



Mooney Aircraft Corporation

P.O. BOX 72, KERRVILLE, TEXAS 78029-0072 PHONE (512) 896-6000

SPECIAL LETTER 92-1
DATE: April 20, 1992

SUBJECT: Mooney M20J 2900 POUND GROSS WEIGHT INCREASE, RETROFIT KITS

MODEL/S/N AFFECTED: M20J, Mooney 205, 201, ATS, MSE; S/N 24-1686 thru 24-3200, 24-3202 thru 24-3217

TIME OF COMPLIANCE: At owners discretion.

INTRODUCTION: The gross weight of 1991 and later M20J aircraft has been increased from 2740 pounds to 2900 pounds. This increase in useful load is retrofitable to some earlier M20J aircraft. See S/N's listed above. The incorporation of this retrofit is up to the discretion of the aircraft owner/operator.

Five kits are provided for incorporation of: (1) the proper airspeed indicator, (2) the applicable AFM Supplement required for each listed series of S/N aircraft and (3) the inspection of the rudder static balance limits.

CAUTION

This Special Letter is to advise M20J owners (for S/N's listed above only) of the opportunity to incorporate this new configuration, if desired. HOWEVER, it is essential that the Serial Number of each aircraft and the number of the Pilot's Operating Handbook and Airplane Flight Manual (POH/AFM) being used for each aircraft be provided to the Service Parts Dept. at the time of the retrofit kit order. This will assist in assuring that the proper set of components are being provided for your aircraft.

INSTRUCTIONS:

1. Procure correct retrofit kit listed below. (Refer to S/N and POH/AFM of existing aircraft)
2. Retrofit Kit (for specific aircraft serial numbers) may be ordered direct from Mooney Service Parts Department, (512) 257-8601, using Master Card, Visa or C.O.D. The kits are priced at \$1,750.00 net.
3. See instructions shown on field of Mooney 940071 drawing.
4. Install correct airspeed indicator supplied in appropriate kit.
5. Incorporate **proper** AFM Supplement into the appropriate POH/AFM for aircraft S/N

In addition:

6. Refer to Mooney Service Bulletin M20-252, dated 4-6-92. The INSTRUCTIONS shown therein **MUST** be followed for the above S/N aircraft to complete retrofit incorporation of the 2900 pound gross weight increase for these M20J's.

NOTE

When complying with this Special Letter, the instructions of SB M20-252, dated 4-6-92 or subsequent revision, must be accomplished on the above serial numbered aircraft even though the Serial Numbers on SB M20-252 do not specifically refer to the above aircraft.

WARRANTY: N/A

REFERENCE: DATA:

1. Mooney drawing number 940071
2. Mooney Service Bulletin M20-252, dated 4-6-92 (or subsequent revision)
3. M20J Service and Maintenance Manual, No. 121, Chapter 27.

PARTS LIST: CAUTION – ORDER CORRECT KIT FOR YOUR AIRCRAFT – REFER TO S/N & POH/AFM LISTED

Mooney Kit Number SL92-1-1 (for S/N's 24-1686 THRU 24-2999)			
ITEM	P/N	DESCRIPTION	QUANTITY
1.	940071-501	RETROFIT DRAWING	1
2.	POH/AFM # 3210 (Rev. A or B)	AFM SUPPLEMENT PAGES	1
3.	820308-537	INDICATOR, AIRSPEED	1

Mooney Kit Number SL92-1-2 (for S/N's 24-3000 THRU 24-3056)			
ITEM	P/N	DESCRIPTION	QUANTITY
1.	940071-503	RETROFIT DRAWING	1
2.	# POH/AFM # 1233(A)	AFM SUPPLEMENT PAGES	1
3.	820308-539	INDICATOR, AIRSPEED	1

SUBJECT: Mooney M20J 2900 POUND GROSS WEIGHT INCREASE, RETROFIT KITS (con't.)

PARTS LIST: (con't.)

Mooney Kit Number SL92-1-3 (for S/N's 24-3000 THRU 24-3078)			
ITEM	P/N	DESCRIPTION	QUANTITY
1.	940071-503	RETROFIT DRAWING	.1
2.	# POH/AFM # 1233(B)	AFM SUPPLEMENT PAGES	.1
3.	820308-539	INDICATOR, AIRSPEED	.1

POH/AFM #1233(B) MAY BE USED FOR 24-3000 THRU 24-3078 AIRCRAFT. HOWEVER, AIRCRAFT SERIAL NUMBER'S 24-3000 THRU 24-3056 MAY BE USING POH/AFM # 1233(A). BE SURE WHICH POH/AFM IS BEING USED PRIOR TO ORDERING THE APPROPRIATE KIT.

Mooney Kit Number SL92-1-4 (for S/N's 24-3079 THRU 24-3153)			
ITEM	P/N	DESCRIPTION	QUANTITY
1.	940071-503	RETROFIT DRAWING	.1
2.	POH/AFM # 3200(A)	AFM SUPPLEMENT PAGES	.1
3.	820308-539	INDICATOR, AIRSPEED	.1

Mooney Kit Number SL92-1-5 (for S/N's 24-3154 THRU 24-3200, 24-3202 THRU 24-3217)			
ITEM	P/N	DESCRIPTION	QUANTITY
1.	940071-505	RETROFIT DRAWING	.1
2.	POH/AFM # 3201	AFM SUPPLEMENT PAGES	.1
3.	820308-535	INDICATOR, AIRSPEED	.1

FIGURES/
TABLES:

Refer to M20J S & M No. 121, Chapter 27, Figure 27-18 and 27-19 for the rudder balance inspection portion of the procedures.

CAUTION

Use the balance limits specified in Service Bulletin M20-252. The S & M will be revised in the near future to reflect the new limits for the 2900 pound gross weight aircraft.

MOONEY AIRCRAFT CORPORATION

PO BOX 72 KERRVILLE, TX 78029-0072

SERVICE BULLETIN

THIS BULLETIN IS FAA APPROVED FOR ENGINEERING DESIGN

SB M20-252

DATE: 4-6-92

SUBJECT: MOONEY M20J RUDDER BALANCE WEIGHT INSPECTION

MODEL/
S/N AFFECTED: 24-3201, 24-3218 THRU 24-3256 (EXCLUDING 24-3239 & 24-3251)

TIME OF
COMPLIANCE: WITHIN NEXT 15 FLIGHT HOURS

INTRODUCTION: The continual evaluation of data and testing of various systems on M20 Series aircraft models has led, among other things, to the introduction of the 2900 pound gross weight M20J aircraft. An analysis of computer data has determined that a slight change to the rudder static balance limits are necessary on the 2900 pound gross weight M20J. These new limits are listed in INSTRUCTIONS below. The possibility exists that the rudders on some of the affected aircraft listed herein may be outside these new limits. Therefore, it is mandatory that this Service Bulletin be complied with as indicated.

INSTRUCTIONS:

1. Remove rudder from empennage of the aircraft per M20J Service and Maintenance (S & M) manual, No. 121, Section 27-20-00, paragraphs 2, A, B, C,
2. Check rudder balance per M20J S & M, Section 27-92-00 thru 27-93-01 & Tables 27-18 and 27-19 (See **CAUTIONS** below).

CAUTION: Table 27-18 - Use GAUGE WEIGHT DISTANCE LIMITS of: + 6.69 in. to + 10.68 in. for 2900 pound aircraft. - The + 3.37 in. to + 10.68 in. limits remain in effect for 2740 pound gross weight aircraft.

CAUTION: Table 27-19 - Use ABSOLUTE BALANCE LIMITS of: + 15.50 in. lbs. to + 12.50 in. lbs. for 2900 pound aircraft. - The + 18.00 in. lbs. to + 12.50 in. lbs. limits remain in effect for 2740 pound gross weight aircraft.

3. If rudder balance falls within the above limits, re-install rudder on the aircraft per M20J S & M, Section 27-20-00, paragraph 2, D. Proceed to Step 8.

If rudder does not fall within the above limits, proceed to Step 4.

4. Temporarily add additional weight (washers or any other items) until static balance falls within limits. Remove temporary weights and weigh them to see approximately how much additional weight was needed to balance within limits. If 2.66 oz. or less is needed, the addition of washers described in Step 5 will provide the necessary added weight (ie. 16 each AN970-3 washers weigh 2.66 oz.)
5. If balance just exceeds limit, one method is to remove the balance weight attach screws, one at a time and add washers under screw head (up to two under each screw) as required to balance rudder within the 2900 pound limits. If necessary, proceed to each attaching screw and add washers. It is recommended that the washers be distributed among all 8 attaching screws for a neater appearance. Either AN960-10 or AN970-3 washers may be used. However, for **each washer** added under screw head, the length of the NAS623-3 screw **MUST BE** increased by one dash number. (See Service Bulletin Kit for Part Numbers. You will need to request the quantity of washers and/or screws desired)
6. If greater than 2.66 oz. is required, remove the balance weight and weigh it together with the temporary weights. The total weight of these should be the specified weight of the new 460011-503 balance weight ordered. The maximum 460011-503 balance weight available is 2.88 pounds.
7. Re-check rudder after each change to the balance weight per S & M manual procedures until within limits.
8. Enter compliance statement in Airframe log book and return aircraft to service.

WARRANTY: Mooney Aircraft Corporation will allow up to 2.5 hours labor to inspect the rudder balance. If the rudder is out of balance, up to an additional 2.0 hours will be approved to balance and repaint as necessary. The necessary weights and hardware can be ordered through the nearest Mooney Service Center. Warranty credit will be allowed for this Service Bulletin effort if necessary paperwork is received by Service Parts within 180 days of the date of this Service Bulletin.

REFERENCE
DATA: N/A

PARTS LIST: KIT PART NUMBER - SB M20-252-1

ITEM	P/N	DESCRIPTION	QTY	
1.	460011-503	WEIGHT, BALANCE	.1	*
2.	AN960-10	WASHER	.16	**
3.	AN970-3	WASHER, LARGE OD	.16	**
4.	NAS623-3-2	SCREW	.8	**
5.	NAS623-3-3	SCREW	.8	**

* Order weight as needed. 2.88 pounds is heaviest weight available from MAC.

** Use as required per Step 5

FIGURES/
TABLES: Refer to M20J Service and Maintenance Manual, No. 121, Chapter 27, FIGURE 27-18 and 27-19.

CAUTION

Use the limits depicted in this SB for 2900 pound gross weight aircraft until S & M can be revised.

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

FAA APPROVED

AIRPLANE FLIGHT MANUAL SUPPLEMENT

FOR

Mooney Aircraft Model

M20J

(S/N 24-3154 THRU 24-3200, 24-3202 THRU 24-3217)

WITH

**INCREASED GROSS WEIGHT MODIFICATIONS
FOR 2900 POUND OPERATIONS**

REG. NO. _____

SERIAL NO. _____

This Supplement must be attached to the M20J FAA Approved Pilot's Operating Handbook and Airplane Flight Manual (POH/AFM), No. 3201, basic issue or subsequent revisions, when aircraft (within Serial Numbers listed above) are operated at an increased gross weight of 2900 pounds. The information contained herein supplements or supersedes the basic manual only in those areas listed by a vertical black mark in the margin. For limitations, procedures and performance information not contained in this supplement, consult the basic Airplane Flight Manual.

FAA APPROVED: _____



Michele M. Owsley
Manager, Aircraft Certification Office
FEDERAL AVIATION ADMINISTRATION
Fort Worth, Texas. 76193-0150

MOONEY AIRCRAFT CORPORATION

P. O. BOX 72

Kerrville, Texas 78029-0072

LOG OF REVISIONS

Revision Number	Revision Pages	Description of Revisions	FAA Approved	Date

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

This supplement is to provide operating procedures and performance data for the M20J aircraft, S/N 24-3153 thru 24-3200, 24-3202 thru 24-3217, when operating at the increased gross weight of 2900 pounds.

The pages of this AFM Supplement, will supercede the basic pages of POH/AFM, No. 3201, or subsequent revisions, in the areas marked with a vertical black line in the margin. The data on the entire page is provided for immediate reference even though some of it may be the same as the basic POH/AFM.

SECTION I - GENERAL

The following supplemental pages are to be used when operating at the increased gross weight of 2900 pounds:

Page Number 1-3 THRU 1-6

SECTION II - LIMITATIONS

The following supplemental pages are to be used when operating at the increased gross weight of 2900 pounds:

Page Numbers 2-1 THRU 2-4, 2-7/ 2-8

SECTION III - EMERGENCY PROCEDURES

The following supplemental pages are to be used when operating at the increased gross weight of 2900 pounds:

Page Number 3-3/3-4, 3-7/3-8

SECTION IV - NORMAL PROCEDURES

The following supplemental pages are to be used when operating at the increased gross weight of 2900 pounds:

Page Numbers 4-1/4-2, 4-9 THRU 4-14

SECTION V - PERFORMANCE

The following supplemental pages are to be used when operating at the increased gross weight of 2900 pounds:

Page Numbers 5-1 THRU 5-4, 5-11 THRU 5-35

SECTION VI - WEIGHT AND BALANCE

The following supplemental pages are to be used when operating at the increased gross weight of 2900 pounds:

Page Numbers 6-1/6-2, 6-5 thru 6-10

SECTION VII - AIRPLANE AND SYSTEMS DESCRIPTION

The following supplemental pages are to be used when operating at the increased gross weight of 2900 pounds:

Page Number No pages changed for this SECTION.

SECTION VIII - HANDLING, SERVICE AND MAINTENANCE

The following supplemental pages are to be used when operating at the increased gross weight of 2900 pounds:

Page Number No pages changed for this SECTION.

SECTION IX - SUPPLEMENTAL DATA

The following supplemental pages are to be used when operating at the increased gross weight of 2900 pounds:

Page Numbers Supplemental Pages for M20J 2900 # Gross Weight operations added to this Section.

SECTION X - SAFETY & OPERATIONAL TIPS

The following supplemental pages are to be used when operating at the increased gross weight of 2900 pounds:

Page Number No pages changed for this SECTION.

NOTE

ALL PAGES LISTED UNDER SECTION HEADINGS ABOVE MUST BE INCLUDED IN THIS SUPPLEMENT AND INSERTED INTO THE POH/AFM OF ANY M20J AIRCRAFT (WITHIN S/N's LISTED) WHICH IS OPERATING AT THE INCREASED GROSS WEIGHT OF 2900 POUNDS.

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

THE AIRCRAFT WEIGHT AND BALANCE DATA AND EQUIPMENT LISTINGS (SECTION VI) FROM THE ORIGINAL POH/AFM **MUST BE** ENTERED ON TO ANY SUPPLEMENTAL PAGES INSERTED INTO THE POH/AFM WHEN THE AIRCRAFT IS TO BE OPERATED AT 2900 POUNDS GROSS WEIGHT.

INTRODUCTION

This Pilot's Operating Handbook conforms to GAMA Specification No. 1 and includes both manufacturers material and FAA APPROVED material required to be furnished to the pilot by the applicable Federal Aviation Regulations. Section IX contains supplemental data supplied by Mooney Aircraft Corporation.

Section I contains information of general interest to the pilot. It also contains definitions of the terminology used in this Operators Manual.

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

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

THIS SECTION DOES NOT REQUIRE FAA APPROVAL.

DESCRIPTIVE DATA

ENGINE

Number of engines	1
Engine Manufacturer	AVCO Lycoming
Model	IO-360-A3B6D
Recommended TBO	1800 Hours
Type	Reciprocating, aircooled, fuel injected.
Number of cylinders	4, Horizontally opposed
Displacement	361 Cu. In. (5915.7 cc)
Bore	5.125 In. (13.02 cm)
Stroke	4.375 In. (11.11 cm)
Compression ratio	8.7:1
Fuel System	
Type	Fuel Injection Flow
Make	Bendix, RSA-5-AD1
Fuel-Aviation Gasoline	100 or 100LL min. grade

Accessories

Magnetos	Bendix D4LN 2021 or D4LN3021
Spark Plugs	18 MM X .750-20 Thd. Connection
Alternator	Prestolite 28V, 70A
Starter	Prestolite 24 Volts

Ratings:

Maximum Continuous Sea Level-BHP/RPM	.200/2700
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PROPELLER

Number	1
Manufacturer	McCaughey*
Model Number	B2D34C214/90DHB-16E*
Number of Blades	2
Diameter Max.	74.0 in. (187.9 cm)*

**SECTION I
GENERAL**

**AFM 3201 SUPPLEMENT
2900 POUND GROSS WEIGHT**

**MOONEY
MODEL M20J**

Min.	. . . . .	.73.0 in. (185.4 cm)*
Type	. . . . .	Constant Speed
Governing	. . . . .	Hydraulically controlled by engine oil
Blade Angles @ 30 in. Sta. (75 cm):	. . . . .
	. . . . .	Low .13.9 degrees +/- .2 degrees*
	. . . . .	High 33.0 degrees +/- .5 degrees*

* OPTION: Hartzell HC-C2YK-1BF/F7666A-3Q
 73.0" (185.42 cm) (No cutoff allowed)
 Blade Angles: @30 in. sta.(75 cm)
 Low: 14.1 degrees +/- .1 degree
 High: 29.3 degrees to 31.3 degrees
 Spinner: Hartzell No. A2295

FUEL

Minimum Fuel Grade (Color)	. . . . .	100/130 (Green), 100 LL (Blue)
Total Capacity	. . . . .	66.5 U.S. Gal. (251.7 Liters)(55.4 Imp. Gal.)
Usable	. . . . .	64.0 U.S. Gal. (242.3 Liters)(53.3 Imp. Gal.)

