the basic Airplane Flight Manual (AFM).

FAA APPROVED: C L Stone

for Don P. Watson, Manager
Aircraft Certification Division
FEDERAL AVIATION ADMINISTRATION
Southwest Region
Fort Worth, TX 76101

DATE: 1-30-84

MOONEY AIRCRAFT CORPORATION
P. O. Box 72
Kerrville, Texas 78028

LOG OF REVISIONS

Revision Number	Revised Pages	Description of Revision	FAA Approved*	Date

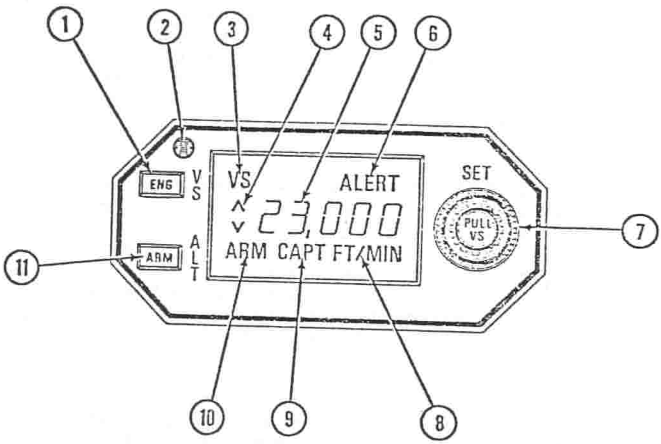
The revised portions of affected pages are indicated by vertical black lines in the margin.

*Don P. Watson, Manager, Airplane Certification Division

SECTION I - GENERAL

This supplement is provided to acquaint the pilot with the limitations as well as the normal and emergency operating procedures of the King KAS 297B Vertical Speed and Altitude Selector when added to a KFC 150 or a KAP 150 Flight Control System.

The KAS 297B provides the pilot with the following features: ability to select vertical speed hold; ability to select, arm and, upon approaching the selected altitude, automatically transfer into Altitude Hold; altitude alerting as specified by FAR 91.51. The KAS 297B controls and display are described in Figure 1 and corresponding prargraphs.



KAS 297B VERTICAL SPEED AND ALTITUDE SELECTOR
FIGURE 1

CONTROL FUNCTION DESCRIPTION

1. VERTICAL SPEED MODE (ENG) BUTTON - When pressed will engage the Vertical Speed Hold mode. When pressed a second time will disengage the Vertical Speed Hold mode.

2. PHOTOCELL - Automatically dims display according to the cockpit ambient light.

SECTION I - GENERAL, Cont.

3. VERTICAL SPEED (VS.) ANNUNCIATOR - Illuminates when the Vertical Speed Hold mode is engaged.

4. VERTICAL SPEED UP/DOWN CARETS ($\Diamond$) - Indicates whether the selected vertical speed is up or down.

5. GAS DISCHARGE DISPLAY - Displays selected altitude from 100 to 35,000 feet or the selected vertical speed from 0 to 3,000 feet per minute up or down.

6. ALTITUDE ALERT (ALERT) ANNUNCIATOR - The Alert annunciator is illuminated 1000 feet prior to the selected altitude, goes out 300 feet prior to the selected altitude and illuminates momentarily when the selected altitude is reached. Once the selected altitude is reached the light signifies that the 300 feet "safe band" has been exceeded and will remain on until 1000 feet from the selected altitude. The alert light is accompanied by a 2 second aural tone anytime the light initially comes on or the selected altitude is reached.

7. VERTICAL SPEED/ALTITUDE SELECT KNOB - Concentric knobs which allow easy setting of altitude or vertical speed. The small knob (inner) has an in and out position.

   Altitude is displayed and selected when the small knob is in the "IN" position. When rotated the small knob selects altitude in 100 foot increments with roll over into the 1000 digits. The larger knob (outer) selects altitude in 1000 foot increments with roll over into the 10,000 digits.

   Vertical speed is displayed and selected when the small knob is in the "out" position. When rotated the small knob selects vertical speed in 100 fpm increments. The larger knob selects vertical speed in 1000 fpm increments up to a maximum of 3000 fpm.

8. MODE (FT or FT/MIN) ANNUNCIATOR - Indicates FT/MIN when in the Vertical Speed Hold mode and FT when in the Altitude Select mode.

9. ALTITUDE CAPTURE (CAPT) ANNUNCIATOR - Indicates the KAS 297B has switched the autopilot from Pitch Attitude Hold or Vertical Speed Hold mode into the pitch roundout mode (CAPT). The point, just prior to transfer into Altitude Hold, at which the CAPT mode becomes active varies with the vertical speed, i.e.

SECTION I - GENERAL, Cont.

9. (Con't)

The higher the rate of climb, the sooner the CAPT mode becomes active; at low rates of climb the activation of the CAPT mode and transfer to altitude hold occur almost simultaneously.

10. ALTITUDE SELECT ARM (ARM) ANNUNCIATOR - Indicates that the Altitude Select mode is armed to capture the selected altitude.

11. ALTITUDE SELECT MODE (ARM) BUTTON - When pressed and the selected altitude is displayed, will arm the Altitude Select mode. The Altitude Select (ARM) mode will cancel altitude hold (ALT) if ALT is already engaged. If Altitude Select (ARM) mode is present when GS couple occurs, the GS mode will cancel Altitude Select (ARM) mode. The engagement of ALT by the pilot's use of tha ALT switch will cancel the Altitude Select (ARM) mode. Reselection of a new altitude will also cycle the Altitude Select (ARM) mode off.

12. CONTROL WHEEL STEERING (CWS) BUTTON (Not Shown)- When pressed, in addition to the normal autopilot functions the CWS also interfaces with the KAS 297B. When operating in the Vertical Speed Hold mode, the CWS will re-sync the Vertical Speed Hold mode to the current vertical speed of the airplane. If altitude is displayed when the CWS is pressed, the display will automatically display vertical speed as long as the CWS is depressed. CWS does not affect the Altitude Select mode.

13. VERTICAL TRIM CONTROL (Not Shown) - When in the Vertical Speed Hold mode this control can be used to slow the vertical speed up or down at 100 fpm for every second the rocker switch is held down. If altitude is being displayed at the time the rocker switch is depressed, vertical speed will be displayed until 1-2 seconds after the rocker switch is released.

The following circuit breakers are used to protect the following elements of the King KAS 297B.

LABEL	FUNCTION
AUTOPILOT	Supplies power to the KC 192 or the KC 191 computer, the autopilot pitch and roll servos, the Elev Trim Switch/ Circuit Breaker, and the KAS 297B.
ENCODING ALT	Supplies power to the King KEA 130A Altimeter.

SECTION II - LIMITATIONS

A. Altitude Select captures below 800 feet AGL are prohibited.

B. The addition of the King KAS 297B vertical speed and altitude selector must be installed with the King KFC 150 Series Flight Control System and imposes no additional limitations to those defined in the supplement for the KFC 150 Series Flight Control System.

SECTION III - EMERGENCY PROCEDURES

No Change.

SECTION IV - NORMAL PROCEDURES

A. PREFLIGHT

1. PREFLIGHT TEST BUTTON (KC 192 or KC 191)- PRESS momentarily and NOTE:

   a. All legends and digits are displayed on the KAS 297B.

B. VERTICAL SPEED AND ALTITUDE SELECTOR OPERATION

1. Vertical Speed Select

   a. VERTICAL SPEED SELECT Knob - PULL small knob to the "OUT" position.

   b. VERTICAL SPEED SELECT Knob - ROTATE until desired vertical speed is displayed.

   c. VERTICAL SPEED MODE (ENG) Button - PUSH to engage the Vertical Speed Hold mode.

2. Changing Vertical Speed

   a. Using CWS

      1) CWS Button - PRESS and HOLD.

      2) Airplane - Establish desired vertical speed.

      3) CWS Button - Release.

   b. Using Vertical Trim Control

      1) VERTICAL TRIM CONTROL - PRESS either up or down to increase or decrease the vertical speed. Displayed vertical speed changes 100 fmp for every second the control is held down.

SECTION IV - NORMAL PROCEDURES, Cont.

CAUTION

WHEN OPERATING AT OR NEAR THE BEST RATE OF CLIMB AIRSPEED AND USING VERTICAL SPEED HOLD, IT IS EASY TO DECELERATE TO AN AIRSPEED ON THE BACK SIDE OF THE POWER CURVE (A DECREASE IN AIRSPEED RESULTS IN A REDUCED RATE OF CLIMB). CONTINUED OPERATION ON THE BACK SIDE OF THE POWER CURVE IN VERTICAL SPEED HOLD MODE WILL RESULT IN A STALL.

CAUTION

WHEN OPERATION AT OR NEAR THE MAXIMUM AUTOPILOT SPEED, IT WILL BE NECESSARY TO REDUCE POWER IN ORDER TO MAINTAIN THE DESIRED RATE OF DESCENT AND NOT EXCEED THE MAXIMUM AUTOPILOT SPEED.

C. ALTITUDE PRESELECT

1. ALTITUDE SELECT Knob - PUSH small knob to the "IN" position.
2. ALTITUDE SELECT Knob - ROTATE until the desired altitude is displayed.
3. ALTITUDE SELECT MODE (ARM) Button - PUSH to arm the Altitude Select Mode.
4. Airplane - ESTABLISH ATTITUDE necessary to intercept the selected altitude.

SECTION V - X

No Change.

MOONEY AIRCRAFT CORPORATION
P.O. Box 72
Kerrville, Texas

FAA APPROVED

AIRPLANE FLIGHT MANUAL SUPPLEMENT

FOR

MOONEY MODELS M20J & M20K

WITH

KING 150 SERIES FLIGHT CONTROL SYSTEM

REG. NO. N252SS
SER. NO. 25-1066

The information contained in this manual is FAA Approved material which, along with the FAA Approved Airplane Flight Manual, placards and instrument markings, is applicable to the operation of the airplane when modified by the installation of the King 150 Series Automatic Flight Control System as per Mooney Drawing 830125.

FAA APPROVED: D. D. Castle
for Don P. Watson, Chief
Engineering and Mfg. Branch
FEDERAL AVIATION ADMINISTRATION
Southwest Region, Forth Worth, TX

DATE: NOV 3 0 1981

Revision B
Date: 8/5/85

MOONEY AIRCRAFT CORPORATION
P. O. Box 72
Kerrville, Texas 78029

LOG OF REVISIONS

Revision Number	Revised Pages	Description of Revision	FAA Approved*	Date
B	(General Pages) ALL	Reformatted entire Supplement per King's Revision #3 and 4. Revised data to agree with new illustration nos.	C L Stoner	8/5/85
	(Specific Pages) 1,3,6,10,19, 20,21,24,26, 27,28,29	Corrected data, Revised data		

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

* Calvin L. Stoner, Mgr., Airplane Certification Division

MOONEY MODELS M20J & M20K

FAA APPROVED

AUTOPILOT FLIGHT MANUAL SUPPLEMENT

006-0396-01

TABLE OF CONTENTS

Date: NOV 3 0 1981

SECTION I GENERAL

This manual is provided to acquaint the pilot with the limitations as well as normal and emergency operating procedures of the King 150 Series Automatic Flight Control Systems. The limitations presented are pertinent to the operation of the 150 System as installed in the Mooney Models M20J & M20K airplanes; the Flight Control Systems must be operated within the limitations herein specified.

The 150 Series AFCS is certified in this airplane with 2 axis control, pitch and roll as described in Figure 1.

The 150 Series AFCS has an electric pitch trim system which provides autotrim during autopilot operation and manual electric trim for the pilot. The trim system is designed to withstand any single inflight malfunction. Trim faults are visually and aurally annunciated.

A lockout device prevents autopilot engagement until the system has been successfully preflight tested.

The following conditions will cause the Autopilot to automatically disengage:

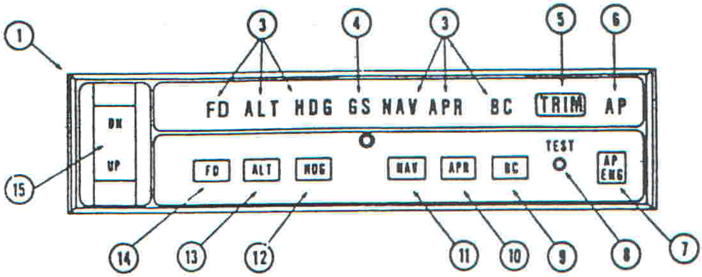
A. Power failure.

B. Internal Flight Control System failure.

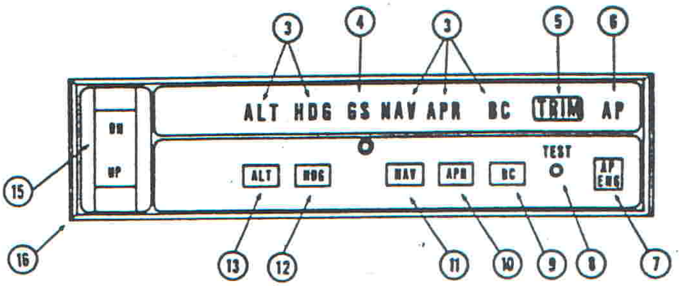
C. With the KCS 55A Compass System, a loss of compass valid (displaying HDG flag) disengages the Autopilot when a mode using heading information is engaged. With the HDG flag present, the Autopilot may be re-engaged in the basic wings level mode along with any vertical mode.

D. Roll rates in excess of 14° per second will cause the autopilot to disengage except when the CWS switch is held depressed.

E. Pitch rates in excess of 8° per second will cause the autopilot to disengage except when the CWS switch is held depressed.

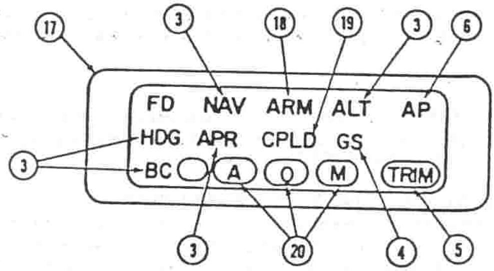


KC 192 AUTOPILOT & FLIGHT DIRECTOR
COMPUTER

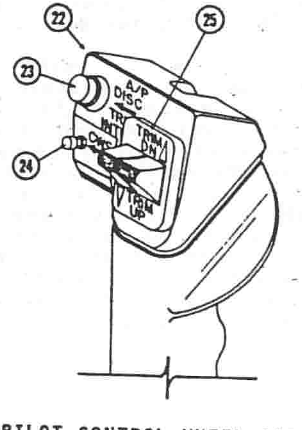


KC 191 AUTOPILOT COMPUTER

FIGURE 1 KING 150 AUTOPILOT SYSTEM
CONTROLS AND INDICATORS



KA 185 REMOTE MODE ANNUNCIATOR
(OPTIONAL)



AUTOPILOT CONTROL WHEEL SWITCH CAP

FIGURE 1 KING 150 AUTOPILOT SYSTEM
CONTROLS AND INDICATORS

SECTION I
GENERAL

1. KFC 150 SYSTEM KC 192 AUTOPILOT COMPUTER - Complete Flight Director and Autopilot computer, including system mode annunciators and system controls.

2. (Not used)

3. MODE ANNUNCIATORS - Illuminate when a mode is selected by the corresponding mode selector button (PUSH ON - PUSH OFF).

4. GLIDESLOPE (GS) ANNUNCIATOR - Illuminates continuously whenever the autopilot is coupled to the glideslope signal. The GS annunciator will flash if the glideslope signal is lost (GS flag in CDI or absence of glideslope pointers in KI 525A). The autopilot reverts to pitch attitude hold operation. If a valid glideslope signal returns within six seconds, the autopilot will automatically recouple in the GS mode. If the valid signal does not return within six seconds, the autopilot will remain in pitch attitude hold mode until such time that a valid glideslope returns and the aircraft passes thru the glideslope. At that point GS couple will re-occur.

5. TRIM WARNING LIGHT (TRIM) - Illuminates continuously whenever trim power is not on or the system has not been preflight tested. THE TRIM warning light illuminates and is accompanied by an audible warning whenever a manual trim fault is detected. The Manual Trim System is monitored for the Trim Servo running without a command. The TRIM warning light will illuminate and be accompanied by an audible warning whenever an autotrim failure occurs. The autotrim system is monitored for the following failures: trim servo running without a command; trim servo not running when commanded to run; trim servo running in the wrong direction.

FIGURE 1 KING 150 AUTOPILOT SYSTEM
CONTROLS AND INDICATORS

6. AUTOPILOT (AP) ANNUNCIATOR - Illuminates continuously whenever the autopilot is engaged. Flashes approximately 12 times whenever the autopilot is disengaged (an aural alert will also sound for 2 seconds).

7. AUTOPILOT ENGAGE (AP ENG) BUTTON - When pushed, engages autopilot if all logic conditions are met. When pushed again, disengages autopilot.

8. PREFLIGHT TEST (TEST) BUTTON - When momentarily pushed, initiates preflight test sequence which automatically turns on all annunciator lights, tests the roll and pitch rate monitors, tests the autotrim fault monitor, checks the manual trim drive voltage and tests all autopilot valid and dump logic. If the preflight is successfully passed, the AP annunciator light will flash for approximately 6 seconds (an aural tone will also sound simultaneously with the annunciator flashes). The autopilot can not be engaged until the autopilot preflight tests are successfully passed.

9. BACK COURSE APPROACH (BC) MODE SELECTOR BUTTON - When pushed will select the Back Course Approach mode. This mode functions identically to the approach mode except that response to LOC signals is reversed. Glideslope coupling is inhibited in the Back Course Approach mode.