OIL

Total Oil Capacity	. . . . .	8 Qts. (7.57 Liters)
Oil Capacity Minimum for Flight	. . . . .	5 Qts. (4.73 Liters)
Oil Filter	. . . . .	Full Flow

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

LANDING GEAR

TYPE: Electrically operated, fully retractable tricycle gear with rubber shock discs. The main wheels have hydraulically operated disc brakes. The nose wheel is fully steerable 14 degrees left or right of center.

Wheel Base	. . . . .	71 9/16 in. (181.8 cm)
Wheel Tread	. . . . .	110 in. (279.4 cm)
Tire Size:		
Nose	. . . . .	5.00 x 6 (6 ply)Type III
Main	. . . . .	6.00 x 6 (6 ply)Type III
Tire Pressure:		
Nose	. . . . .	49 PSI
Main	. . . . .	30 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. (54.4 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 1-10
Useful Load	Varies with installed equipment. See Section VI for specific airplane weight (pg. 6-5).

CABIN AND ENTRY DIMENSIONS

Cabin Width (Maximum)	43.5 In. (110.5 cm)
Cabin Length (Maximum)	114 In. (290 cm)
Cabin Height (Maximum)	44.5 In. (113 cm)
Entry Width (Minimum)	29.0 In. (73.6 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. (.934 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	16.59 Lbs./Sq. Ft. (83.62 Kg/Sq. m)
Power Loading @ Maximum Gross Weight	14.5 Lbs./HP (6.57 Kg/HP)

IDENTIFICATION PLATE

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

SYMBOLS, ABBREVIATIONS & TERMINOLOGY

GENERAL AIRSPEED TERMINOLOGY & SYMBOLS

g	Acceleration due to gravity.
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.
IAS	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.
V _a	MANEUVERING SPEED - The maximum speed at which application of full available aerodynamic control will not overstress the airplane.
V _{fe}	MAXIMUM FLAP EXTENDED SPEED - The highest speed permissible with wing flaps in a prescribed extended position.
V _{le}	MAXIMUM LANDING GEAR EXTENDED SPEED - The maximum speed at which an aircraft can be safely flown with the landing gear extended.
V _{lo}	MAXIMUM LANDING GEAR OPERATING SPEED - The maximum speed at which the landing gear can be safely extended or retracted.
V _{ne}	NEVER EXCEED SPEED or MACH NUMBER - The speed limit that may not be exceeded at any time.
V _{no}	MAXIMUM STRUCTURAL CRUISING SPEED - The speed that should not be exceeded except in smooth air and then only with caution.
V _s	STALLING SPEED - The minimum steady flight speed at which the airplane is controllable.
V _{so}	STALLING SPEED - The minimum steady flight speed at which the airplane is controllable in the landing configuration.
V _x	BEST ANGLE-OF-CLIMB SPEED - The airspeed which delivers the greatest gain of altitude in the shortest possible horizontal distance.
V _y	BEST RATE-OF-CLIMB SPEED - The airspeed which delivers the greatest gain in altitude in the shortest possible time with gear and flaps up.

ENGINE POWER TERMINOLOGY

BHP	BRAKE HORSEPOWER - The power developed by the engine.
MCP	MAXIMUM CONTINUOUS POWER - The maximum power for takeoff, normal, abnormal or emergency operations.
MP	MANIFOLD PRESSURE - Pressure measured in the engine's induction system and is expressed in inches of mercury (Hg).
RPM	REVOLUTIONS PER MINUTE - Engine speed

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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 M20J.

NOISE LIMITS

The certificated noise level for the M20J at 2900 lbs. (1315 Kg.) maximum weight is 80.64 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.

AIRSPPEED 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 in any operation.
V _{NO}	Maximum Structural Cruising Speed	174/174	Do not exceed this speed except in smooth air, and then only with caution.
V _A	Maneuvering Speed at: lb./Kg.		Do not make full or abrupt control movements above this speed.
	2250/1021	103/104	
	2470/1120	108/109	
	2740/1243	114/115	
	2900/1315	117/118	
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	130/132	Maximum speed at which the aircraft can be safely flown with the landing gear extended.
V _{LO} (EXT)	Max. Speed for Gear Extension	130/132	Max. speed at which the landing gear can be safely extended.
V _{LO} (RET)	Max. Speed for Gear Retraction	104/107	Maximum speed at which the 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 AIRSPPEED LIMITATIONS

AIRSPPEED 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 (Full Flap Operating Range)	58-112	Lower limit is maximum weight V _{so} in landing configuration. Upper limit is maximum speed permissible with flaps extended.
Green Arc (Normal Operating Range)	62-174	Lower limit is maximum weight V _s 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.
Radial Red Line	196	Maximum speed for all operations.

FIGURE 2-2 AIRSPPEED INDICATOR MARKINGS

WEIGHT LIMITS

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

CENTER OF GRAVITY (GEAR DOWN)

Most Forward	41.0 IN. (Fuse. Sta. in IN.)(104 cm) .13.4% MAC 2250 lb.(1021 Kg.)
Intermediate Forward	41.8 IN. (Fuse. Sta. in IN.)(106 cm) .14.7% MAC 2470 lb.(1120 Kg.)
Forward Gross	45.0 IN. (Fuse. Sta. in IN.)(114 cm) .20.1% MAC 2900 lb.(1315 Kg.)
Aft Gross	50.1 IN. (Fuse. Sta. in IN.)(127 cm) .28.7% MAC 2900 lb.(1315 Kg.)
MAC (at Wing Sta. 93.83)(238 cm)	59.18 IN.(150 cm)

Datum (station zero) is 5 inches (12.7 cm) aft of the center line of the nose gear attaching bolts, and 33 inches (84 cm) forward of the wing leading edge at wing station 59.25 (150 cm).

MANEUVER LIMITS

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

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

Takeoff maneuvers, prolonged sideslips or steep descents when the selected fuel tank contains less than 8 gallons (48.0 lbs., 30.3 liters, 6.7 IMP. Gal.) of fuel have not been demonstrated and may cause loss of power.

NOTE

Up to 400 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 result momentary propeller RPM overspeed.

FLIGHT LOAD FACTOR LIMITS

Maximum Positive Load Factor
 Flaps Up +3.8 g.
 Flaps Down (33 °) +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 COWL FLAPS INOPERATIVE ARE PROHIBITED.

Autopilot Limitations - See Section IX.

FUEL LIMITATIONS

NOTE

A reduced fuel quantity indicator is installed in each tank. The bottom tip of these indicators shows the 25 U.S. gallon (94.7 liters) (20.8 IMP. Gal.) usable fuel level in each tank.

NOTE

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

Standard Tanks: (2)	. . . . .	33.25 U.S. Gal. each
		(126 Liters)(27.7 Imp. Gal.)
Total Fuel:	. . . . .	66.5 U.S. Gal
		(252 Liters)(55.4 Imp. Gal.)
Usable Fuel:	. . . . .	64.0 U.S. Gal
		(242 Liters)(53.3 Imp. Gal.)
Unusable Fuel:	. . . . .	2.5 U.S. Gal
		(9.5 Liters)(2.1 Imp. Gal.)
Fuel Grade (and Color):		
100/130	. . . . .	minimum grade aviation fuel (green).
100LL	. . . . .	(low lead) aviation fuel (blue) with a lead
	. . . . .	content limited to 2 cc per gallon is also approved.

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

To reduce the possibility of ice formation within the aircraft or engine fuel system it is permissible to add ISO-PROPYL alcohol to the fuel supply in quantities NOT TO EXCEED 1% 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.

AIRSPEDS FOR EMERGENCY OPERATIONS

CONDITION RECOMMENDED SPEED

ENGINE FAILURE AFTER TAKEOFF

Wing Flaps UP 85 KIAS
Wing Flaps DOWN 75 KIAS

MAXIMUM GLIDE SPEED

2900 lb/1315 kg 93 KIAS
2740 lb/1243 kg 90 KIAS
2500 lb/1134 kg 87 KIAS
2300 lb/1043 kg 84 KIAS

MANEUVERING SPEED

2900 lb/1315 118 KIAS
2740 lb/1243 kg 115 KIAS
2470 lb/1120 kg 109 KIAS
2250 lb/1021 kg 104 KIAS

PRECAUTIONARY LANDING WITH ENGINE POWER

Flaps DOWN 75 KIAS

EMERGENCY DESCENT (GEAR UP)

Smooth Air 196 KIAS
Turbulent Air
2900 lb/1315 118 KIAS
2740 lb/1243 kg 115 KIAS
2470 lb/1120 kg 109 KIAS
2250 lb/1021 kg 104 KIAS

EMERGENCY DESCENT (GEAR DOWN)

Smooth Air 132 KIAS
Turbulent Air
2900 lb/1315 kg 118 KIAS
2740 lb/1243 kg 115 KIAS
2470 lb/1120 kg 109 KIAS
2250 lb/1021 kg 104 KIAS

ANNUNCIATOR PANEL WARNING LIGHTS

WARNING LIGHT

FAULT & REMEDY

GEAR UNSAFE

LDG. GR. in transit or not fully extended or retracted. Refer to "Failure of Landing Gear to Extend Electrically" or "Failure of Landing Gear to Retract".

LEFT OR RIGHT FUEL

2 1/2 to 3 gallons of usable fuel remain in the respective tanks. Switch to fuller tank.

PROP DE-ICE

Propeller De-ice system has been turned ON.

PITOT HEAT

Pitot heat switch has been turned ON.

HI/LO VAC (Flashing)

Suction is below 4.25 In. Hg.

HI/LO VAC (Steady)

Suction is above 5.5 In. Hg.

NOTE

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

ALT. VOLTS (Flashing)

Low voltage. Refer to "Alternator Low Voltage".

ALT. VOLTS (Steady)

Overvoltage or tripped Voltage Relay. Refer to "Alternator Failure".

START POWER

Switch or relay has malfunctioned and starter is energized. Flight should be terminated as soon as practicable. Engine damage may result.

STBY VAC

Primary vacuum system has malfunctioned and stand-by vacuum system has been turned ON.

REMOTE RNAV

DME not slaved to RNAV.

LORAN CPLD

Loran is coupled to the NAV CDI or HSI.

ENGINE DRIVEN FUEL PUMP FAILURE

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 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
 - Boost Pump ON
 - Mixture INCREASE
- until engine starts and adjust for smooth engine operation.
LAND as soon as practicable.

FIRES

ENGINE FIRE-GROUND

- Mixture IDLE CUTOFF (Full Aft)
- Fuel Selector Valve OFF
- Magneto/Starter Switch OFF
- Master Switch OFF
- Fire EXTINGUISH with Fire Extinguisher

ENGINE FIRE-IN FLIGHT

- Fuel Selector Valve OFF
- Throttle CLOSED (Full Aft)
- Mixture Control IDLE CUTOFF (Full Aft)
- Magneto/Starter Switch OFF
- Cabin Ventilation & Heating Controls CLOSED
(Controls Forward)
- Cowl Flaps CLOSED
- Landing Gear DOWN or UP,
depending on terrain
- Wing Flaps EXTEND
as necessary

| NOTE |

If fire is not extinguished, attempt to increase airflow over the engine by increasing glide speed and open cowl flaps. Proceed with a POWER OFF landing as described on page 3-10. Do not attempt an engine restart.

ELECTRICAL FIRE- IN FLIGHT (Smoke in Cabin)

- Master Switch OFF



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

- Cabin Ventilation OPEN
 - Heating Controls CLOSED (Control Forward)
 - Circuit Breakers CHECK
- to identify faulty circuit if possible.

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

Master switch 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 approximately 2,000 feet per minute or greater can be attained with the aircraft in two different configurations.

With the gear and flaps retracted and cowl flaps closed, an airspeed of 196 knots will be required for maximum rate of descent. With the gear extended, flaps retracted and cowl flaps closed, an airspeed of 132 knots will also give approximately the same maximum rate of descent. At 132 knots and the gear extended, the angle of descent will be greater, thus resulting in less horizontal distance traveled than a descent at 196 knots. Additionally, a descent at 132 knots will provide a smoother ride, resulting in less pilot workload.

Therefore: The following procedure should be used for an emergency descent:

Power	RETARD initially
Airspeed	132 KIAS
Landing Gear	EXTEND
Wing Flaps	UP
Cowl Flaps	CLOSED
Power During Descent	AS REQUIRED to Maintain
	Cylinder Head Temperature 300° F (149° C) minimum

GLIDE

MAXIMUM GLIDE DISTANCE - MODEL M20J

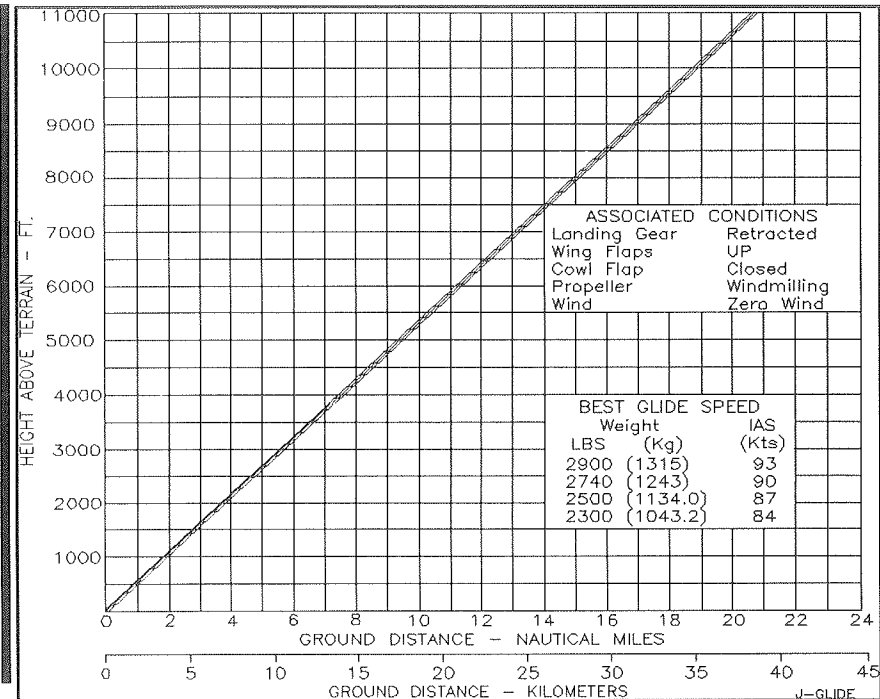


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INTRODUCTION

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

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 (NORMAL)

Electric Fuel Boost Pump	ON at start of takeoff roll
Power	FULL THROTTLE and 2700 RPM
Engine Instruments	CHECK for proper indications
Liftoff/Climb Speed	As specified in Section V (Normal Takeoff Distance)
Landing Gear	Retract in Climb after clearing obstacles
Wing Flaps	UP
Electric Fuel Boost Pump	OFF
	CHECK Pressure

NOTE

If **MAXIMUM PERFORMANCE** takeoffs are desired, obtain full power before brake release and use liftoff/climb speeds as specified in Section V (Maximum Performance Takeoff Distances).

CLIMB

NOTE

Use noise abatement procedure as published by airport or this manual.

CLIMB (CRUISE)

Throttle	26" Hg Manifold Pressure
Propeller	2600 RPM
Mixture	RICH (Lean for Smooth Operation at high elevation)
Cowl Flaps	FULL OPEN or As Required
Airspeed	90 to 100 KIAS
Maintain these power settings and attitude to at least 3000 feet AGL or cruise altitude.	