10. APPROACH (APR) MODE SELECTOR BUTTON - When pushed, will select the Approach mode. This mode provides all angle intercept (with HSI) or a fixed angle intercept of 45° (with DG), automatic beam capture and tracking of VOR, RNAV or LOC signals plus Glideslope coupling in the case of an ILS. The tracking gain of the APR mode is greater than the gain in the NAV mode. The APR annunciator on the Autopilot Computer will flash until the automatic capture sequence is initiated. On the KA 185 Remote Mode Annunciator, APR ARM will annunciate until the automatic capture sequence is initiated. At beam capture, APR CPLD will annunciate.

FIGURE 1 KING 150 AUTOPILOT SYSTEM
CONTROLS AND INDICATORS

11. NAVIGATION (NAV) MODE SELECTOR BUTTON - When pushed will select the Navigation mode. The mode provides all angle intercept (with HSI) or a fixed angle intercept of 45° (with DG), automatic beam capture and tracking of VOR, RNAV or LOC signals. The NAV annunciator on the Autopilot Computer will flash until the automatic capture sequence is initiated. On the KA 185 Remote Mode Annunciator, NAV ARM will annunciate until the automatic capture sequence is initiated. At beam capture, NAV CPLD will annunciate.

12. HEADING (HDG) MODE SELECTOR BUTTON - When pushed will select the Heading mode, which commands the airplane to turn to and maintain the heading selected by the heading bug on the DG or HSI. A new heading may be selected at any time and will result in the airplane turning to the new heading with a maximum bank angle of about 22°. Selecting HDG mode will cancel NAV, APR or BC track modes.

13. ALTITUDE HOLD (ALT) MODE SELECTOR BUTTON - When pushed will select the Altitude Hold mode, which commands the airplane to maintain the pressure altitude existing at the moment of selection. Engagement may be accomplished in climb, descent, or level flight. In the APR mode, altitude hold will automatically disengage when the glideslope is captured.

14. FLIGHT DIRECTOR (FD) MODE SELECTOR BUTTON - When Pushed will select the Flight Director mode (with KC 192 Autopilot Computer only), bringing the Command Bar in view on the KI 256 and will command wings level and pitch attitude hold. The FD mode must be selected prior to Autopilot engagement.

15. VERTICAL TRIM CONTROL - A spring loaded to center rocker switch which will provide up or down pitch command changes: while in ALT will adjust altitude at rate of about 500 fpm; when not in ALT will adjust pitch attitude at a rate of .7 deg/sec.

FIGURE 1 KING 150 AUTOPILOT SYSTEM
CONTROLS AND INDICATORS

will cancel GS couple. The aircraft must pass through the glideslope again to allow GS recouple.

16. KAP 150 SYSTEM KC 191 AUTOPILOT COMPUTER - Complete Autopilot computer, including system mode annunciators and system controls.

17. KA 185 REMOTE MODE ANNUNCIATOR (OPTIONAL) - Provides mode annunciation in the pilots' primary scan area as well as three Marker Beacon lights.

18. ARMED (ARM) ANNUNCIATOR - Illuminates continuously along with NAV or APR when either the NAV or APR mode selector button is depressed. The ARM annunciator will continue to illuminate until the automatic capture sequence is initiated at which time ARM will extinguish and CPLD will annunciate.

19. COUPLED (CPLD) ANNUNCIATOR - Illuminates continuously along with NAV or APR at the initiation of automatic beam capture sequence in either the NAV or APR modes. Normally the CPLD condition follows an ARM condition but may be entered into directly if the beam capture criteria is met when NAV or APR is selected.

20. REMOTE MARKER BEACON LIGHTS - Remote Airway, Outer and Middle Marker Beacon lights driven by the Marker Beacon receiver.

21. (Not used)

22. AUTOPILOT CONTROL WHEEL SWITCH CAP - Switch assembly mounted on the pilot's control wheel associated with the autopilot and manual electric trim systems.

23. AUTOPILOT DISCONNECT/TRIM INTERRUPT (A/P DISC/TRIM INTER) Switch - When depressed will disengage the autopilot and cancel all operating Flight Director modes. When depressed and held will interrupt all

FIGURE 1 KING 150 AUTOPILOT SYSTEM
CONTROLS AND INDICATORS

electric trim power (stop trim motion), disengage the autopilot and cancel all operating Flight Director modes.

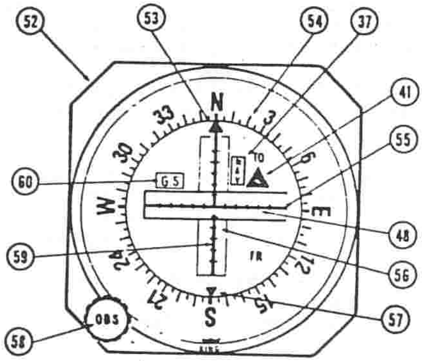
24. CONTROL WHEEL STEERING (CWS) BUTTON - When depressed, allows pilot to manually control the aircraft (disengages the pitch and roll servos) without cancellation of any of the selected modes. Will engage the Flight Director mode if not previously engaged. Automatically synchronizes the Flight Director/Autopilot to the pitch attitude present when the CWS switch is released, or to the present pressure altitude when operating in the ALT hold mode. Will cancel GS couple. The aircraft must pass through the glideslope again to allow GS recouple.

25. MANUAL ELECTRIC TRIM CONTROL SWITCHES - A split switch unit in which the left half provides power to engage the trim servo clutch and the right half to control the direction of motion of the trim servo motor. Both halves of the split trim switch must be actuated in order for the manual trim to coperate in the desired direction. When the autopilot is engaged, operation of the manual electric trim will automatically disconnect the autopilot.

26. KI 256 FLIGHT COMMAND INDICATOR (FCI) - Displays airplane attitude as a conventional attitude gyro and displays commands for flight director operation. The gyro is air driven.

27. DECISION HEIGHT (DH) ANNUNCIATOR LIGHT - Optional light for use with the aircraft's optional radar altimeter.

FIGURE 1 KING 150 AUTOPILOT SYSTEM
CONTROLS AND INDICATORS



KI 204/206 VOR/LOC/GS INDICATOR

28. ROLL ATTITUDE INDEX - Displays airplane roll attitude with respect to the roll attitude scale.

29. ROLL ATTITUDE SCALE - Scale marked at 0, ±10,20,30,60 and 90 degrees.

30. PITCH ATTITUDE SCALE - Moves with respect to the symbolic airplane to present pitch attitude. Scale graduated at 0, ±5,10,15,20 and 25 degrees.

31. COMMAND BAR - Displays computed steering commands referenced to the symbolic airplane. The command bar is visible only when FD mode is selected. The command bar will be biased out of view whenever the system is invalid or a Flight Director mode is not engaged.

FIGURE 1 KING 150 AUTOPILOT SYSTEM
CONTROLS AND INDICATORS

32. FCI SYMBOLIC AIRPLANE - Airplane pitch and roll attitude is displayed by the relationship between the fixed symbolic airplane and the movable background.

    During flight director operation, the symbolic airplane is flown to align it with the command bar to satisfy the flight director commands.

33. KG 258 VERTICAL GYRO - Displays airplane attitude as a conventional attitude gyro. The gyro is air driven.

34. SYMBOLIC AIRPLANE - Serves as a stationary symbol of the aircraft. Aircraft pitch and roll attitudes are displayed by the relationship between the fixed symbolic aircraft and the movable background.

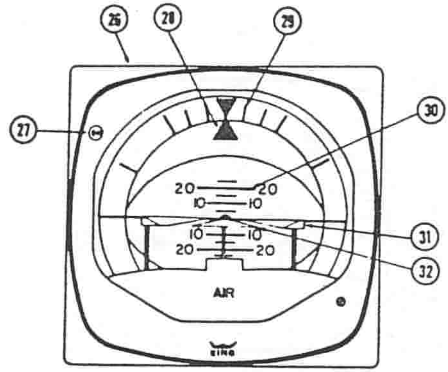
35. SYMBOLIC AIRCRAFT ALIGNMENT KNOB - Provides manual positioning of the symbolic aircraft for level flight under various load conditions.

36. KI 525A HORIZONTAL SITUATION INDICATOR (HSI) - Provides a pictorial presentation of aircraft deviation relative to VOR radials or localizer beams. It also displays glideslope deviations and gives heading reference with respect to magnetic north.

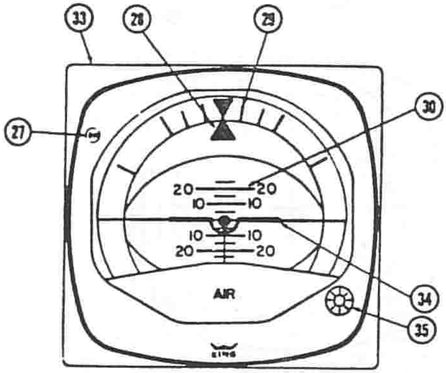
37. NAV FLAG - Flag is in view when the NAV receiver signal is inadequate. When a NAV flag is present in the navigation indicator (CDI or KI 525A) the autopilot operation is not affected. The pilot must monitor the navigation indicators for NAV flags to insure that the Autopilot and/or Flight Director are tracking valid navigation information.