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

CLIMB (BEST RATE)(Vy)

Power	FULL THROTTLE and 2700 RPM
Mixture	FULL RICH (Lean at higher altitudes for smooth operation)
Cowl Flaps	FULL OPEN
Airspeed	86 KIAS at sea level decreasing to 80 KIAS at 10,000 ft.

NOTE

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

CLIMB (BEST ANGLE)(Vx)

Power	. . . . .	FULL THROTTLE and 2700 RPM
Mixture	. . . . .	FULL RICH (Lean at higher altitude for smooth operation)
Cowl Flaps	. . . . .	FULL OPEN
Airspeed	. . . . .	66 KIAS at sea level increasing approximately 1.0 KIAS for each 5000 feet altitude

CRUISE

Upon reaching cruise altitude, accelerate to cruise airspeed; retrim aircraft as necessary for level flight. Set manifold pressure and RPM for desired power setting per Cruise Power Chart in Section V. Position cowl flaps as required to maintain the oil and cylinder head temperature within their normal operating ranges.

| NOTE |

When cruising in conditions where the OAT is well above standard, it may be necessary to OPEN cowl flaps slightly in order to keep engine temperatures in the green arc. When cowl flaps are OPEN during cruise, the following effects on cruise speed will result:

Cowl Flaps 1/4 open (1st Index)	. . . . .	2 KTAS
Approximate loss in TAS	. . . . .
Cowl Flaps 1/2 open (2nd Index)	. . . . .	4 KTAS
Approximate loss in TAS	. . . . .

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

- A. Leaning using exhaust gas temperature gauge (EGT) (if installed).
 1. Lean the mixture exhaust gas temperature peaks on the EGT indicator.

ECONOMY CRUISE - Enrich mixture (push mixture control forward) until the EGT indicator drops 14° C (25 degrees F.) below peak.

BEST POWER MIXTURE - Enrich mixture until EGT indicator drops 55° C (100° F.) below peak.

| NOTE |

Compared to Economy Cruise, Best Power mixture will result in an increase in fuel flow and a reduction in range.

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

- B. Leaning without exhaust gas temperature gauge (EGT):
 1. Slowly move mixture control lever aft from "FULL RICH" position toward "LEAN" position.
 2. Continue leaning until slight loss of power is noted (loss of power may or may not be accompanied by roughness).
 3. Enrich until engine runs smoothly and power is regained.

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

DESCENT

Mixture LEAN to 14° C (25° F) rich of peak EGT as required
for smooth engine operation

Power AS REQUIRED to keep CHT
in Green Arc (300° F (149° C) minimum)

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

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

| NOTE |

Exercise caution with power settings below 15" manifold pressure at airspeeds between 70 - 113 KIAS to preclude continuous operation in the 1500 - 1950 RPM restricted range.

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

Avoid long high speed descents at low manifold pressure as the engine can cool excessively.

Cowl Flaps FULL CLOSED
Ram Air OFF before entering dusty air layers.

| NOTE |

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

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 on floor)
Mixture FULL RICH
Propeller HIGH RPM
Fuel Boost Pump ON
Fuel Selector FULLEST TANK
Wing Flaps AS DESIRED
TAKEOFF POSITION below 132 KIAS
FULL DOWN below 115 KIAS

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

To minimize control wheel forces during maneuvering, timely nose-up trimming is recommended to counteract nose-down pitching moment as power is reduced and/or flaps are extended.

Trim	As desired
Parking Brake	OFF

NOTE

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

GO AROUND (BALKED LANDING)

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

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

Power	FULL THROTTLE/ 2700 RPM
Mixture	FULL RICH
Airspeed	65 KIAS
Wing Flaps	TAKEOFF position after climb established-
Trim	NOSE DOWN (to reduce control force)
Airspeed	Accelerate to 76 KIAS
Landing Gear	RETRACT
Wing Flaps	RETRACT
Cowl Flaps	OPEN
Airspeed	Accelerate to 86 KIAS

LANDING

LANDING (NORMAL)

Approach for Landing Checklist	COMPLETED
Approach Airspeed	As specified in Section V (Normal Landing Distances)
Touchdown	Main wheels first (aligned with runway)
Landing Roll	Lower nose wheel gently
Brakes	Minimum required
Fuel Boost Pump	OFF after landing

NOTE

Landing information for reduced flap settings are not available.
See Section V for Landing Distance Tables.

NOTE

If maximum performance landings are desired, use above procedure except, reduce the approach airspeed to that specified in Section V (Maximum Performance Landing Distances). Apply maximum braking (without skidding tires) during rollout.

LANDING (CROSSWIND)

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

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

~ ~ ~ ~ ~
~ 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 Flaps	.	.	.	.	.	.	.	FULL OPEN
Trim	.	.	.	.	.	.	.	RESET to Takeoff
Radios	.	.	.	.	.	.	.	As required
Lighting	.	.	.	.	.	.	.	As required

SHUTDOWN

Parking brake	.	.	.	.	.	.	.	SET
Throttle	.	.	.	.	.	.	.	1000 to 1200 RPM (until cylinder head temperature starts to drop)
Radio Master	.	.	.	.	.	.	.	OFF
Internal/External Lights	.	.	.	.	.	.	.	OFF
Magneto/Starter Switch	.	.	.	.	.	.	.	Grounding Check
Mixture	.	.	.	.	.	.	.	IDLE CUTOFF
Magneto/Starter Switch	.	.	.	.	.	.	.	OFF when propeller stops
Alternator Field Switch	.	.	.	.	.	.	.	OFF
Master Switch	.	.	.	.	.	.	.	OFF
Oxygen System (if equipped)	.	.	.	.	.	.	.	OFF

SECURING AIRCRAFT

Magneto/Starter	.	.	.	.	.	.	.	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.

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INTRODUCTION

The purpose of this section is to present the owner or operator with information needed to facilitate planning of flight with reasonable accuracy. The Performance Data and Charts presented are calculated based upon actual flight tests with airplane and engine in good condition and the engine power control system properly adjusted.

The flight test data has been corrected to International Standard Atmosphere conditions and then expanded analytically to cover various airplane gross weights, operating altitudes and outside air temperatures.

VARIABLES

It is not possible to make allowances in the charts for varying levels of pilot technique, proficiency or environmental conditions. Mechanical or aerodynamic changes are not authorized because they can affect performance or flight characteristics of the airplane. The effect of such things as soft runways, sloped runways, winds aloft or airplane configuration changes must be evaluated by the pilot. However, the performance data on the charts can be duplicated, by following the stated procedures, in a properly maintained, standard M20J.

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

To obtain effect of altitude and OAT on aircraft performance:

1. Set altimeter to 29.92 in.Hg. and read "Pressure Altitude".
2. Using the OAT grid for the applicable chart, read corresponding effect of OAT on performance.

CAUTION

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

OPERATIONAL PROCEDURES FOR MAXIMUM FUEL EFFICIENCY

For maximum fuel efficiency in the M20J, proper mixture leaning during cruise flight must be accomplished. The IO-360-A3B6D engine in the M20J has been designed to attain maximum fuel efficiency, at desired cruise power, at 14°C rich of peak EGT. EGT is usually a more accurate indication of engine operation and fuel burn than indicated fuel flow. Therefore it is recommended that the mixture be set using EGT as the primary reference instead of setting to a particular fuel flow.

The following procedure is recommended for setting cruise power and leaning to best economy at 75% 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 EGT indicator. If leaning the mixture causes the original manifold pressure setting to change, use the throttle to maintain that desired cruise manifold pressure and continue leaning until best economy setting is obtained.

PERFORMANCE CONSIDERATIONS

RANGE ASSUMPTIONS

Range data climb allowance is based on climbing at maximum continuous power to cruise altitude.

Range reserves of 45 minutes at cruise power have been allowed on Range Data. Other conditions used in the Ranges shown are listed on each chart.

USE OF COWL FLAPS

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 flaps to keep engine temperatures in the normal operating range. Since the cowl flaps in the M20J are 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's position indicator as a reference, the following cowl flap's open positions are given along with their effects on cruise speed:

Cowl flaps closed to cowl flap's indicator- 1/4 open, (Indicator positioned at first index);
(approximate loss in TAS) 2 Kts.

Cowl flaps closed to cowl flap's indicator- 1/2 open, (Indicator positioned at second index);
(approximate loss in TAS) 4 Kts.

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

$$5 \text{ hr.} \times 4 \text{ Kts.} = 20 \text{ N.M. reduction in range}$$

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(extended position) 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.

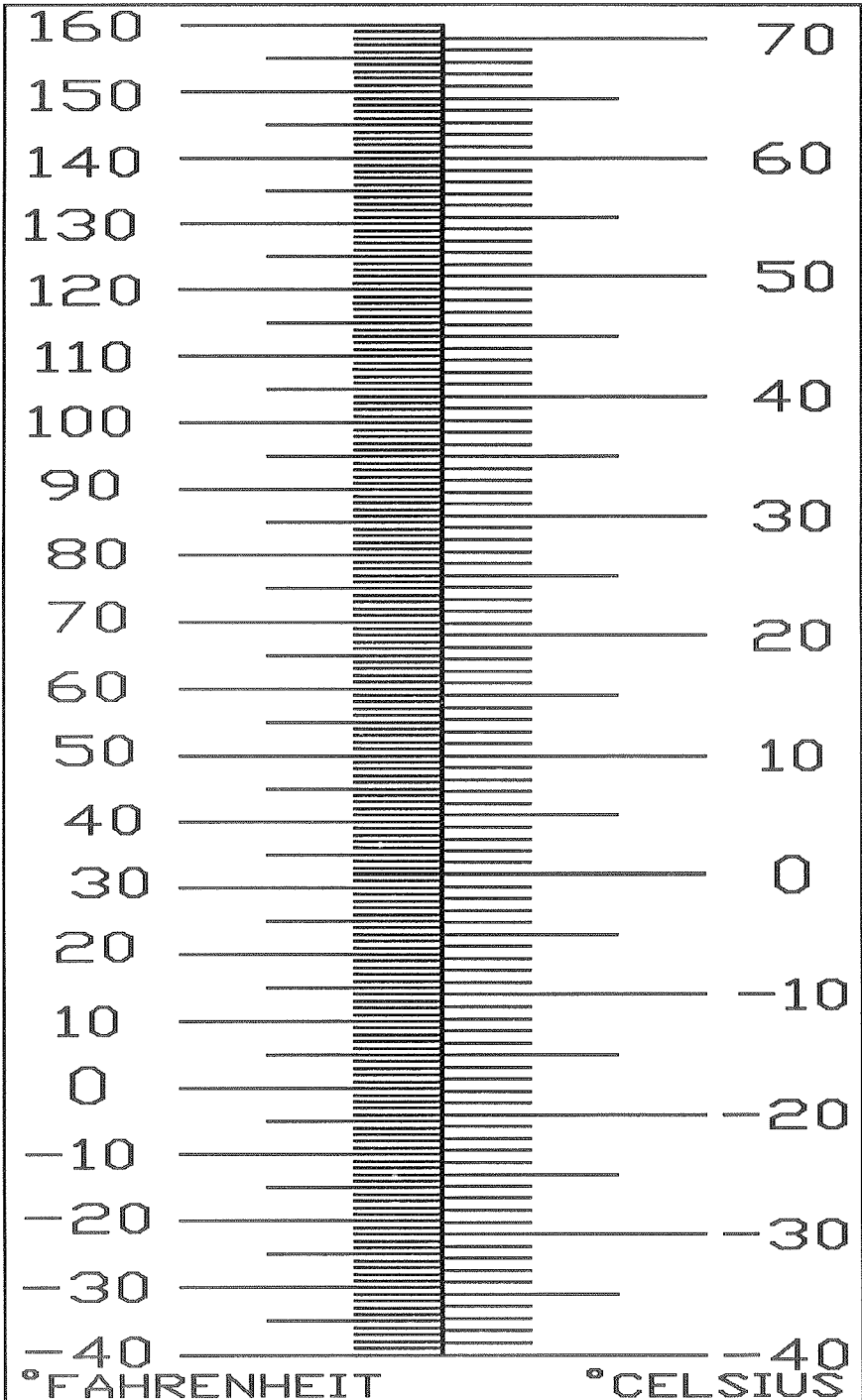
If these small gear doors are removed, a decrease in cruise speed and range can be expected and should be considered in preflight planning. To be conservative, the following figures should be used:

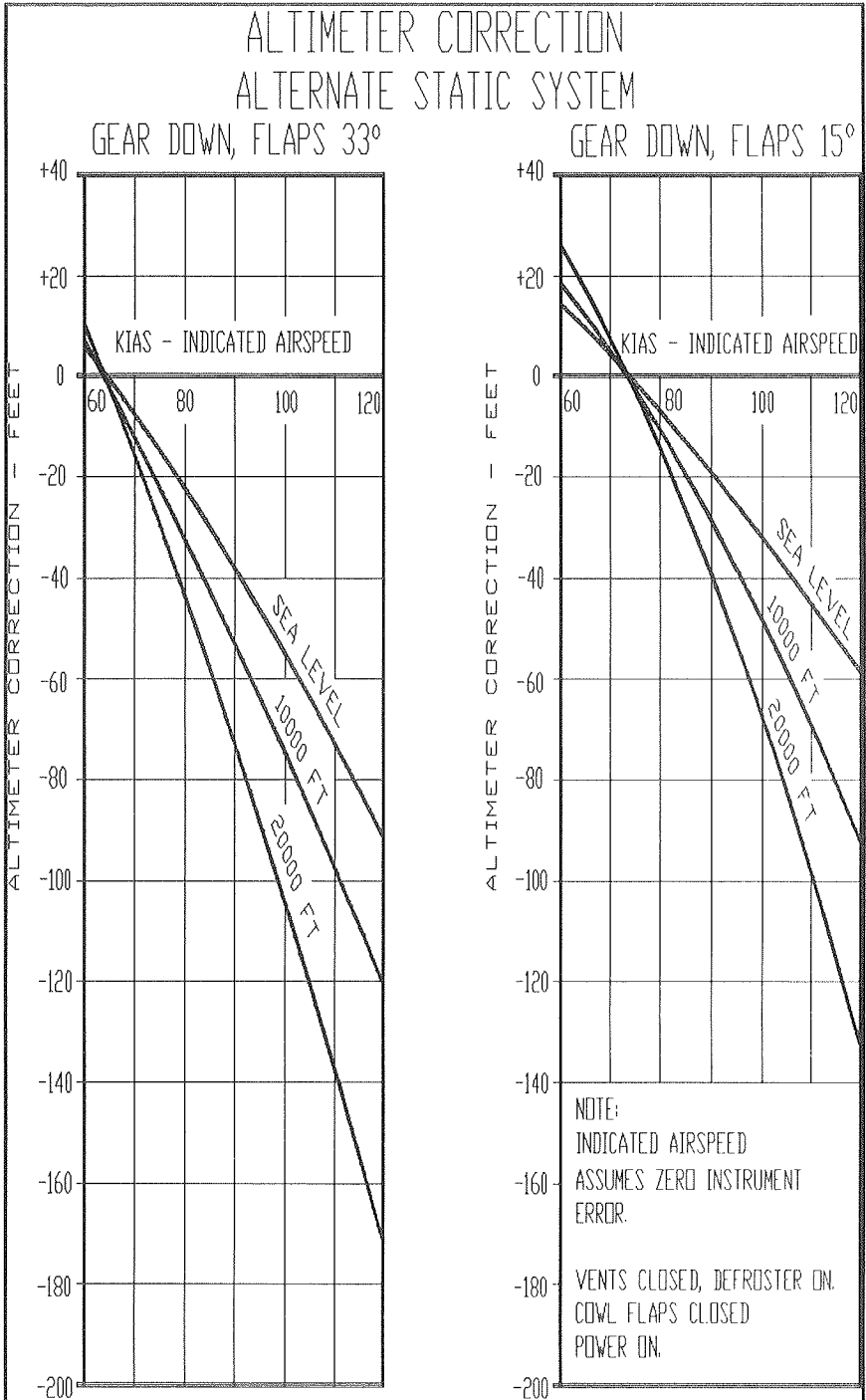
- A. Decrease true airspeed at cruise by approximately 5 Kts.
- B. Decrease range by as much as 50 N.M.(92 Km) for 64.0 gallon(243 liters) fuel capacity.