38. LUBBER LINE - Indicates aircraft magnetic heading on compass card (45).

FIGURE 1 KING 150 AUTOPILOT SYSTEM
CONTROLS AND INDICATORS

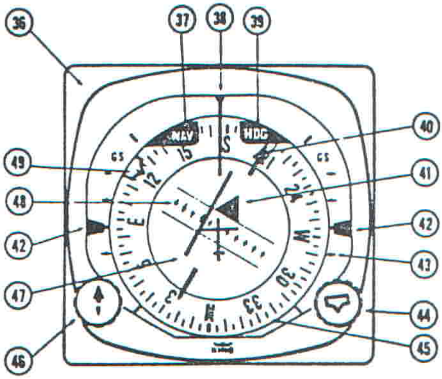


KI 256 FLIGHT COMMAND INDICATOR

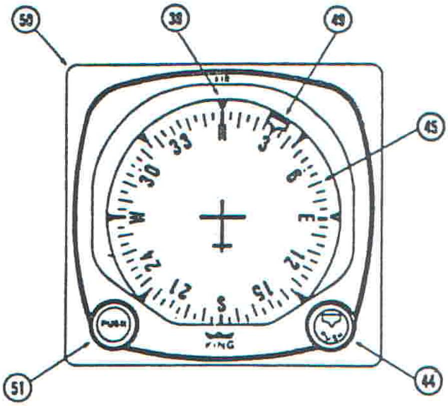


KG 258 VERTICAL GYRO

FIGURE 1 KING 150 AUTOPILOT SYSTEM
CONTROLS AND INDICATORS



KI 525A HSI



KG 107 DG

FIGURE 1 KING 150 AUTOPILOT SYSTEM
CONTROLS AND INDICATORS

39. HEADING WARNING FLAG (HDG) - When flag is in view the heading display is invalid. If a HDG flag appears and a lateral mode (HDG, NAV, APR or APR BC) is selected, the Autopilot will be disengaged. The Autpoilot may be re-engaged in the basic wings level mode along with any vertical mode. The CWS switch would be used to manually maneuver the aircraft laterally.

40. COURSE BEARING POINTER - Indicates selected VOR course or localizer course on compass card (45). The selected VOR radial or localizer heading remains set on the compass card when the compass card (45) rotates.

41. TO/FROM INDICATOR FLAG - Indicates direction of VOR station relative to selected course.

42. DUAL GLIDESLOPE POINTERS - Indicate on glideslope scale (43) aircraft displacement from glideslope beam center. Glideslope pointers in view indicate a usable glideslope signal is being received.

43. GLIDESLOPE SCALES - Indicate displacement from glideslope beam center. A glideslope deviation bar displacement of 2 dots, represents full scale (0.7°) deviation above or below glideslope beam centerline.

44. HEADING SELECTOR KNOB () - Positions heading bug (49) on compass card (45) by rotating the heading selector knob. The Bug rotates with the compass card.

45. COMPASS CARD - Rotates to display heading of airplane with reference to lubber line (38) on HSI or DG.

46. COURSE SELECTOR KNOB - Positions course bearing pointer (40) on the compass card (45) by rotating the course selector knob.

FIGURE 1 KING 150 AUTOPILOT SYSTEM
CONTROLS AND INDICATORS

47. COURSE DEVIATION BAR (D-BAR) - The center portion of omni bearing pointer moves laterally to pictorially indicate the relationship of aircraft to the selected course. It indicates degrees of angular displacement from VOR radials and localizer beams, or displacement in nautical miles from RNAV courses.

48. COURSE DEVIATION SCALE - A course deviation bar displacement of 5 dots represents full scale (VOR = $\pm 10^{\circ}$, LOC = $\pm 2\ 1/2^{\circ}$, RNAV = 5NM, RNAV APR = 1 1/4NM) deviation from beam centerline.

49. HEADING BUG - Moved by knob (44) to select desired heading.

50. KG 107 NON-SLAVED DIRECTIONAL GYRO (DG) - Provides a stable visual indication of aircraft heading to the pilot. The gyro is air driven.

51. GYRO ADJUSTMENT KNOB (PUSH) - When pushed in, allows the pilot to manually rotate the gyro compass card (45) to correspond with the magnetic heading indicated by the magnetic compass. The unslaved compass card must be manually reset periodically to compensate for precessional errors in the gyro.

52. KI 204/206 VOR/LOC/GLIDESLOPE INDICATOR - Provides rectilinear display of VOR/LOC and Glidelope deviation.

53. COURSE INDEX - Indicates selected VOR course.

54. COURSE CARD - Indicates selected VOR course under course index.

55. GLIDESLOPE DEVIATION NEEDLE - Indicates deviation from ILS glideslope.

56. GLIDESLOPE SCALE - Indicates displacement from glideslope beam center. A glideslope deviation needle displacement of 5 dots, represents full

FIGURE 1 KING 150 AUTOPILOT SYSTEM CONTROLS AND INDICATORS scale (0.7°) deviation above or below glideslope beam centerline.

57. RECIPROCAL COURSE INDEX - Indicates reciprocal of selected VOR course.

58. OMNI BEARING SELECTOR (OBS) KNOB - Rotates course card to selected course.

59. COURSE DEVIATION NEEDLE - Indicates course deviation from selected omni course or localizer centerline.

60. GLIDESLOPE (GS) FLAG - Flag is in view when the GS receiver signal is inadequate.

FIGURE 1 KING 150 AUTOPILOT SYSTEM
CONTROLS AND INDICATORS

The airplane MASTER SWITCH function is unchanged and can be used in an emergency to shut off electrical power to all flight control systems while the problem is isolated.

The RADIO MASTER switch supplies power to the avionics bus bar of the radio circuit breakers and the autopilot circuit breaker.

The following circuit breakers are used to protect the following elements of the King 150 Series Autopilot:

LABEL	FUNCTION
AUTOPILOT	Supplies power to the KC 192 or the KC 191 Computer, the autopilot pitch and roll servos, and the Elev Trim Switch/Circuit Breaker.
RADIO MASTER	Switch/circuit breaker supplies power to the avionics bus.
ELEV TRIM	Switch/circuit breaker supplies power to the autotrim and manual electric pitch trim systems.
HSI	Supplies power to the optional KCS 55A Compass System.

SECTION II LIMITATIONS

A. During autopilot operation, a pilot with seat belt fastened must be seated at the left pilot position.

B. The autopilot must be OFF during takeoff and landing.

C. The system is approved for Category I operation only (Approach mode selected).

D. Do not operate autopilot with flaps extended beyond the take-off position.

E. Autopilot airspeed limitations: Maximum 180 KIAS; minimum 80 KIAS.

NOTE

IN ACCORDANCE WITH FAA RECOMMENDATION, USE OF "ALTITUDE HOLD" MODE IS NOT RECOMMENDED DURING OPERATION IN SEVERE TURBULENCE.

Placards:

NONE

SECTION III EMERGENCY PROCEDURES

A. In case of Autopilot malfunction: (Accomplish Items 1 and 2 simultaneously.)

1. Airplane Control Wheel - GRASP FIRMLY and regain aircraft control.

2. A/P DISC/TRIM INTER switch - PRESS and HOLD.

B. In case of Electric Trim Malfunction (either manual electric or autotrim):

1. A/P DISC/TRIM INTER switch - PRESS and HOLD throughout recovery.

2. ELEV TRIM switch - OFF.

3. Aircraft - RETRIM manually.

CAUTION

WHEN DISCONNECTING THE AUTOPILOT AFTER A TRIM MALFUNCTION, HOLD THE CONTROL WHEEL FIRMLY; UP TO 45 POUNDS OF FORCE ON THE CONTROL WHEEL MAY BE NECESSARY TO HOLD THE AIRCRAFT LEVEL.

Maximum Altitude losses due to autopilot malfunction:

Configuration	Alt Loss
Cruise, Climb, Descent	400'
Maneuvering	90'
APPR	90'

SECTION IV - NORMAL PROCEDURES

A. PREFLIGHT (Perform prior to each flight)

1. GYROS - Allow 3-4 minutes for gyros to come up to speed.

2. RADIO MASTER - ON

3. ELEV TRIM - ON

4. PREFLIGHT TEST Button - PRESS momentarily and NOTE:

   a. All annunciator lights on (TRIM annunciator flashing).

   b. After approximately 5 seconds, all annunciator lights off except AP which will flash approximately 12 times and then remain off.

NOTE

IF TRIM WARNING LIGHT STAYS ON THEN THE AUTOTRIM DID NOT PASS PREFLIGHT TEST. THE AUTOPILOT CIRCUIT BREAKER SHOULD BE PULLED. (THE AUTOPILOT AND MANUAL ELECTRIC TRIM WILL BE INOPERATIVE).

5. MANUAL ELECTRIC TRIM - TEST as follows:

   a. Actuate left side of split switch unit to the fore and aft positions. The trim wheel should not move on its own. Rotate the trim wheel manually against the engaged clutch to check the pilot's trim overpower capability.

   b. Actuate right side of split switch unit to the fore and aft positions. Trim wheel should not move on its own and normal trim wheel force is required to move it manually.

   c. Press the A/P DISC/TRIM INTER switch down and hold. Manual Electric Trim should not operate either nose up or nose down.

6. FLIGHT DIRECTOR (KFC 150 Only) - ENGAGE by pressing FD or CWS button.

7. AP ENG Button - PRESS to engage autopilot.

8. Flight Controls - MOVE fore, aft, left & right to verify that the autopilot can be overpowered.

9. A/P DISC/TRIM INTER switch - PRESS. Verify that the autopilot disconnects and all flight director modes are canceled.

10. TRIM - SET to take off position.

B. AUTOPILOT OPERATION

1. Before takeoff

A/P DISC/TRIM INTER switch - PRESS.

2. Inflight Autopilot Engagement

a. FD Mode Selector Button (KFC 150 Only) - PRESS.

b. AP ENG Button - PRESS. Note AP annunciator on. If no other modes are selected the autopilot will operate in wings level and pitch attitude hold.

CAUTION

DO NOT HELP THE AUTOPILOT AS THE AUTOPILOT WILL RUN THE PITCH TRIM TO OPPOSE YOUR HELP.

3. Climb or Descent

a. Using CWS

1) CWS Button - PRESS and MOVE aircraft nose to the desired attitude.

2) CWS Button - RELEASE. Autopilot will maintain aircraft pitch attitude up to the pitch limits of +15° or -10°.

b. Using Vertical Trim

1) VERTICAL TRIM Control - PRESS either up or down to modify aircraft attitude at a rate of .7 deg/sec, up to the pitch limits of +15° or -10°.

2) VERTICAL TRIM Control - RELEASE when desired aircraft attitude is reached. The autopilot will maintain the desired pitch attitude.

4. Altitude Hold

a. ALT Mode Selector Button - PRESS. Note ALT mode annunciator ON. Autopilot will maintain the selected pressure altitude.

b. Change selected altitudes

1) Using CWS (recommended for altitude changes greater than 100 ft.)

a) CWS Button - PRESS and fly aircraft to desired pressure altitude.

b) CWS Button - RELEASE when desired pressure altitude is reached. The autopilot will maintain the desired pressure altitude.

2) Using Vertical Trim (Recommended for altitude changes less than 100 ft.)

a) VERTICAL TRIM Control - PRESS either up or down. Vertical Trim will seek an altitude rate of change of about 500 fpm.

b) VERTICAL TRIM Control - RELEASE when desired pressure altitude is reached. The autopilot will maintain the desired pressure altitude.

5. Heading Changes

a. Manual Heading Changes

1) CWS Button - PRESS and MANEUVER aircraft to the desired heading.

2) CWS Button - RELEASE. Autopilot will maintain aircraft in wings level attitude.

NOTE

AIRCRAFT HEADING MAY CHANGE IN THE WINGS LEVEL MODE DUE TO AN AIRCRAFT OUT OF TRIM CONDITION.

b. Heading Hold

1) HEADING Selector Knob - SET BUG to desired heading.

2) HDG Mode Selector Button - PRESS. Note HDG mode annunciator ON. Autopilot will automatically turn the aircraft to the selected heading.

c. Command Turns (Heading Hold mode ON)

1) HEADING Selector Knob - MOVE BUG to the desired heading. Autopilot will automatically turn the aircraft to the new selected heading.

6. NAV Coupling

a. When equipped with HSI.

1) Course Bearing Pointer - SET to desired course.

NOTE

WHEN EQUIPPED WITH NAV 1/NAV 2 SWITCHING AND NAV 2 IS SELECTED, SET OBS TO THE DESIRED COURSE.

2) HEADING Selector Knob - SET BUG to provide desired intercept angle.

3) NAV Mode Selector Button - PRESS.

a) If the Course Deviation Bar is greater than 2 to 3 dots: the aircraft will continue in HDG mode (or wings level if HDG not selected) with the NAV annunciator flashing; when the computed capture point is reached the HDG will disengage, the NAV annunciator will illuminate steady and the selected course will be automatically captured and tracked.

b) If the D-Bar is less than 2 to 3 dots: the HDG mode will disengage upon selecting NAV mode; the NAV annunciator will illuminate steady and the capture/track sequence will automatically begin.

b. When equipped with DG

1) OBS Knob - SELECT desired course.

2) NAV Mode Selector Button - PRESS.

3) HEADING Selector Knob - ROTATE BUG to agree with OBS course.

NOTE

WHEN NAV IS SELECTED, THE LATERAL OPERATING MODE WILL CHANGE FROM HDG (IF SELECTED) TO WINGS LEVEL FOR 5 SECONDS. A 45° INTERCEPT ANGLE WILL THEN BE AUTOMATICALLY ESTABLISHED BASED ON THE POSITION OF THE BUG.

a) If the D-Bar is greater than 2 to 3 dots: the autopilot will annunciate HDG mode (unless HDG not selected) and NAV flashing; when the computed capture point is reached the HDG annunciator will go out, the NAV annunciator will illuminate steady and the selected course will be automatically captured and tracked.

b) If the D-Bar is less than 2 to 3 dots: the HDG mode will disengage upon selecting NAV mode; the NAV annunciator will illuminate steady and the capture/track sequence will automatically begin.

7. Approach (APR) Coupling

a. When equipped with HSI

1) COURSE Bearing Pointer - SET to desired course.

NOTE

WHEN EQUIPPED WITH NAV 1/NAV 2 SWITCHING AND NAV 2 IS SELECTED, SET OBS TO THE DESIRED COURSE.

2) HEADING Selector Knob - SET BUG to provide desired intercept angle.

3) APR Mode Selector Button - PRESS.

a) If the Course Deviation Bar is greater than 2 to 3 dots: the aircraft will continue in HDG mode (or wings level if HDG not selected) with the APR annunciator flashing; when the computed capture point is reached the HDG will disengage, the APR annunciator will illuminate steady and the selected course will be automatically captured and tracked.

b) If the D-Bar is less than 2 to 3 dots: the HDG mode will disengage upon selecting APR mode; the APR annunciator will illuminate steady and the capture/track sequence will automatically begin.

b. When equipped with DG

1) OBS Knob - SELECT desired approach course.

2) APR Mode Selector Button - PRESS.

3) HEADING Selector Knob - ROTATE Bug to agree with OBS course.

NOTE

WHEN APR IS SELECTED, THE LATERAL OPERATING MODE WILL CHANGE FROM HDG (IF SELECTED) TO WINGS LEVEL FOR 5 SECONDS. A 45° INTERCEPT ANGLE WILL THEN BE AUTOMATICALLY ESTABLISHED BASED ON THE POSITION OF THE BUG.

a) If the D-Bar is greater than 2 to 3 dots: the autopilot will annunciate HDG mode (unless HDG not selected) and APR flashing; when the computed capture point is reached the HDG annunciator will go out, the APR annunciator will illuminate steady and the selected course will be automatically captured and tracked.

b) If the D-Bar is less than 2 to 3 dots: the HDG mode will disengage upon selecting APR mode; the APR annunciator will illuminate steady and the capture/track sequence will automatically begin.

8. BC Approach Coupling

a. When equipped with HSI

1) COURSE Bearing Pointer - SET to the ILS front course inbound heading.

NOTE

WHEN EQUIPPED WITH NAV 1/NAV 2 SWITCHING AND NAV 2 IS SELECTED, SET OBS TO THE ILS FRONT COURSE INBOUND HEADING.

2) HEADING Selector Knob - SET BUG to provide desired intercept angle.

3) BC Mode Selector Button - PRESS.

a) If the Course Deviation Bar is greater than 2 to 3 dots: the aircraft will continue in HDG mode (or wings level if HDG not selected) with BC annunciated steady and APR annunciator flashing; when the computed capture point is reached the HDG will disengage, and the BC and APR annunciators will illuminate steady and the selected course will be automatically captured and tracked.

b) If the D-Bar is less than 2 to 3 dots: the HDG mode will disengage upon selecting BC mode; the APR BC annunciator will illuminate steady and the capture/track sequence will automatically begin.

b. When equipped with DG

1) OBS Knob - SELECT the ILS front course inbound heading.

2) BC Mode Selector Button - PRESS.

3) HEADING Selector Knob - ROTATE Bug to the ILS front course inbound heading.