OPERATIONAL CONSIDERATIONS

| NOTE |

Engine cooling has been satisfactorily demonstrated for an outside air temperature of 23° C (40° F) above standard. This is not an operating limitation. (See Powerplant Limitations in Section II)





STALL SPEED vs. ANGLE OF BANK

ASSOCIATED CONDITIONS:

FORWARD C.G.
POWER IDLE

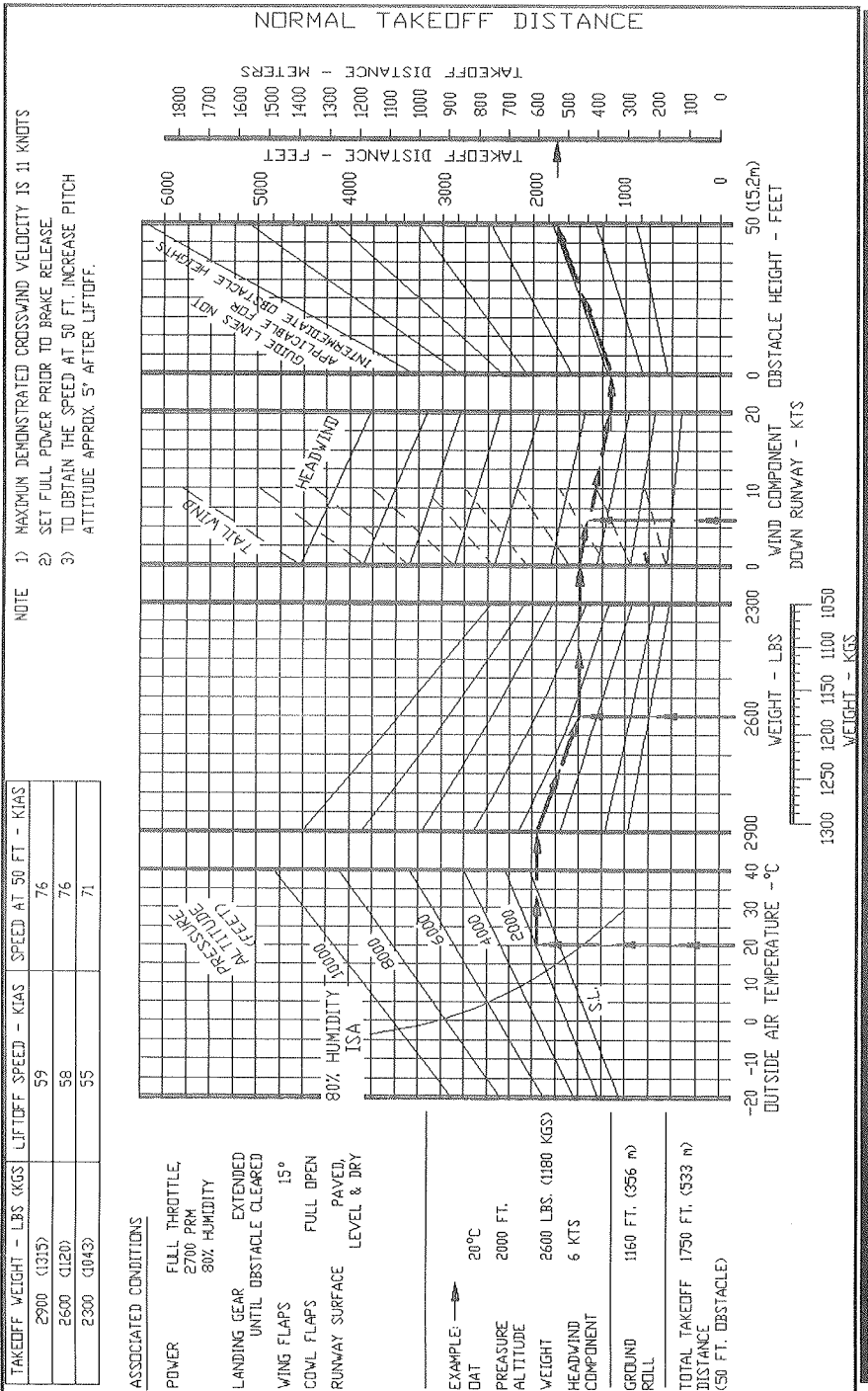
EXAMPLE:

WEIGHT 2500 LBS (1134 KGS)
LANDING GEAR DOWN
FLAPS 15°
ANGLE OF BANK 45°

NOTE: UP TO 400 FEET ALTITUDE LOSS MAY
OCCUR DURING STALLS AT MAXIMUM WEIGHT

STALL SPEED 64.0 KCAS (63 KIAS)

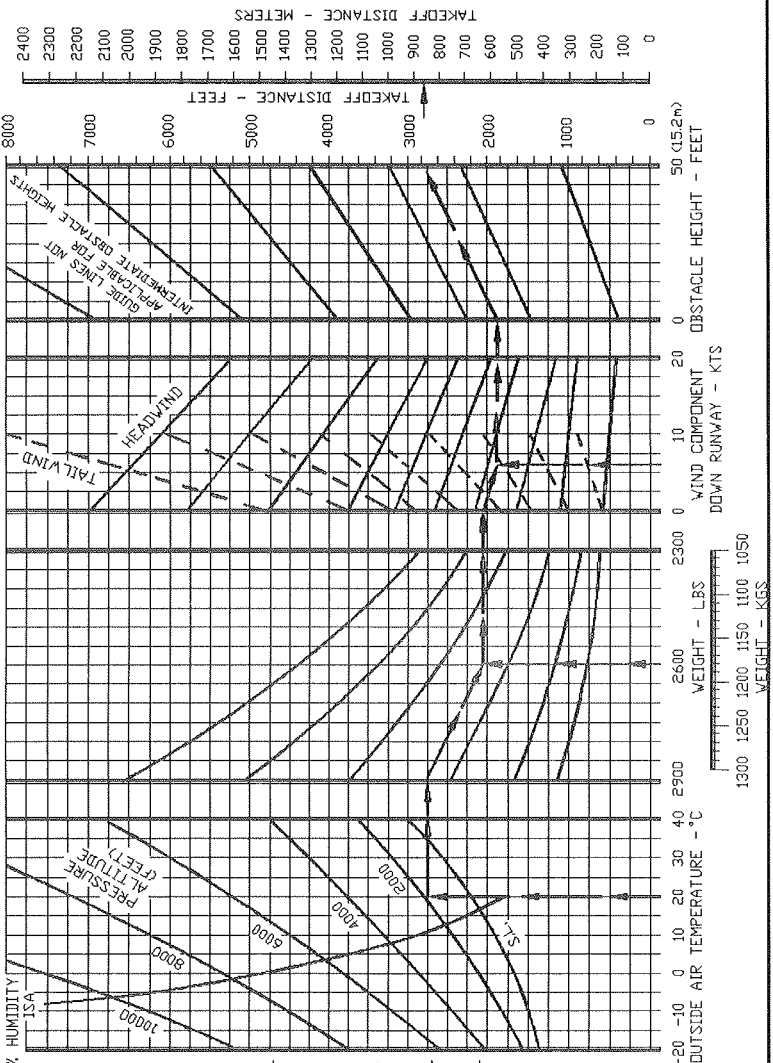
GROSS WEIGHT	GEAR AND FLAP POSITION	ANGLE OF BANK							
		0°		30°		45°		60°	
		KCAS	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS	KIAS
2900 LBS (1315 KGS)	GEAR UP FLAPS 0°	63	62	68	68	75	75	89	91
	GEAR DOWN FLAPS 15°	62	61	66	65	73	72	87	88
	GEAR DOWN FLAPS 33°	56	58	61	63	67	69	80	83
2740 LBS (1243 KGS)	GEAR UP, FLAPS 0°	59	57	64	63	70	70	84	85
	GEAR DOWN, FLAPS 15°	57	56	61	60	67	66	80	80
	GEAR DOWN FLAPS 33°	53	55	57	59	63	65	75	77
2500 LBS (1134 KGS)	GEAR UP, FLAPS 0°	57	55	61	59	67	67	80	81
	GEAR DOWN, FLAPS 15°	54	53	58	57	64	63	77	76
	GEAR DOWN FLAPS 33°	51	53	55	57	60	62	72	75
2300 LBS (1032 KGS)	GEAR UP, FLAPS 0°	54	52	58	56	65	64	77	77
	GEAR DOWN, FLAPS 15°	52	51	56	55	62	61	73	72
	GEAR DOWN FLAPS 33°	49	51	52	54	58	60	69	71



NORMAL TAKEOFF DISTANCE - GRASS SURFACE

- NOTE
- 1) MAXIMUM DEMONSTRATED CROSSWIND VELOCITY IS 11 KNOTS
 - 2) SET FULL POWER PRIOR TO BRAKE RELEASE.
 - 3) TO OBTAIN THE SPEED AT 50 FT. INCREASE PITCH ATTITUDE APPROX. 5° AFTER LIFTOFF.

TAKEOFF WEIGHT - LBS (KGS)	LIFTOFF SPEED - KIAS	SPEED AT 30 FT - KIAS
2300 (1043)	58	76
2600 (1180)	55	76
2900 (1315)	59	76



ASSOCIATED CONDITIONS

POWER FULL THROTTLE,
2700 RPM
80% HUMIDITY

LANDING GEAR EXTENDED
UNTIL OBSTACLE CLEARED

WING FLAPS 15°

COUL FLAPS FULL OPEN

RUNWAY SURFACE SHORT LEVEL
DRY GRASS

EXAMPLE

DAT 20°C

PRESSURE ALTITUDE 2000 FT.

WEIGHT 2600 LBS. (1180 KGS)

HEADWIND COMPONENT 6 KTS

GROUND ROLL 1875 FT. (571 m)

TOTAL TAKEOFF DISTANCE (50 FT. OBSTACLE) 2775 FT. (846 m)

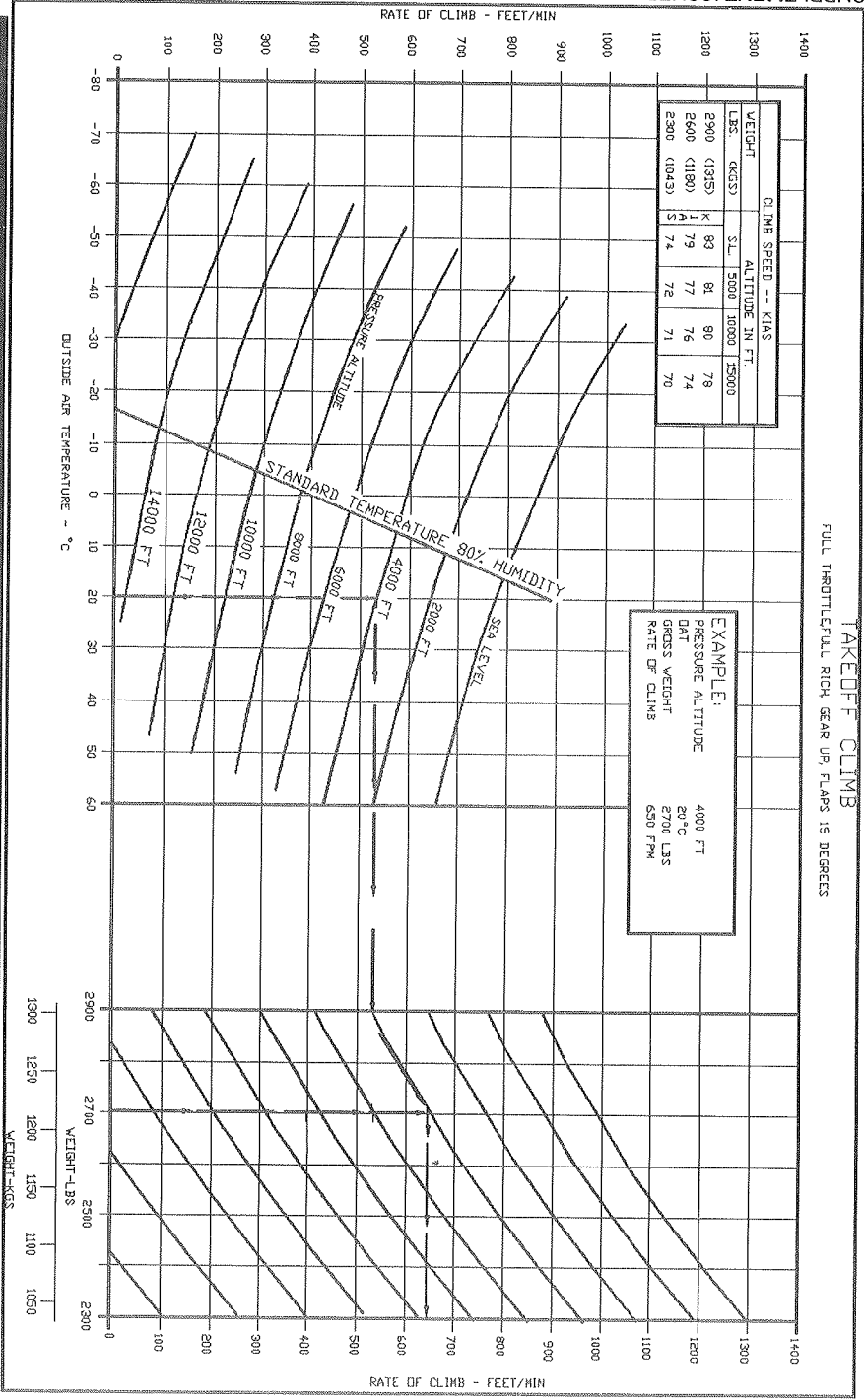
**MOONEY
MODEL M201**

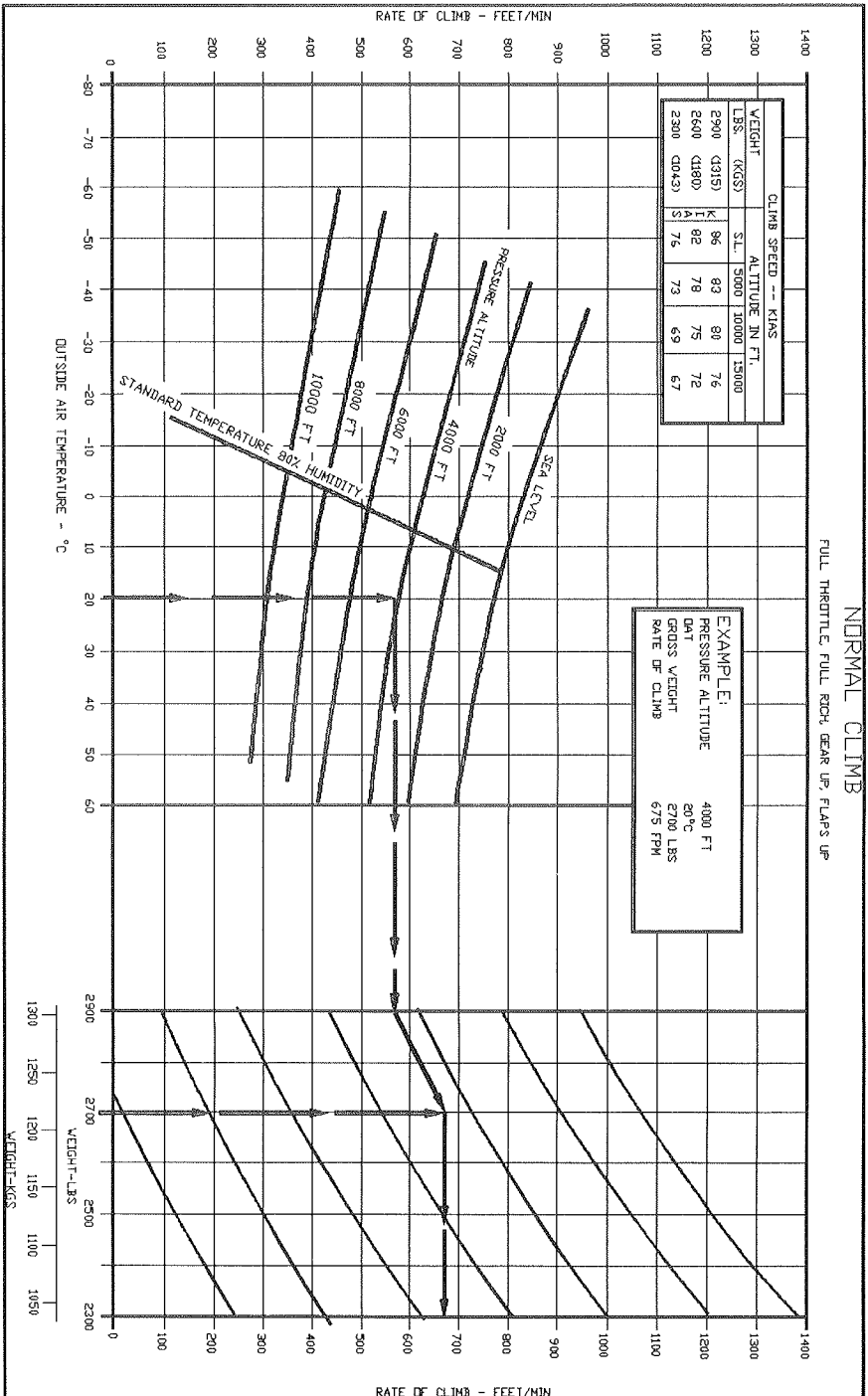
**AFM 3201 SUPPLEMENT
2900 POUND GROSS WEIGHT**