NOTE

WHEN BC IS SELECTED, THE LATERAL OPERATING MODE WILL CHANGE FROM HDG (IF SELECTED) TO WINGS LEVEL FOR 5 SECONDS. A 45° INTERCEPT ANGLE WILL THEN BE ESTABLISHED BASED ON THE POSITION OF THE BUG.

a) If the D-Bar is greater than 2 to 3 dots: the autopilot will annunciate HDG (unless HDG not selected) and BC modes with APR flashing; when the computed capture point is reached the HDG annunciator will go out, the BC and APR annunciators will illuminate steady and the selected course will be automatically captured and tracked.

b) If the D-Bar is less than 2 to 3 dots: the HDG mode will disengage upon selecting BC mode; the BC and APR annunciators will illuminate steady and the capture/track sequence will automatically begin.

9. Glideslope Coupling

NOTE

GLIDESLOPE COUPLING IS INHIBITED WHEN OPERATING IN NAV OR APR BC MODES. GLIDESLOPE COUPLING OCCURS AUTOMATICALLY IN THE APR MODE.

a. APR Mode - ENGAGED.

b. At glideslope centering - NOTE GS annunciator ON.

NOTE

AUTOPILOT CAN CAPTURE GLIDESLOPE FROM ABOVE OR BELOW THE BEAM WHILE OPERATING IN EITHER PITCH ATTITUDE HOLD OR ALT HOLD MODES.

10. Missed Approach

a. A/P DISC/TRIM INTER switch - PRESS to disengage AP.

b. MISSED APPROACH - EXECUTE.

c. CWS Button - PRESS (KFC 150 ONLY) as desired to activate FD mode during Go-Around maneuver.

d. AP ENG Button - PRESS (if AP operation is desired). Note AP annunciator ON.

NOTE

IF IT IS DESIRED TO TRACK THE ILS COURSE OUTBOUND AS PART OF THE MISSED APPROACH PROCEDURE, USE THE NAV MODE TO PREVENT INADVERTANT GS COUPLING.

11. Before Landing

A/P DISC/TRIM INTER switch - PRESS to disengage AP.

C. FLIGHT DIRECTOR OPERATION (KFC 150 Systems Only)

NOTE

THE FLIGHT DIRECTOR MODES OF OPERATION ARE THE SAME AS THOSE USED FOR AUTOPILOT OPERATIONS EXCEPT THE AUTOPILOT IS NOT ENGAGED AND THE PILOT MUST MANEUVER THE AIRCRAFT TO SATISFY THE FLIGHT DIRECTOR COMMANDS.

SECTION V PERFORMANCE

No change.

SECTION VI THRU X

No change.

SECTION X
SAFETY INFORMATION

MOONEY M20K

TABLE OF CONTENTS

MOONEY M20K

INTRODUCTION

The best of engineering know-how and manufacturing craftsmanship have gone into the design and building of your Mooney Aircraft. Like any high performance airplane, it operates most efficiently and safely in the hands of a skilled pilot.

We urge you to be thoroughly familiar with the contents of your operating manuals, placards, and check list to insure maximum utilization of your airplane. When the airplane has changed ownership, some of these may have been misplaced. If any are missing, replacements should be obtained from any Mooney Marketing or Service Center as soon as possible.

For your added protection and safety, we have added this special section to the Pilot's Operating Handbook to refresh your knowledge of a number of safety subjects. You should review these subjects periodically.

Topics in this section are mostly excerpts from FAA Documents and other articles pertaining to the subject of safe flying. They are not limited to any particular make or model airplane and do not replace instructions for particular types of airplanes.

Your Mooney Aircraft was designed and built to provide you with many years of safe and efficient transportation. By maintaining it properly and flying it prudently, you should realize its full potential.

MOONEY AIRCRAFT CORPORATION

SECTION X
SAFETY INFORMATION

MOONEY M20K

GENERAL

Flying is one of the safest modes of travel. Remarkable safety records are being established each year. As a pilot you are responsible to yourself, your relatives, to those who travel with you, to other pilots and to ground personnel to fly wisely and safely.

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

---------------------DO'S---------------------

1. Be thoroughly familiar with your airplane and be current in it, or get a check ride.
2. Pre-plan all aspects of your flight-including weather. FLY YOUR PLAN.
3. Use services available-FSS, Weather Bureau, etc.
4. Pre-flight you airplane thoroughly.
5. Use your check lists.
6. Have more than enough fuel for takeoff, the planned trip, and adequate reserve.
7. Be sure your weight loading and C.G. are within limits.
8. Be sure articles and baggage are secured.
9. Check freedom of all controls.
10. Maintain appropriate airspeed in takeoff, climb, descent and landing.
11. Avoid other aircraft wake turbulence.
12. Switch fuel tanks before engine starvation occurs.
13. Practice engine out, emergency landing gear extension and other emergency procedures at safe altitude; preferably with a check pilot.
14. Use caution in mountainous terrain.
15. Keep your airplane in good mechanical condition.
16. Stay informed and alert, fly in a sensible manner.

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DON'TS

1. Don't take off with frost, ice or snow on the aircraft surfaces.
2. Don't take off with less than minimum recommended fuel, plus reserves.
3. Don't fly in a reckless, show off, careless manner.
4. Don't fly in thunderstorms or severe weather.
5. Don't fly in possible icing conditions. If you encounter icing conditions, alter altitude or course to minimize exposure.
6. Don't apply controls abruptly or with high forces that could exceed design loads of the airplane.
7. Don't fly when physically or mentally exhausted.
8. DON'T TRUST TO LUCK.

GENERAL SOURCES OF INFORMATION

There is a wealth of information available to the pilot created for the sole purpose of making your flying easier, faster, and safer. Take advantage of this knowledge and be prepared for an emergency in the remote event that one should occur. You as a pilot also have certain responsibilities under government regulations. These are designed for your own protection. Compliance is not only beneficial but mandatory.

RULES AND REGULATIONS

Federal Aviation regulations, Part 91, General Operating and Flight Rules, is a document of law governing operation of aircraft and the owner's and pilot's responsibilities.

This document covers such subjects as:

- Responsibilities and authority of the pilot in command
- Certificates required
- Liqour and drugs
- Flight plans
- Pre-flight action
- Fuel requirements

Flight rules
Maintenance, preventative maintenance, alterations, inspections and maintenance records

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

FEDERAL AVIATION REGULATIONS, PART 39
AIRWORTHINESS DIRECTIVES

This document specifies that no person may operate a product to which an airworthiness directive issued by the FAA applies, except in accordance with the requirements of that airworthiness directive.

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

This document contains a wealth of pilot information for nearly all realms of flight, navigation, ground procedures and medical information. Among the subjects are:

Controlled Air Space
Services Available to Pilots
Radio Phraseology and Technique
Airport Operations
Clearances and Separations
Pre-flight
Departures - IFR
Enroute - IFR
Arrival - IFR
Emergency Procedures
Weather
Wake Turbulence
Medical Facts for Pilots
Bird Hazards
Good Operating Practices
Airport Location Directory

We urge all pilots to be thoroughly familiar with and use the information in this manual.

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ADVISORY INFORMATION

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

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

GENERAL INFORMATION ON SPECIFIC TOPICS

FLIGHT PLANNING

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

All pilots are urged to obtain a complete preflight briefing. This would consist of weather; local, enroute and destination, plus alternates, enroute navaid information. Also airport runways active, length of runways, take off and landing distances for the airplane for conditions expected should be known.

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

The pilot must be completely familiar with the performance of the airplane and performance data in the airplane manuals and placards. The resultant effect of temperature and density altitude must be taken into account in determining performance if not accounted for on the charts. Applicable FAA manuals must be aboard the airplane at all times including the weight and balance forms and equipment lists.

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The airplane must be loaded so as not to exceed the weight and the weight and balance loading center of gravity (c.g.) limitations. Also, that at least minimum fuel for takeoff is aboard and sufficient for the trip, plus reserves. Oil in the engines should be checked and filled as required.

INSPECTIONS - MAINTENANCE

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

While the following items cannot substitute for the pre-flight specified for each type of airplane, they will serve as reminders of general items that should be checked.

SPECIAL CONDITIONS CAUTIONARY NOTICE

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

NOTE

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

Corrosion, and its effects, must be treated at the earliest possible opportunity. A clean dry surface is virtually immune to corrosion. Make sure that all drain holes remain unobstructed. Protective films and sealants help to keep corrosive agents from contacting metallic surfaces. Corrosion inspections should be made most frequently under high-corrosion-risk operating conditions, such as in regions of heavy airborne salt concentrations (e.g., near the sea) and high-humidity areas (e.g., tropical regions).

WALK AROUND INSPECTIONS

All airplane surfaces free of ice, frost or snow.
Tires properly inflated.
All external locks, covers and tie downs removed.
Fuel sumps drained.
Fuel quantity, adequate for trip, plus reserve, (visually checked) and access doors secured.
Oil quantity checked and access doors secured.
Check general condition of airplane, engine, propeller, exhaust stacks, etc.
All external doors secured.