**SECTION V
PERFORMANCE**

TAKEOFF CLIMB
FULL THROTTLE/FULL RICH GEAR UP FLAPS 15 DEGREES

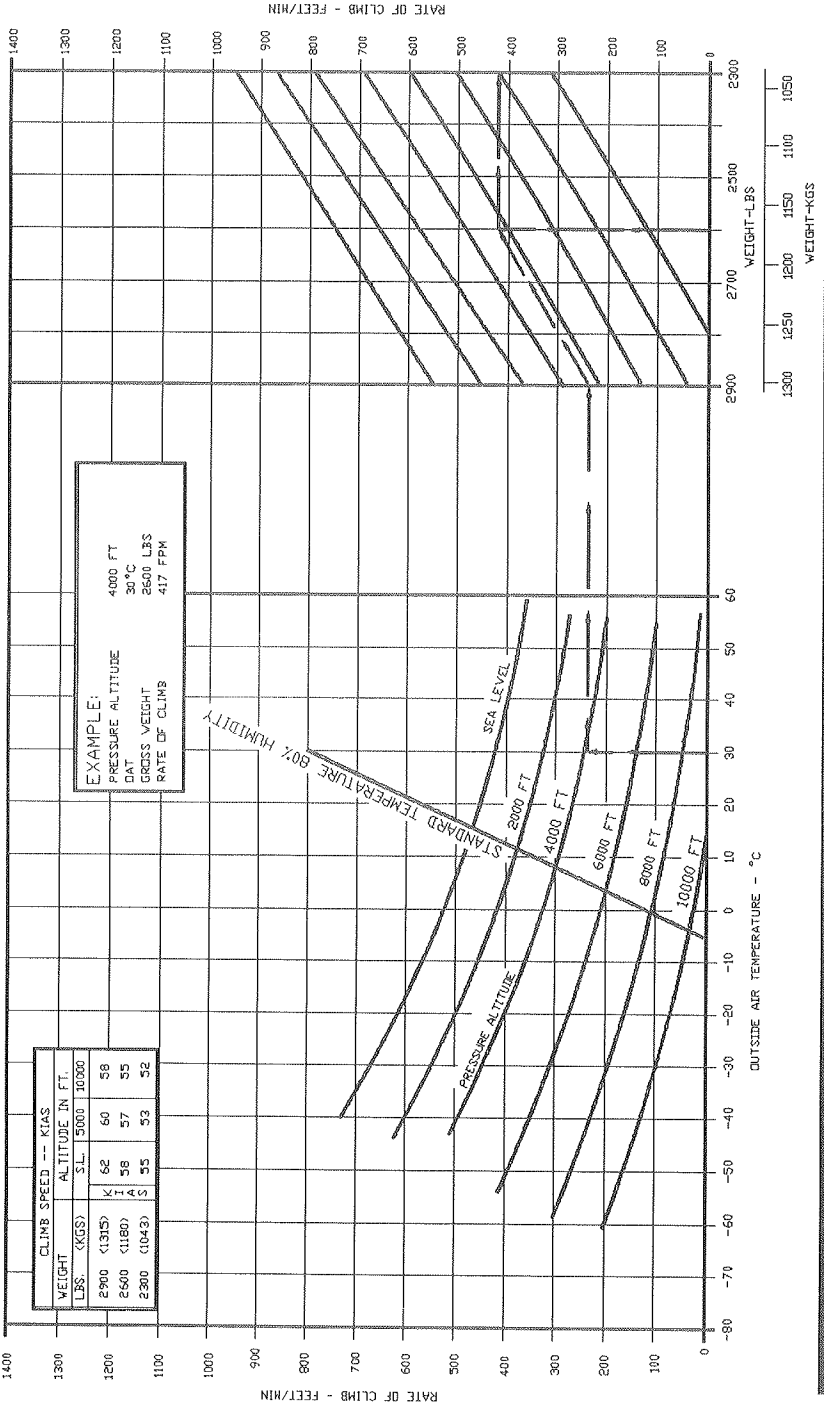
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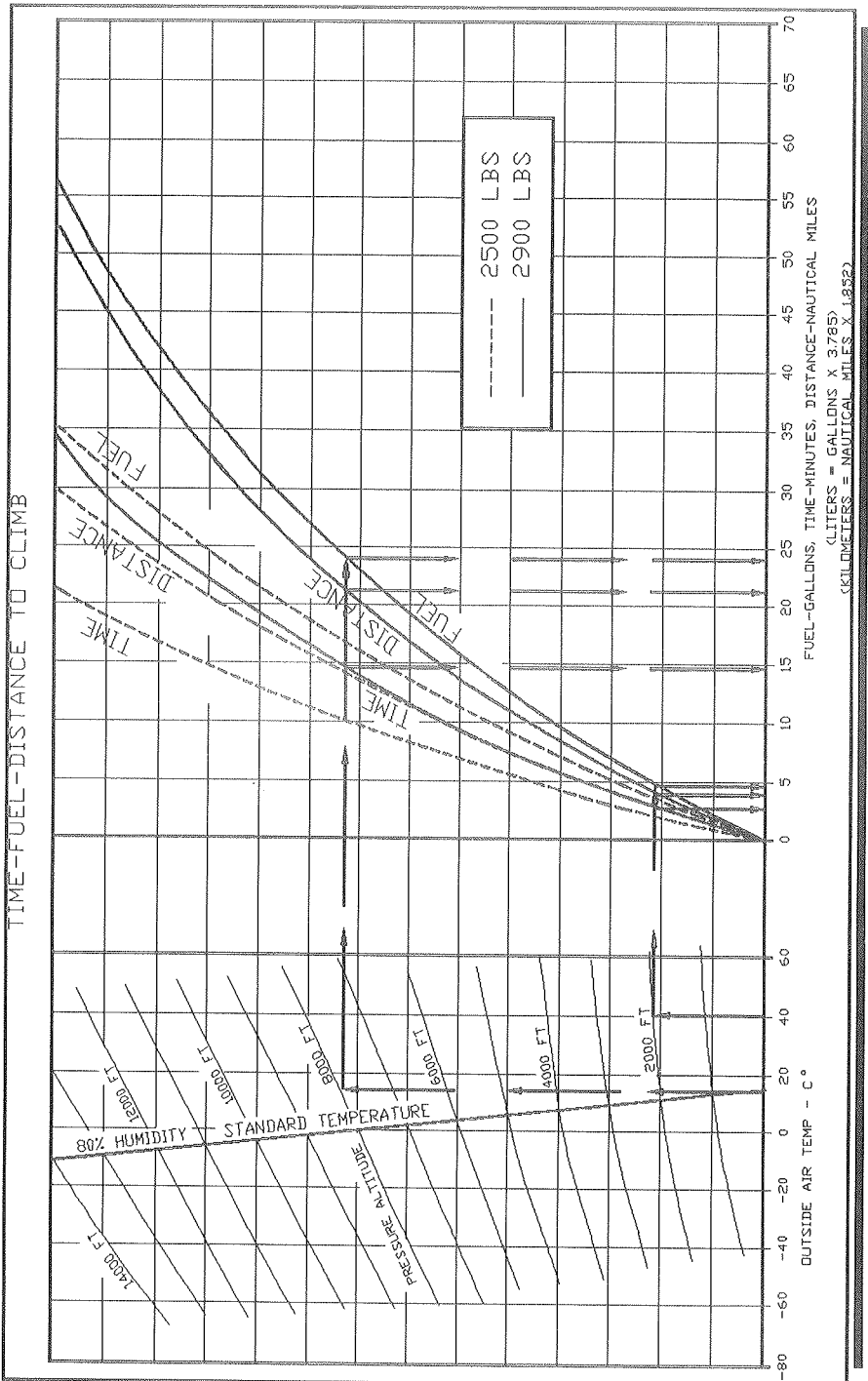




BALKED LANDING CLIMBS

FULL THROTTLE, FULL RICH, GEAR DOWN, FLAPS 30 DEGREES





CRUISE & RANGE DATA CONDITIONS

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

2. To obtain the performance shown by the Cruise and Range Data Tables on non-standard days, increase or decrease the manifold pressure approximately .4 in. Hg. for each 10°C variation in outside air temperature. INCREASE manifold pressure for air temperatures ABOVE standard and DECREASE manifold pressure for air temperatures LOWER than standard.



CRUISE POWER SCHEDULE

EXAMPLE:
CRUISE ALT. 6000 FT.
OAT 10°C(50°F)
POWER 65%
RPM 2600
M.P. 22.0
(7 C CORRECTION)

1. BEST POWER IS 55°C(100°F) RICH OF PEAK EGT. 2. ECONOMY CRUISE IS 14°C(25°F) RICH OF PEAK EGT.

Pressure	RPM	75% Power (150 BHP)					70% Power (140 BHP)					65% Power (130 BHP)				
		2400	2500	2600	2700	2400	2500	2600	2700	2400	2500	2600	2700			
Altitude	Best ECON.	10.3	10.4	10.5	10.8	9.7	9.8	9.9	10.2	9.2	9.3	9.4	9.6			
Feet	Best POWER	12.0	12.2	12.3	12.5	11.3	11.5	11.7	11.9	10.5	10.8	11.0	11.2			
Std. Day	Std. Temp.	MANIFOLD PRESSURE - INCHES OF MERCURY														
S.L.	15°C	27.0	25.8	24.5	23.5	25.5	24.3	23.0	22.0	24.0	22.9	21.7	21.0			
2000	11°C	26.8	25.6	24.4	23.3	25.1	24.1	23.0	22.0	23.6	22.6	21.6	20.6			
4000	7°			24.4	23.2	24.9	23.9	22.9	21.8	23.3	22.4	21.5	20.5			
6000	3°			24.1	23.1	24.4	23.6	22.7	21.7	22.8	22.1	21.3	20.4			
8000	-1°				23.6			22.7	21.7			21.2	20.4			
10000	-5°								21.4			21.1	20.2			
12000	-9°															
14000	-13°															

NOTE: ADD .4" M.P. FOR EACH 10°C(50°F) OAT ABOVE STANDARD DAY TEMPERATURE. SUBTRACT .4" M.P. FOR EACH 10°C(50°F) BELOW STD. DAY TEMPERATURE. IF OAT ABOVE STANDARD PRECLUDES OBTAINING THE DESIRED M.P. USE THE NEXT HIGHER RPM/ M.P. WITH APPROPRIATE TEMPERATURE CORRECTION TO M.P.



CRUISE POWER SCHEDULE

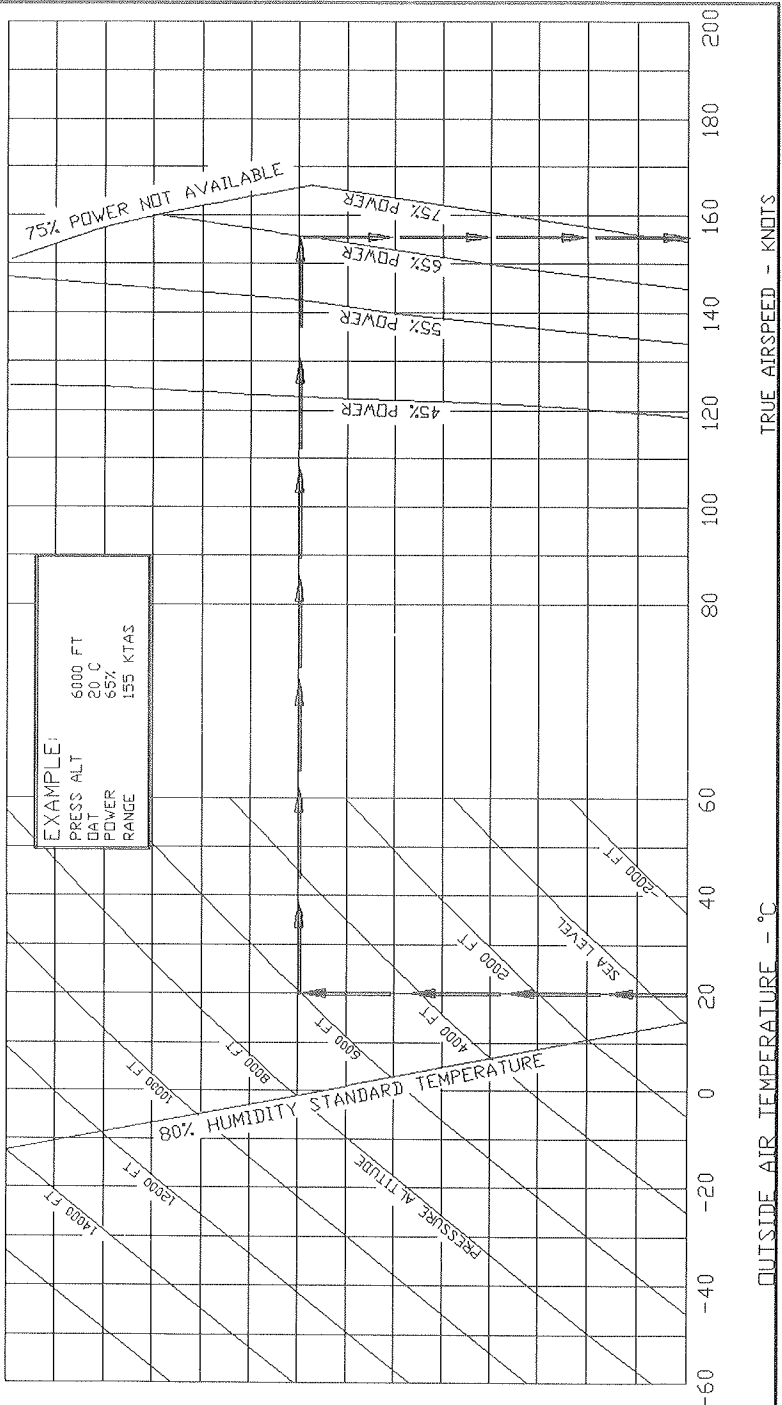
1. BEST POWER IS 55°C(100°F) RICH OF PEAK EGT. 2.ECONOMY CRUISE IS 14°C(25°F) RICH OF PEAK EGT.

Pressure	RPM	60% Power (120 BHP)										55% Power (110 BHP)										45% Power (90 BHP)									
		2200	2300	2400	2500	2600	2700	2200	2300	2400	2500	2600	2700	2000	2100	2200	2300	2400	2500	2600	2700										
Altitude	Best ECON.	8.4	8.5	8.6	8.7	8.8	9.1	7.8	8.0	8.1	8.2	8.3	8.6	6.5	6.7	6.8	6.9	7.0	7.2	7.3	7.5										
Feet	Best POWER	9.8	9.9	10.0	10.2	10.4	10.7	9.2	9.3	9.4	9.6	9.8	10.0	7.7	7.9	8.0	8.2	8.3	8.5	8.6	8.9										
Std. Day	Std. Temp.	MANIFOLD PRESSURE - INCHES OF MERCURY																													
S.L.	15°c	24.2	23.4	22.5	21.5	20.5	19.5	22.5	21.8	21.0	20.0	19.0	18.0	21.0	20.0	19.0	18.3	17.5	16.9	16.3	15.4										
2000	11°	24.0	23.0	22.0	21.1	20.2	19.3	22.2	21.3	20.4	19.6	18.8	18.0	20.5	19.6	18.7	18.0	17.2	16.6	16.0	15.3										
4000	7°	23.7	22.7	21.7	20.9	20.1	19.2	22.0	21.1	20.2	19.5	18.7	17.9	20.4	19.5	18.6	17.9	17.1	16.5	15.8	15.3										
6000	3°	23.6	22.5	21.3	20.6	19.9	19.1	22.0	20.9	19.8	19.2	18.6	17.8	20.4	19.4	18.3	17.6	16.8	16.3	15.7	15.2										
8000	-1°				21.3	20.6	19.8	19.0	22.0	20.9	19.8	19.2	18.6	17.8	20.3	19.3	18.2	17.4	16.5	16.1	15.7	15.1									
10000	-5°				21.0	20.4	19.8	18.8			19.5	18.9	18.3	17.6			18.2	17.4	16.5	16.1	15.6	15.0									
12000	-9°						19.6	18.8			19.3	18.8	18.2	17.5			18.0	17.2	16.4	16.0	15.5	14.9									
14000	-13°												17.9	17.3					16.2	15.8	15.4	14.7									

NOTE: Add .4" M.P. for each 10° C OAT above Std. Day Temperature. Subtract .4" M.P. for each 10° C OAT below Std. temperature correction to M.P.

SPEED, POWER VS ALTITUDE

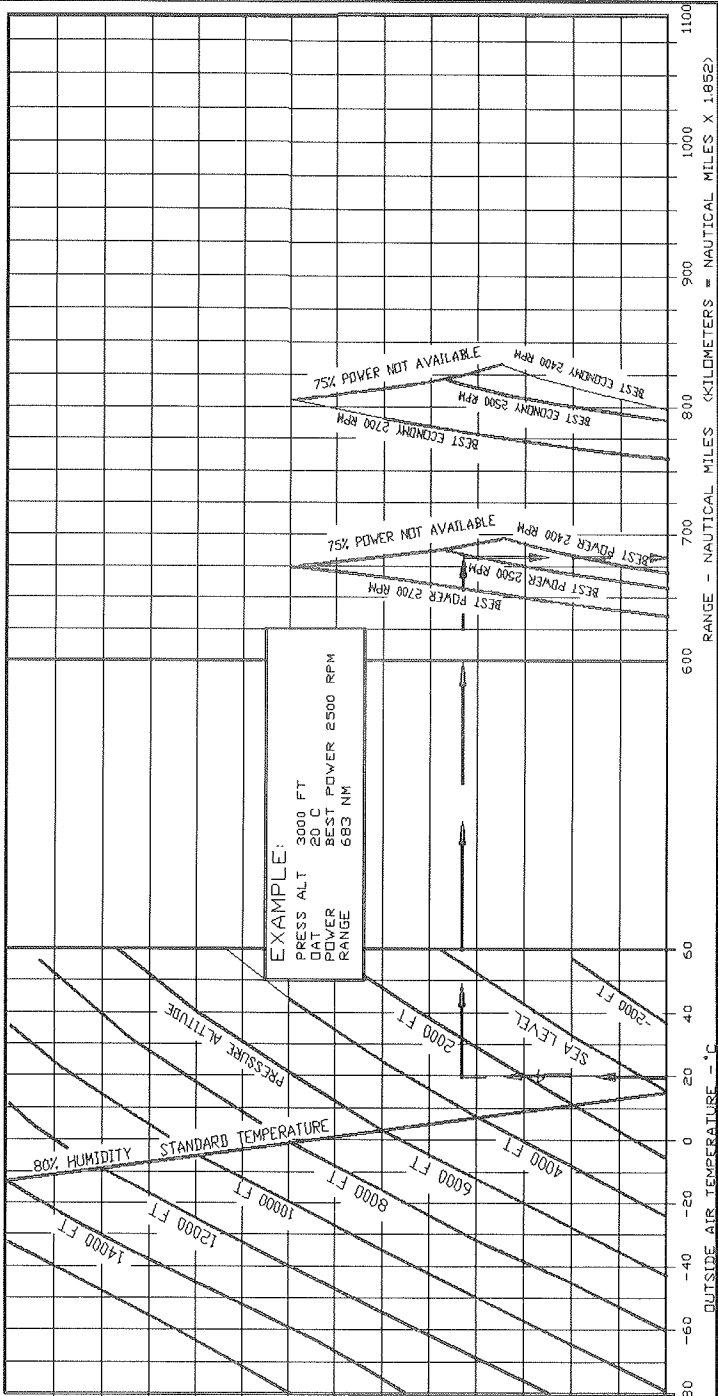
GEAR UP, FLAPS UP, COWL FLAPS CLOSED, 2900 LBS (1315 KGS)



RANGE 75% POWER

2900 LBS (1315.4 KGS)

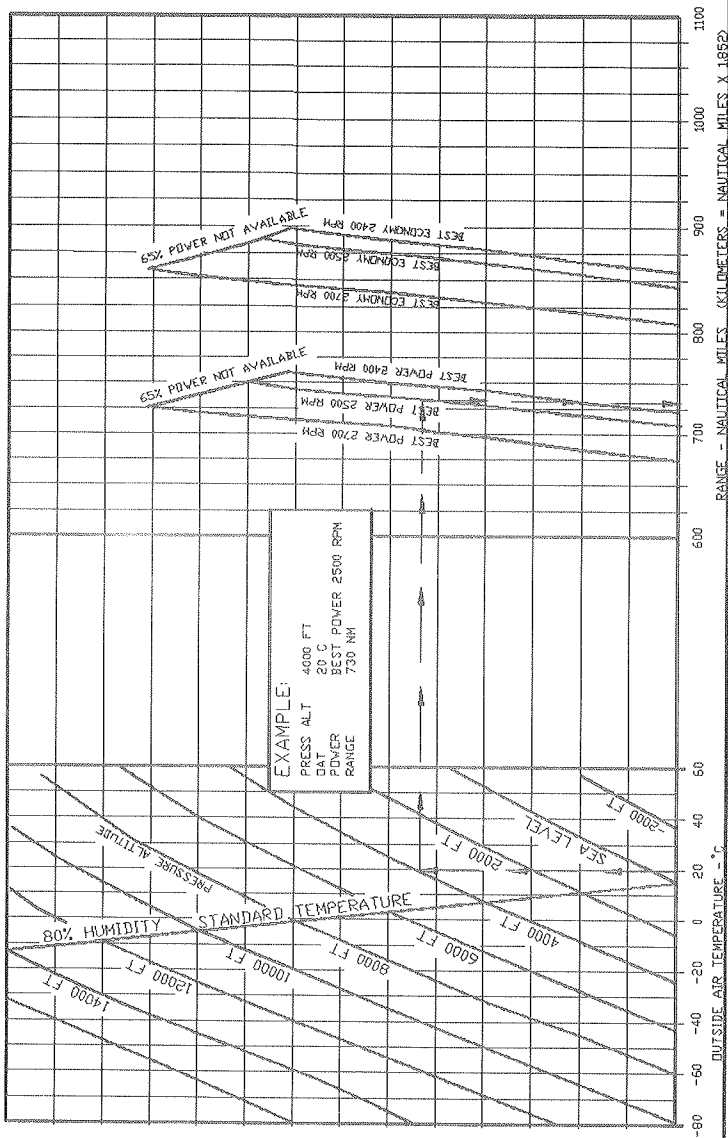
Clean Configuration, 64.0 Gallons (252 Liters) (55.4 Imp. Gal.) Usable Fuel
Zero Wind, Cowl Flaps Closed, Range Includes Warmup, Taxi Takeoff,
Max Power Climb, Descent, Plus 45 Minutes Reserve at Cruise Power



RANGE 65% POWER

2900 LBS (1315.4 KGS)

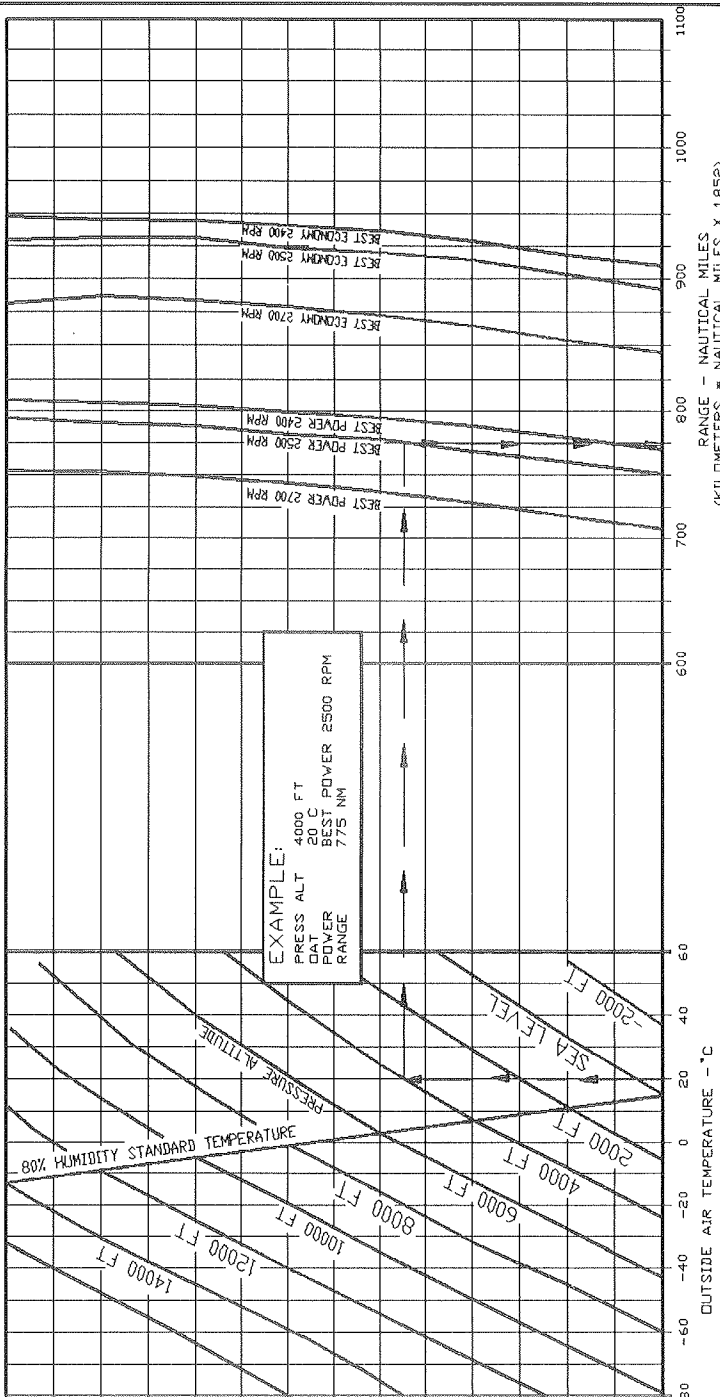
Clean Configuration, 64.0 Gallons (242 Liters) (55.4 Imp. Gal.) Usable Fuel
Zero Wind, Cowl Flaps Closed, Range Includes Warmup, Taxi, Takeoff,
Max. Power Climb, Descent, Plus 45 Minutes Reserve at Cruise Power



RANGE 55% POWER

2900 LBS (1315.4 KGS)

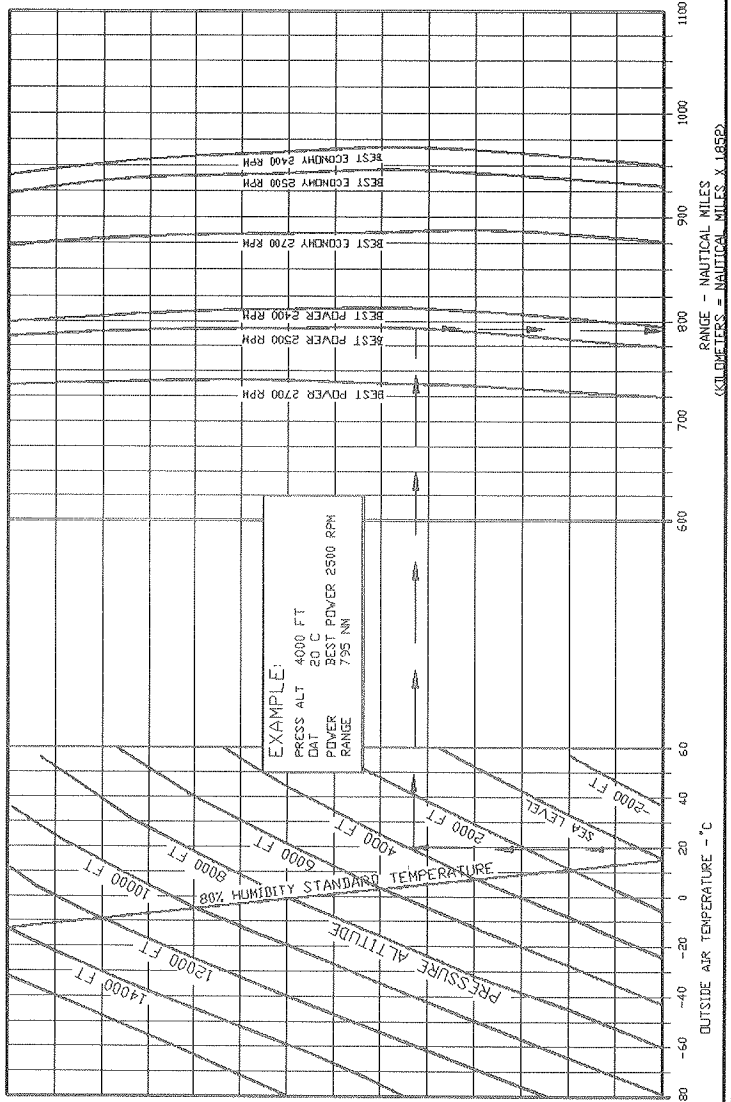
Clean Configuration, 64.0 Gallons (252 Liters) (55.4 Imp. Gal.) Usable Fuel
Zero Wind, Cowl Flaps Closed, Range Includes Warmup, Taxi, Takeoff,
Max Power Climb, Descent, Plus 45 Minutes Reserve at Cruise Power



RANGE 45% POWER

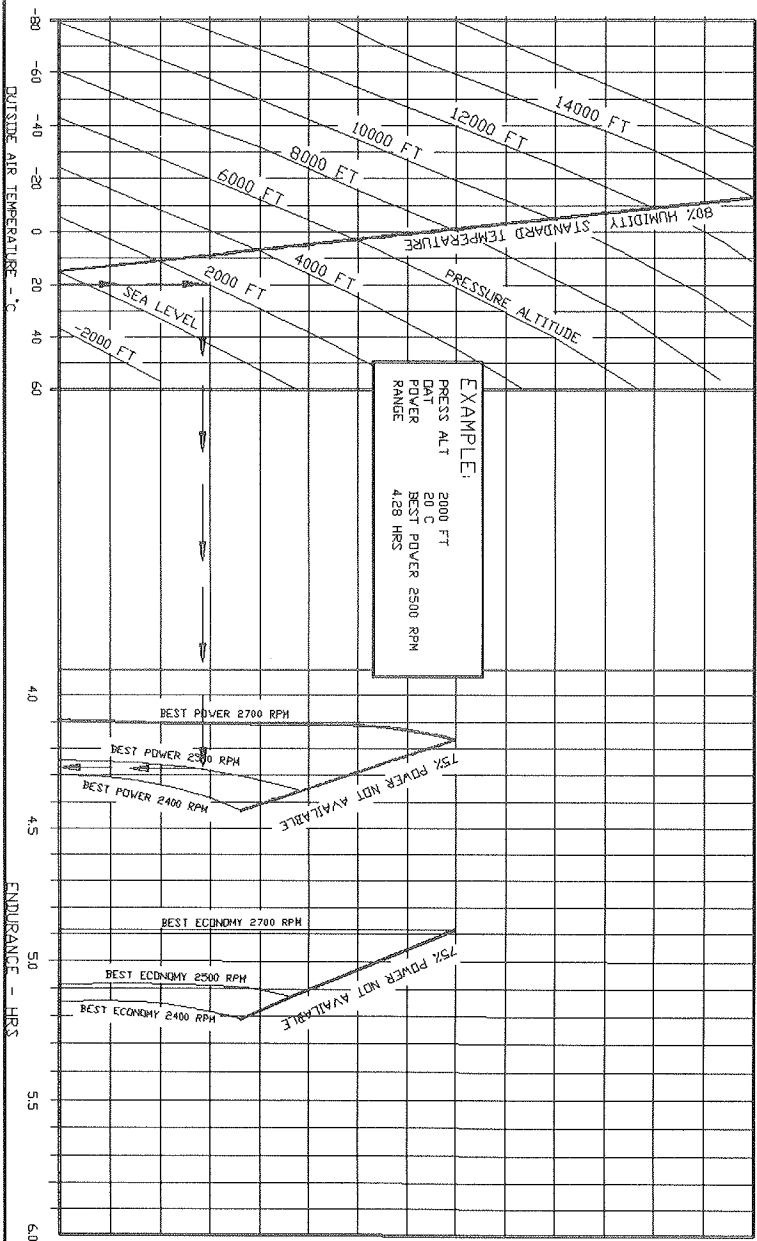
2900 LBS (1315.4 KGS)