COCKPIT CHECKS

Flashlight available.
Required documents on board.
Use the check list.
All internal control locks removed (If installed).
Check freedom of controls.
Cabin and baggage door properly closed.
Seat belts and shoulder harnesses fastened.
Passengers briefed.
Engine and propeller operating satisfactorily.
All engine gauges checked for proper readings.
Cowl flaps in proper position.
Fuel selector in proper position.
Fuel quantity checked by gauges.
Altimeter setting checked.

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FLIGHT OPERATIONS

GENERAL

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

TURBULENT WEATHER

A complete weather briefing prior to beginning a flight is the start of assurance of a safe trip. Updating of weather information enroute is another assurance. However, the wise pilot also knows weather conditions change quickly at times and treats weather forcasting as professional advice rather than as absolute fact. He obtains all the advice he can, but still stays alert through knowledge of weather changes, observations, and conditions.

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

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

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

FLIGHT IN TURBULENT AIR

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

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Flying through turbulent air presents two basic problems, to both of which the answer is PROPER AIRSPEED. On the one hand, if you maintain an excessive airspeed, you run the risk of structural damage or failure; on the other hand, if your airspeed is too low, you may stall. If turbulence encountered in cruise or descent becomes uncomfortable to the pilot or passengers, the best procedure is to reduce speed to the maneuvering speed, which is listed in the Limitations Section of the FAA Approved Airplane Flight Manual and Pilots Operating Handbook. This speed gives the best assurance of avoiding excessive stress loads, and at the same time providing margin against inadvertent stalls due to gusts.

Beware of overcontrolling in attempting to correct for changes in altitude; applying control pressure abruptly will build up G-forces rapidly and could cause damaging structural stress loads. You should watch particularly your angle of bank, making turns as wide and shallow as possible, and be equally cautious in applying forward or back pressure to keep the nose level. Maintain straight and level attitude in either up or down drafts. Use trim sparingly to avoid being grossly mistrimmed as the vertical air columns change velocity and direction.

MOUNTAIN FLYING

Avoid flight at low altitudes over mountainous terrain, particularly near the lee slopes. OBSERVE PUBLISHED MINIMUM ENROUTE ALTITUDES (MEA). If the wind velocity near the level of the ridge is in excess of 25 knots and approximately perpendicular to the ridge, mountain wave conditions are likely over and near the lee slopes. If the wind velocity at the level of the ridge exceeds 50 knots, a strong mountain wave is probable with strong up and down drafts and severe or extreme turbulence. The worst turbulence will be encountered in and below the rotor zone which is usually 8 to 10 miles downwind from the ridge. This zone is characterized by the presence of "roll clouds" if sufficient moisture is present; alto cumulus standing lenticular clouds are also visible signs that a mountain wave exists, but their presence is likewise dependent on moisture. Mountain wave turbulence can, of course, occur in dry air and the absence of such clouds should not be taken as any assurance that mountain wave turbulence will not be encountered. A mountain wave downdraft may exceed the climb capability of your airplane. AVOID MOUNTAIN WAVE DOWNDRAFTS.

VFR - LOW CEILINGS

If you are not instrument rated, avoid "VFR On Top" and "Special VFR". Being caught above an undercast when an emergency descent is required (or at destination) is an extremely hazardous position for the VFR pilot. Accepting a clearance out of certain airport control zones with no minimum ceiling and one-mile visibility as permitted with "Special VFR" is not a recommended practice for VFR pilots.

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

VFR AT NIGHT

When flying VFR at night, in addition to the altitude appropriate for the direction of flight, pilots should maintain a safe minimum altitude as distated by terrain, obstacles such as TV towers, or communities in the area flown. This is especially true in mountainous terrain, where there is usually very little ground reference and absolute minimum clearance is 2,000 feet. Don't depend on your being able to see obstacles in time to miss them. Flight on dark nights over sparcely populated country can be almost the same as IFR and should be avoided by untrained pilots.

VERTIGO - DISORIENTATION

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

Under VFR conditions the visual sense, using the horizon as a reference, can override the illusions. Under low visibility conditions (night, fog, clouds, haze, etc.) the illusions predominate. Only through awareness of these illusions, and proficiency in instrument flight procedures, can an airplane be operated safely in a low visibility environment.

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

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

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

STALLS, SPINS AND SLOW FLIGHT

Stalls, and slow flight should be practiced at safe altitudes to allow for recovery. Any of these maneuvers should be performed at an altitude in excess of 6,000 feet above ground level.

Spins may be dangerous and should be avoided. In fact, most airplanes are placarded against intentional spins. Spins are preceded by stalls. A prompt and decisive stall recovery protects against inadvertent spins.

All airplanes are required to have flight characteristics that give adequate advance warning of an impending stall or they must be equipped with an artificial stall warning device. Keep the artificial system in good working order. Do not operate the airplane with the device made inoperative by the use of circuit breakers or other means.

Stalls should be practiced at safe altitudes for ample recovery. Should a spin be encountered inadvertently, spin recovery should be initiated immediately.

As stall attitude is approached, be alert. Take prompt corrective action to avoid the stall or if you are practicing stalls, react the moment the stall occurs. The following is suggested:

1. Do not carry passengers. Be certain that the airplane's center of gravity is as far forward as possible. Forward CG aids spin recovery.
2. Be certain that both student pilot and instructor pilot have a full set of operable controls.
3. Conduct such practicing at altitudes in excess of 6,000 feet above ground level.

Remember that an airplane at or near traffic pattern altitude probably will not recover from a spin before impact with the ground. When descending to traffic pattern altitude and during operation in the traffic pattern and approach, maintain a safe margin above stall speed. During takeoff or go-around, be especially careful to avoid departure stalls associated with turns at low speed. Maintain speeds recommended in the handbook.

STANDARD PROCEDURE FOR SPIN RECOVERY

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

Rudder...............Apply FULL RUDDER opposite the direction of spin.

Control wheel........FORWARD of neutral in a brisk motion. Additional FORWARD elevator control may be required if the rotation does not stop.

Ailerons.....................................NEUTRAL

Throttle..............................RETARD to IDLE
Flaps....If extended, RETRACT as soon as possible
Rudder..................................NEUTRALIZE
Control Wheel.......Smoothly move aft to bring the nose up to a level flight attitude after spin has stopped.

VORTICES - WAKE TURBULENCE

Every airplane generates wakes of turbulence while in flight. Part of this is from the propeller or jet engine and part from the wing tip vortices. The larger and heavier the airplane the more pronounced wake turbulence will be. Wing tip vortices from large heavy airplanes are very severe at close range, degenerating with time, wind and space. These are rolling in nature from each wing tip. In test, vortex velocities of 133 knots have been recorded. Exhaust velocities from large airplanes at takeoff have been measured at 25 mph, 2100 feet behind medium large airplanes.

Encountering the rolling effect of wing tip vortices within two minutes or less after passage of large airplanes is hazardous to light airplanes. This roll effect can exceed the maximum counter roll obtainable in an airplane.

The turbulent areas may remain for as long as three minutes or more depending on wind conditions and may extend several miles behind the airplane. Plan to fly slightly above or to the upwind side of the other airplane's flight path.

Because of the wide variety of conditions that can be encountered, there is no set rule to follow to avoid wake turbulence in all situations. However, the Airman's Information Manual goes into considerable detail for a number of wake turbulence avoidance procedures. Use prudent judgment and allow ample clearance time and space following or crossing the wake turbulence of other airplanes in all takeoff, climb out, approach and landing operations. Be observant of wake turbulence from all aircraft, regardless of size.

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The Airman's Information Manual contains a section on wake turbulence. FAA Advisory Circular AC 90-230 is also recommended reading.

TAKE-OFF AND LANDING CONDITIONS

When taking off on runways covered with water or freezing slush, the landing gear should remain extended for approximately ten seconds longer than normal, allowing the wheels to spin and dissipate the freezing moisture. The landing gear should then be cycled up, then down, wait approximately five seconds and then retract again. Caution must be exercised to insure that the entire operation is performed below Maximum Landing Gear Operating Airspeed.

Use caution when landing on runways that are covered by water or slush which cause hydroplaning (aquaplaning), a phenomenon that renders braking and steering ineffective because of the lack of sufficient surface friction. Snow and ice covered runways are also hazardous. The pilot should be alert to the possibility of the brakes freezing.

Use caution when taking off or landing in gusty winds. Be aware of special wind conditions caused by buildings or other obstructions located near runway in a crosswind pattern.

MEDICAL FACTS FOR PILOTS

GENERAL

Modern industry's record in providing reliable equipment is very good. When the pilot enters the airplane, he becomes an integral part of the man-machine system. He is just as essential to a successful flight as the control surfaces. To ignore the pilot in pre-flight planning would be as senseless as failing to inspect the integrity of the control surfaces or any other vital part of the machine. The pilot himself has the responsibility for determining his reliability prior to entering the airplane for flight.

While piloting an airplane, an individual should be free of conditions which are harmful to alertness, ability to make correct decisions, and rapid reaction time.

FATIGUE

Fatigue generally slows reaction times and causes foolish errors due to inattention. In addition to the most common cause of fatigue, insufficient rest and loss of sleep, the pressure of business, financial worries and family problems, can be contributing factors. If your fatigue is a factor prior to a given flight, don't fly. To prevent fatigue effects during long flights, keep mentally active by making ground checks and radio-navigation position plots.

HYPERVENTILATION

Hyperventilation or overbreathing, is a disturbance of respiration that may occur in individuals as a result of emotional tension or anxiety. Under conditions of emotional stress, fright, or pain, breathing rate may increase, causing increased lung ventilation, although the carbon dioxide output of the body cells does not increase. As a result, carbon dioxide is "washed out" of the blood. The most common symptoms of hyperventilation are: dizziness; hot and cold sensations; tingling of the hands, legs and feet; tetany; nausea; sleepiness; and finally unconsciousness.

Should symptoms occur that cannot definitely be identified as either hypoxia or hyperventilation try three or four deep breaths of oxygen. The symptoms should improve markedly if the condition was hypoxia (recovery from hypoxia is rapid). If the symptoms persist, discontinue use of oxygen; consciously slow your breathing rate until symptoms clear; then resume normal breathing rate. Normal breathing can be aided by talking aloud.

ALCOHOL

Common sense and scientific evidence dictate that you not fly as a crew member while under the influence of alcohol. Even small amounts of alcohol in the human system can adversely affect judgment and decision making abilities. FAR 91.11 states "(a) No person may act as a crew member-(1) within 8 hours after the consumption of any alcoholic beverage."

Tests indicate that as a general rule, 2 ounces of alcohol at 15,000 feet produce the same adverse effects as 6 ounces at sea level. In other words, the higher you get, "the higher you get".

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DRUGS

Self-medication or taking medicine in any form when you are flying can be extremely hazardous. Even simple home or over-the-counter remedies drugs such as aspirin, antihistamines, cold tablets, cough mixtures, laxatives, tranquilizers, and appetite suppressors, may seriously impair the judgment and coordination needed while flying. The safest rule is to TAKE NO MEDICINE before or while flying, except on the advice of your Aviation Medical Examiner.

SCUBA DIVING

Flying shortly after any prolonged scuba diving could be dangerous. Under the increased pressure of the water, excess nitrogen is absorbed into your system. If sufficient time has not elapsed prior to takeoff for your system to rid itself of this excess gas, you may experience the bends at altitudes even under 10,000 feet, where most light planes fly.

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PHYSIOLIGICAL ASPECTS OF HIGH ALTITUDE FLIGHT

GENERAL

The Mooney Model M20K is an aircraft designed to fly safely and efficiently at altitudes as high as 28,000 feet. The strong climb capabllities and low drag characteristics of the airplane make it very desirable to climb to and cruise at these higher altitudes. However, high altitude flight carries a requirement for the pilot to have a thorough knowledge of the physical and mental stresses imposed upon the human body at the altitudes the Mooney M20K is capable of flying. In other words, the altitude capability of the M20K should be matched by its pilot and passengers.

A most effective and enlightening training course available to pilots who fly often at high altitude is sponsored by the FAA through the Civil Aeromedical Institute in Oklahoma City, OK. This one day training session, entitled Physiological Training, is available at approximately 35 military installations around the country and is also offered directly from the Civil Aeromedical Institute in Oklahoma City, OK. Inquires concerning the course and its availability should be addressed to:

Mike Monroney Aeronautical Center
Civil Aeromedical Institute
Physiological Operations & Training
Section AAM-142
P.O. Box 25082
Oklahoma City, OK, 73125
Telephone: (405) 686-4837

Mooney Aircraft Corporation recommends this training course for all pilots who operate the Model M20K at high altitudes.

The topics presented in this section of the Pilot's Operating Handbook are only for a basic review of the more important aspects of high altitude flight. For further information, the following publications are recommended:

FAA Advisory Circular AC-8B "Use of Oxygen By Aviation Pilots and Passengers"

FAA Publication "Aviation Medical Handbook for Pilots"
Office of Aviation Medicine Report AM66-28 "Oxygen in General Aviation"
FAA publication "Physioligical Training"
FAR 91.32 - Oxygen Requirements

FAR 91.32 is the regulation governing oxygen requirements, it states:

(a) General. No person may operate a civil aircraft of U.S. registery:

(1) At cabin pressure altitudes above 12,500 ft. MSL up to and including 14,000 ft.MSL, unless the required minimum flight crew is provided with and uses supplemenmtal oxygen for that part of the flight at those altitudes that is of more than 30 minutes duration;

(2) At cabin pressure altitudes above 14,000 ft. MSL, unless the required minimum flight crew is provided with and uses supplemental oxygen during the entire flight time at those altitudes, and

(3) At cabin pressure altitudes above 15,000 ft. MSL, unless each occupant of the aircraft is provided with supplemental oxygen.

THE MODEL M20K OXYGEN SYSTEM AND ITS USE

The Mooney Model M20K can be equipped with a four place supplemental oxygen system as a factory installed option. If this system is installed , it is recommended that the POH Supplement covering the Oxygen System operating procedures in Section IX be read and understood before using the system at high altitudes. Regardless of which type of on-board oxygen system is used, its operational procedures MUST BE completely understood before attempting flights at altitudes where use of supplement oxygen is essential for pilot and/or passenger safety.

Since proper oxygen flow is critical to pilot/passenger safety, especially at altitudes above 20,000 ft. MSL, it is important to monitor closely the face mask hose flow indicator to ensure oxygen is constantly flowing to the 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.

When flying at very high altitudes, another good idea is to have dual oxygen systems on board; the second system could be a small portable unit. The aircraft and portable systems would both be available for immediate use in case either single system failed. Also, if more than one person is on board, each could breath from separate oxygen systems, if desired.

One of the best publications concerning the use of oxygen is the FAA Advisory Circular AC91-8B,"Use of Oxygen by Aviation Pilots/Passengers". Mooney Aircraft recommends this publication be read by all M20K pilots who routinely use the higher altitudes that the aircraft is capable of obtaining.

HYPOXIA

The lack of adequate oxygen in the tissues of the body is known as hypoxia. When the state of oxygen deficiency is sufficient to impair functions of the brain and other organs, hypoxia becomes a definite threat to pilot performance and aviation safety. While there are forms of hypoxia caused by reduced oxygen carrying capacity of the blood, poor circulation of the blood, and the inability of body cells to utilize oxygen; the most frequent type of hypoxia ecountered in aviation is that caused by the reduced oxygen partial pressure in the inspired air as a result of the decrease in barometric pressure at altitude. This type is commonly referred to as altitude hypoxia and is the greatest potential physiological hazard to the pilot in the high altitude environment.

A common misconception exists among many pilots who have not completed phsiological training that it is possible to know the symptoms of hypoxia and then to take corrective measures once the symptoms are noted. This concept is appealing because it allows all action, both preventive and corrective, to be postponed until the actual occurrence. Unfortunately, this theory is both false and dangerous for the untrained crew member, since one of the earliest effects of hypoxia is impairment of judgement. Effective performance time or time of useful consciousness is defined as the amount of time in which a person is able to effectively or adequately perform flight duties with an insufficient supply of oxygen. Listed below are some average effective performance times for personnel flying without supplemental oxygen:

20,000 feet....................30 minutes or more
22,000 feet....................5 to 10 minutes
25,000 feet....................3 to 5 minutes
28,000 feet....................2.5 to 3 minutes
30,000 feet....................1 to 2 minutes

NOTE: Based on interruption of Oxygen supplement after being at altitude rather than ascending.

It can be seen, from the table above, why pilots who routinely fly at altitudes that require supplemental oxygen should be thoroughly familiar with the aircraft oxygen system. That includes pilots who fly the Mooney Model M20K aircraft.

Pilots should understand that while hypoxia is the major problem associated with high altitude flight, it is not the only one. Pilots should be familiar with decompression sickness or "bends", as well as with secondary problems ie., the expansion of entrapped gases and ear and sinus blocks. Information on these subjects are available in the references listed previously in this section.

ADDITIONAL INFORMATION

In addition to the coverage of subjects in this section, the National Transportation Safety Board and the F.A.A.periodically issue general aviation pamphlets concerning aviation safety, and in greater detail. These can be obtained at FAA Offices, Weather Stations, Flight Service Stations, or Airport Facilities. These are very good sources of information and are highly recommended for study. Some of these are titled:

Airman's Information Manual
12 Golden Rules for Pilots
Weather or Not
Disorientation
Plane Sense
Weather Info Guide for Pilots
Wake Turbulence
Don't Trust to Luck, Trust to Safety
Thunderstorm - TRW
IFR-VFR Either Way Disorientation Can be Fatal