Clean Configuration, 64.0 Gallons (282 Liters) (55.4 Imp. Gall) Usable Fuel
Zero Wind, COW Flaps Closed, Range Includes Warmup Tax, Takeoff,
Max Power Climb, Descent, Plus 45 Minutes Reserve at Cruise Power

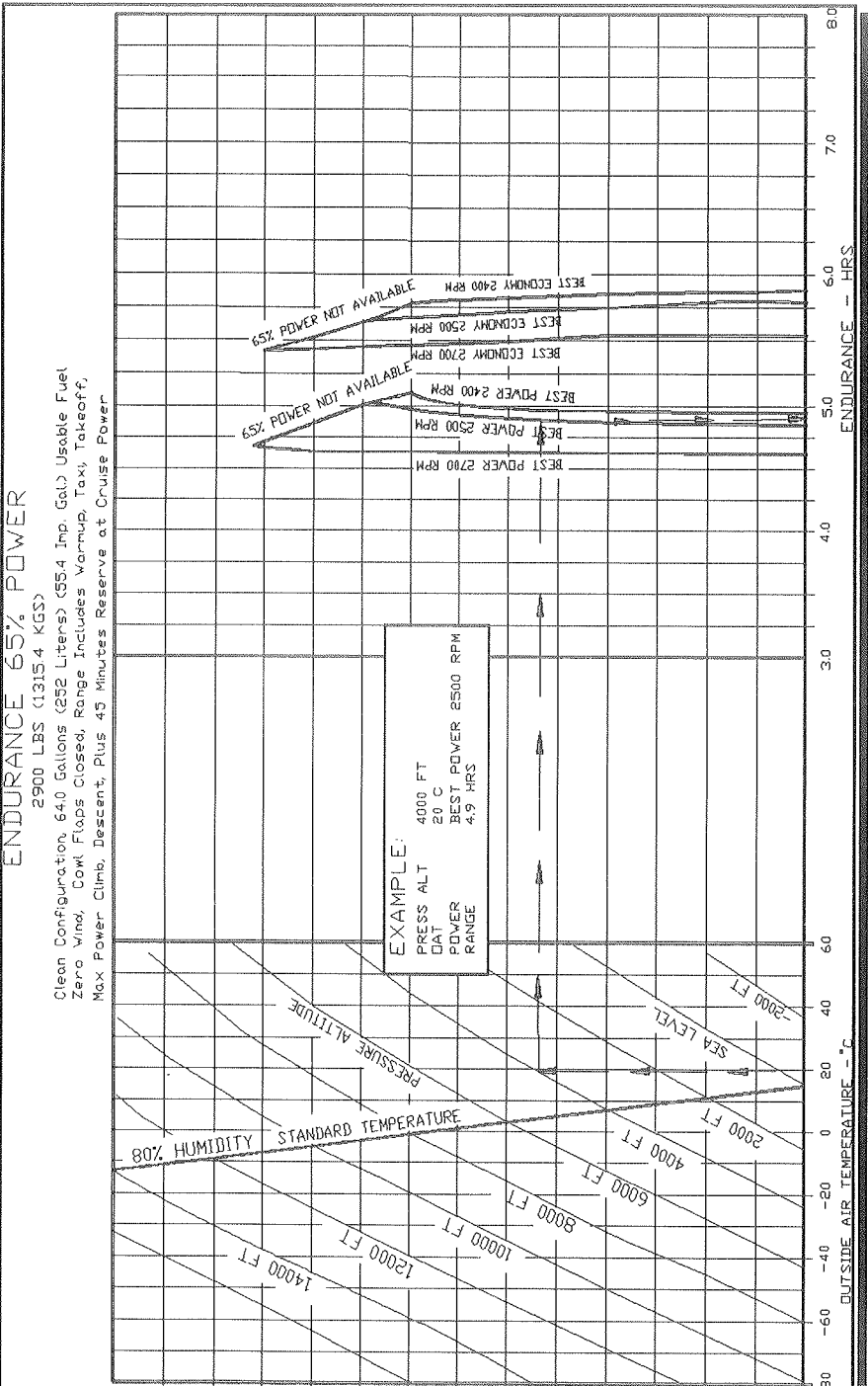


ENDURANCE 75% POWER

2900 LBS. (1315.4 KG)
 Clean Configuration 640 Gallons (2422 Liters) (55.4 Imp. Gal.) Usable Fuel
 Zero Wind, Cool Flaps Closed, Range Includes Warmup, Taxi, Takeoff,
 Max Power Climb, Descent, Plus 45 Minutes Reserve at Cruise Power



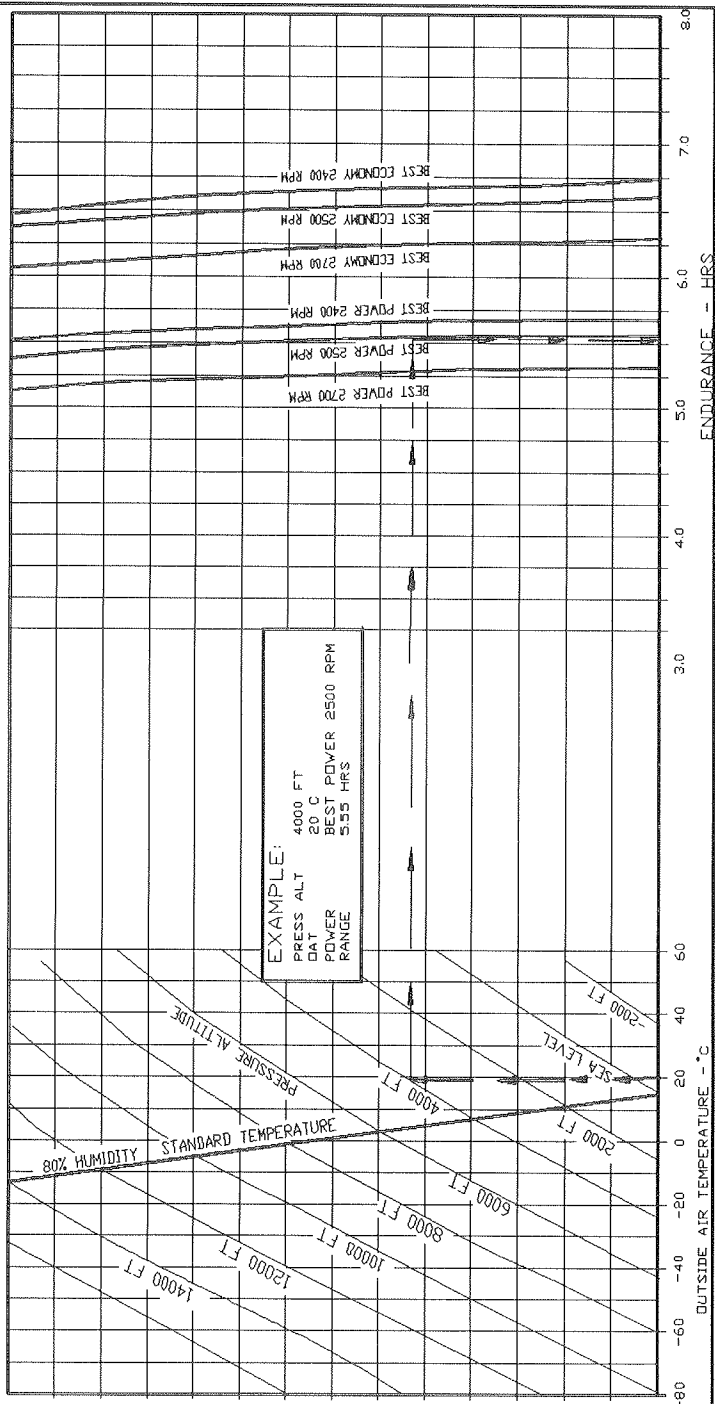
EXAMPLE:
 PRESS ALT 2000 FT
 OAT 20 C
 BEST POWER 2500 RPM
 4.28 HRS



ENDURANCE 55% POWER

2900 LBS (1315.4 KGS)

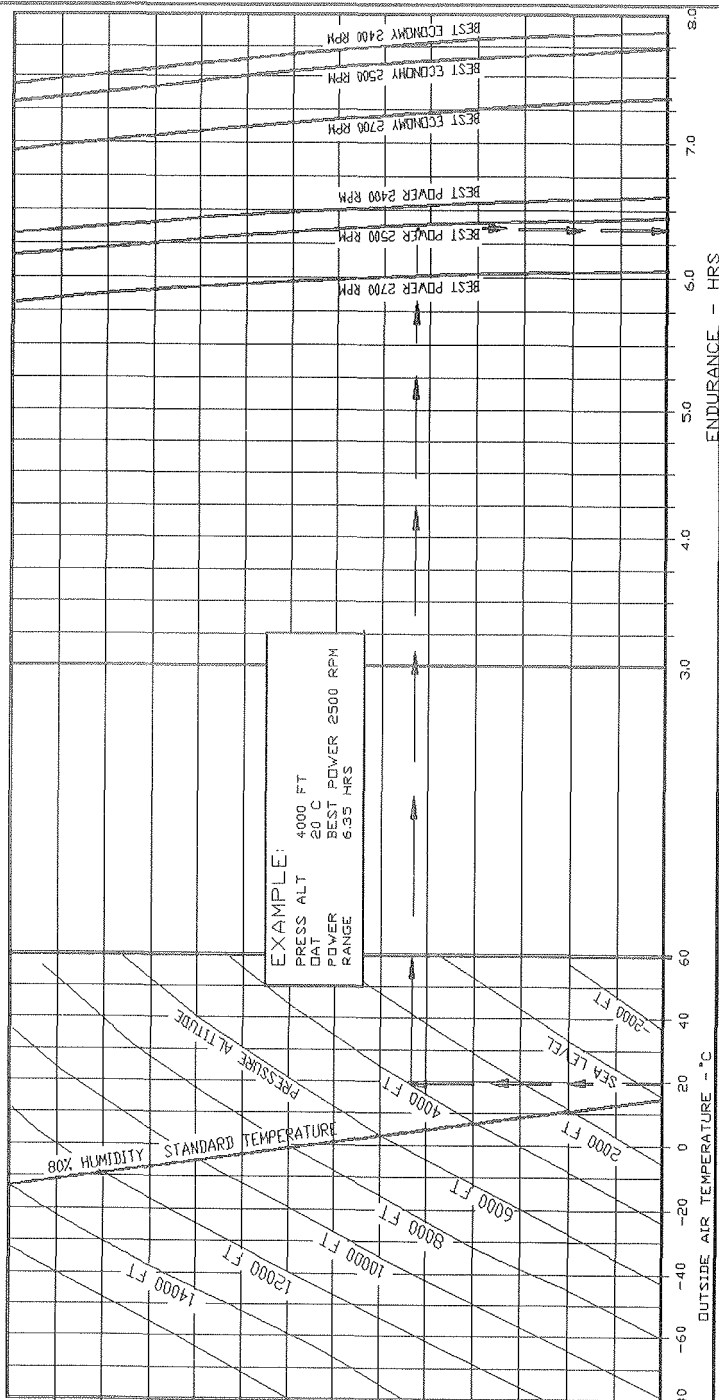
Clean Configuration, 64.0 Gallons (252 Liters) (55.4 Imp. Gal.) Usable Fuel
Zero Wind, Cowl Flaps Closed, Range Includes Warmup, Taxi, Takeoff,
Max Power Climb, Descent, Plus 45 Minutes Reserve at Cruise Power



ENDURANCE 45% POWER

2900 LBS (1315.4 KGS)

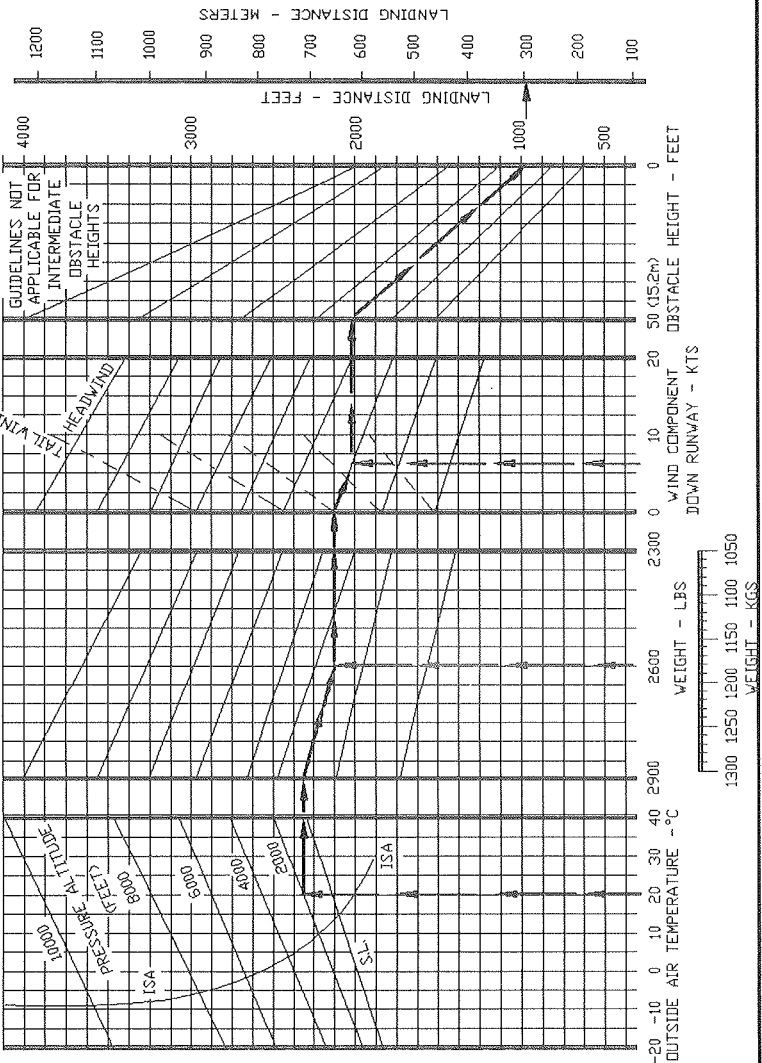
Clean Configuration, 6.0 Gallons (228 Liters) (55.4 Imp. Gall) Usable Fuel
Zero Wind, Cowl Flaps Closed, Range Includes Warmup Taxi Takeoff,
Max Power Climb, Descent, Plus 45 Minutes Reserve at Cruise Power



NORMAL LANDING DISTANCE

- NOTE 1) MAXIMUM DEMONSTRATED CROSSWIND VELOCITY IS 11 KNOTS
2) AFT CONTROL WHEEL PRESSURE IS RECOMMENDED TO IMPROVE BRAKING EFFECTIVENESS DURING LANDING ROLL

LANDING WEIGHT - LBS (KGS)	APPROACH SPEED KIAS
2900 (1315)	78
2600 (1180)	74
2300 (1043)	70



ASSOCIATED CONDITIONS

POWER IDLE

LANDING GEAR DOWN

WING FLAPS FULL DOWN 33°

RUNWAY SURFACE PAVED, LEVEL & DRY

BRAKING MAXIMUM

EXAMPLE →

DATE 20°C

PRESSURE 2000 FT.

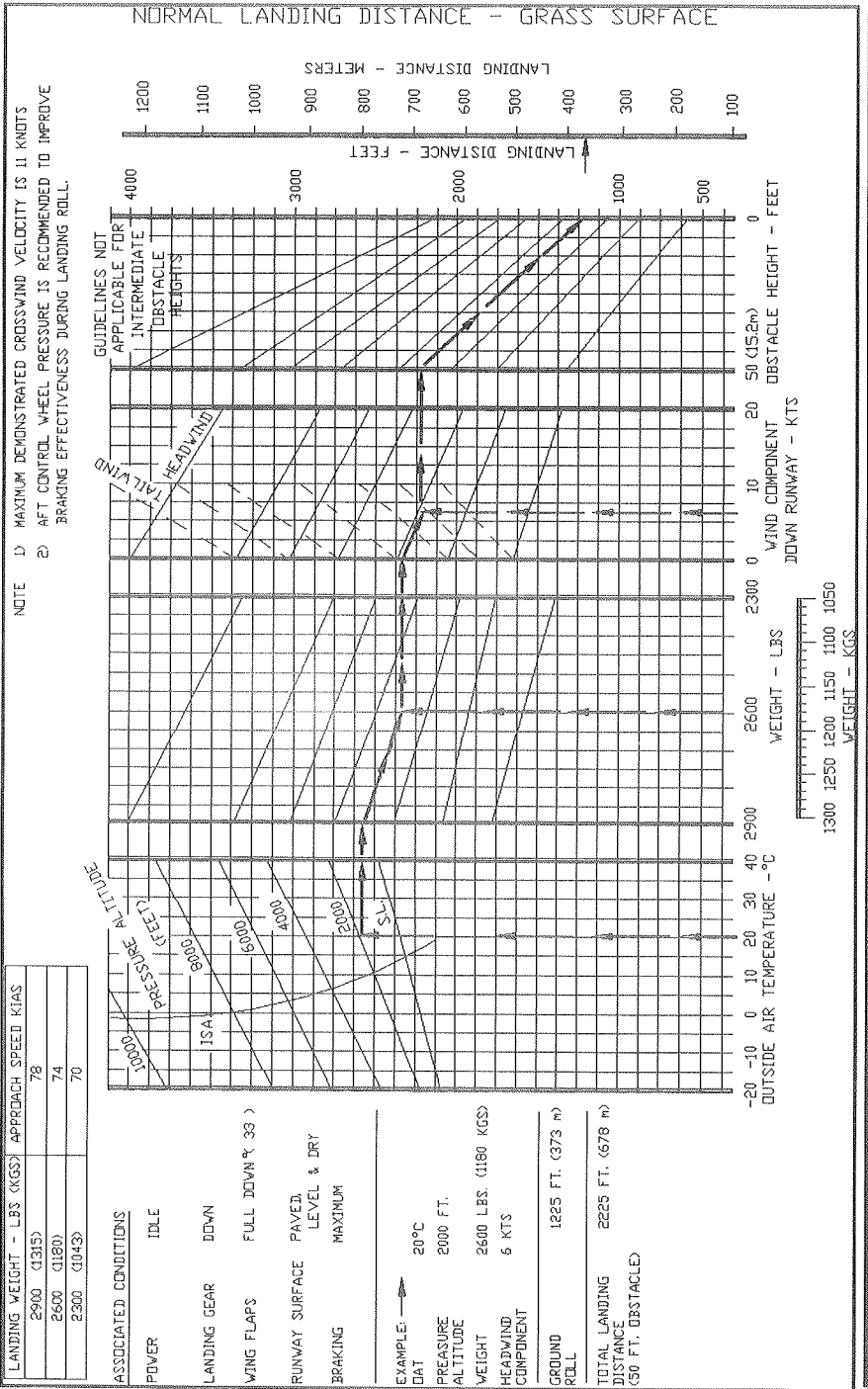
ALTITUDE

WEIGHT 2600 LBS. (1180 KGS)

HEADWIND COMPONENT 6 KTS

GROUND ROLL 975 FT. (297 m)

TOTAL LANDING DISTANCE (50 FT. OBSTACLE) 2005 FT. (611 m)



NOTE

FOR MAXIMUM PERFORMANCE LANDING DISTANCE - SEE SECTION IV.

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NOTE:

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

MODEL - M20J

AIRCRAFT SERIAL NO. _____

AIRCRAFT REGISTRATION NO. _____

Mooney Aircraft Corp. Approval Signature & Date

INTRODUCTION

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

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

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

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

The maximum certificated gross weight for the Model M20J under all operating conditions is 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 usable fuel 64.0 gal. (242.4 liters, 53.3 Imp. Gal.) @ 6 lb/gal = 384.0 lbs. (174.2 Kg.) (.72 Kg/l) from total weight as weighed, (use 5.82 lb/gal. (.69 Kg/l) for 100LL fuel).

OPTIONAL METHOD - Ground aircraft; then de-fuel tanks as follows:

- Disconnect fuel line at electric boost pump outlet fitting.
 - Connect to output fitting a flexible line that will reach fuel receptacle.
 - Turn fuel selector valve to the tank to be drained, and remove filler cap from fuel filler port.
 - Turn on boost pump until tank is empty.
- Repeat steps c. and d. to drain the other tank.
- Replace 1.25 gal. (4.7 liters, 1.0 Imp.Gal.) fuel @ 6.0 lb./gal. (.72 Kg/l) into each tank (unusable fuel). (Use 5.82 lb/gal. (.69 Kg/l) for 100LL fuel).
 - Replace filler caps.

- Fill oil to capacity-8 qts. (7.6 liters).
- Position front seats in full forward position.
- Position flaps in full up position.
- Position a 2000-pound (907.2 Kg.) capacity scale under each of the three wheels.

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.

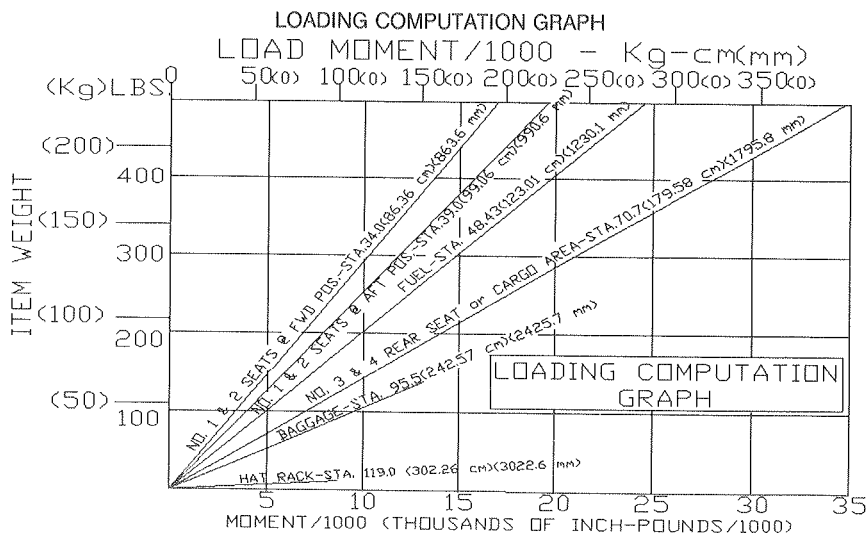
Step 5: Once more proceed as in Step 2 to account for the baggage to be carried and enter the figures in the proper columns.

Step 6: Total the weight columns. This total must be 2900 Pounds(1315 Kg) or less. Total the Moment/1000 column. DO NOT FORGET TO SUBTRACT NEGATIVE NUMBERS.

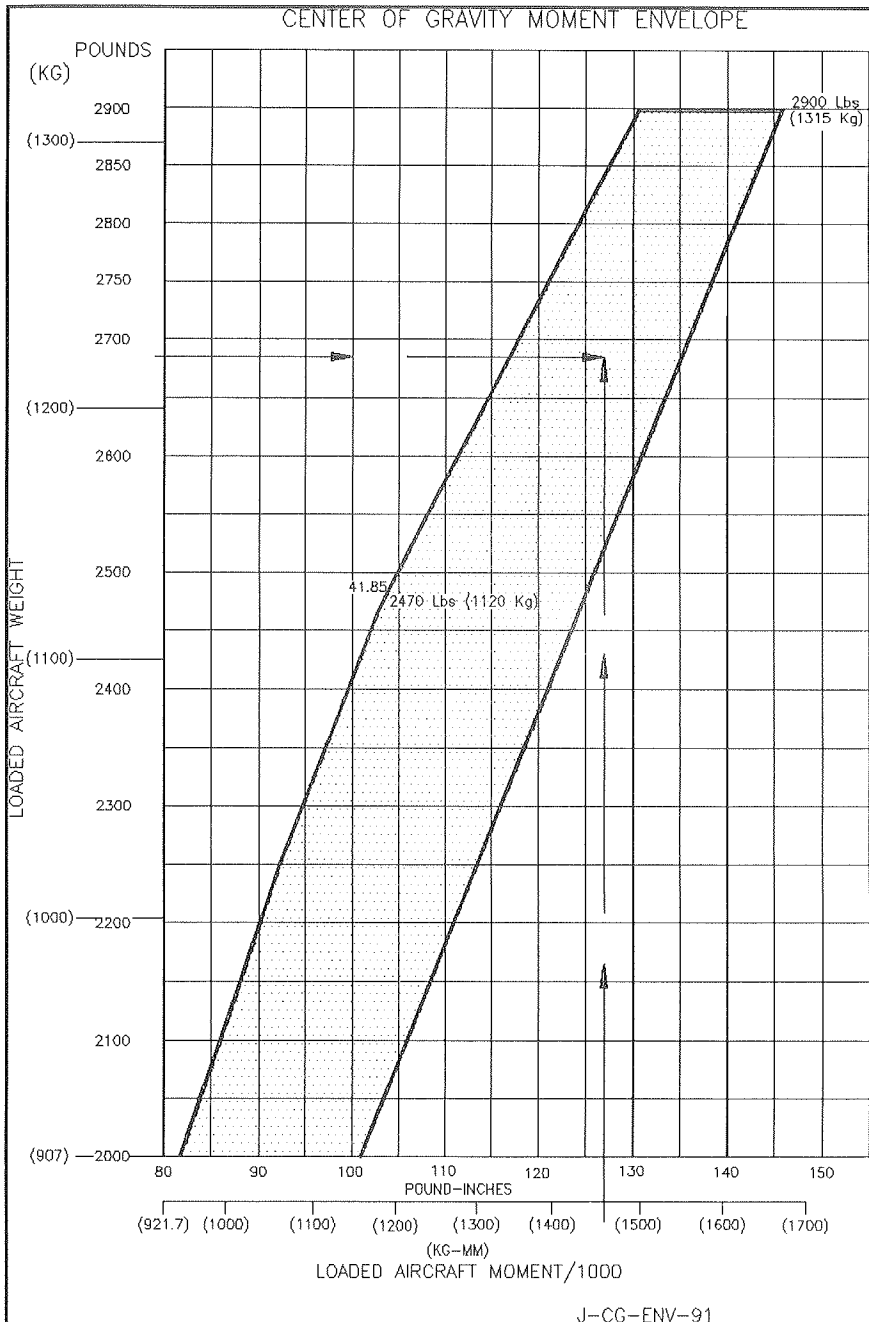
Step 7: Refer to the Center-of-Gravity Moment Envelope (page 6-8). Locate the loaded weight of your airplane on the left scale of the graph and trace a line horizontally to the right. Locate the total moment/1000 value for your airplane on the bottom scale of the graph and trace a line vertically above 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.

PROBLEM FORM					
STEP	ITEM	Sample Problem		Your Problem	
		WEIGHT Lbs. (Kg.)	MOMENT Lb.in/1000 (Kg.cm/1000)	WEIGHT Lbs. (Kg.)	MOMENT Lb.in/1000 (Kg.cm/1000)
1	A/C Basic Empty Wt.(W _T) (From page 6-5) (Includes Full Oil) 8 Qts.(7.6 Li)@Sta.11.5 (29.2 cm)(Oil sump assumed FULL for all flights)	1750 (793.79)	77.02 (887.38)		
2	Pilot Seat (#1) *	170 (77.11)	6.0/2nd pos (69.15)		
	Co-Pilot Seat (#2) *	170 (77.11)	5.78/Fwd (66.8)		
3	Left Rear Seat (#3) or Cargo Area	170 (77.11)	12.5 (144.4)		
	Right Rear Seat (#4) or Cargo Area				
4	Fuel (Max. Usable 64 Gal.(242.3 Li), 384 Lbs.(174.2 Kg) @ Sta. 48.43 (123.0 cm)	312.0 (141.5)	15.11 (174.14)		
5	Baggage (Max. 120 Lbs.)(54.43 Kg) @ Sta. 95.5 (242.57 cm)	110 (49.9)	10.23 (117.9)		
	Hat Rack (Max. 10 Lbs.)(4.54 Kg) @ Sta. 119.0 (302.26 cm)	3.0 (1.36)	.36 (4.15)		
6	Loaded Aircraft Weight	2685 (1218)			
	Total Moment/1000		127 (1463.7)		
7	Refer to Center of Gravity Moment Envelope to determine whether your A/C loading is acceptable.				
*	Obtain the moment/1000 value for each seat position(FWD, MID or AFT) from loading computation graph below.				

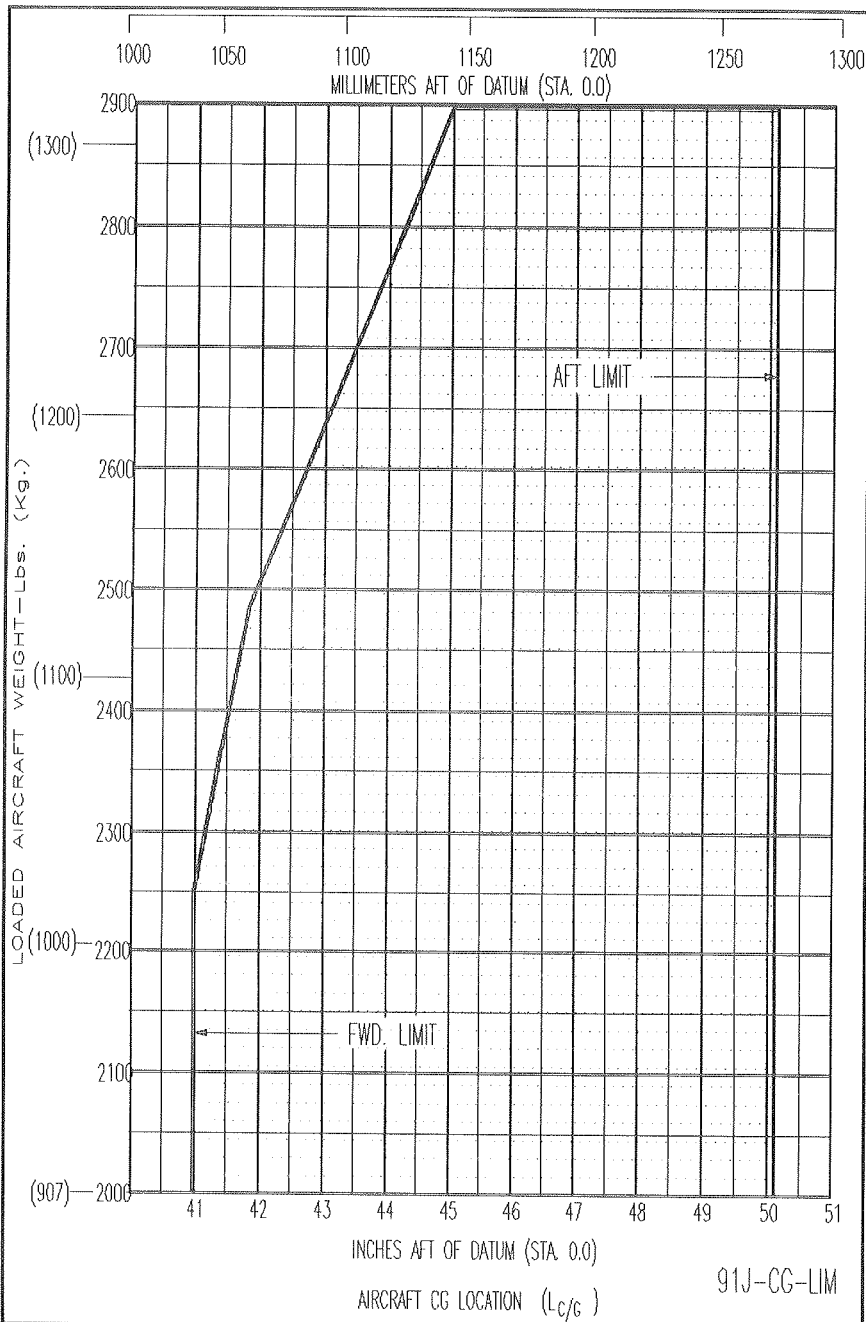
J-LD-PRB



CENTER OF GRAVITY MOMENT ENVELOPE



CENTER OF GRAVITY LIMITS ENVELOPE



EQUIPMENT LIST

The following equipment list is a listing of all items approved at the time of publication of this manual for the Mooney M20J.

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

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

| NOTE |

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

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

