



M20R
OVATION



EMERGENCY PROCEDURES



CONDITION RECOMMENDED SPEED

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ENGINE FAILURE AFTER TAKEOFF

Wing Flaps UP 85 KIAS
Wing Flaps DOWN 80 KIAS

BEST GLIDE SPEED

3368 lb/1528 kg 91.5 KIAS
3200 lb/1452 kg 89.0 KIAS
2900 lb/1315 kg 84.5 KIAS
2600 lb/1179 kg 80.0 KIAS

MANEUVERING SPEED

3368 lb/1528 kg 127 KIAS
3300 lb/1497 kg 126 KIAS
2430 lb/ 1102 kg 108 KIAS
2232 lb/1012 kg 103 KIAS

PRECAUTIONARY LANDING WITH ENGINE POWER

Flaps DOWN 75 KIAS

PRECAUTIONARY LANDING ABOVE 3200 LBS

Flaps DOWN 80 KIAS

EMERGENCY DESCENT (GEAR UP)

Smooth Air 196 KIAS

Turbulent Air

3368 lb/1528 kg 127 KIAS
3300 lb/1497 kg 126 KIAS
2430 lb/1102 kg 108 KIAS
2232 lb/1012 kg 103 KIAS

EMERGENCY DESCENT (GEAR DOWN)

Smooth Air 165 KIAS

Turbulent Air

3368 lb/1528 kg 127 KIAS
3300 lb/1497 kg 126 KIAS
2430 lb/1102 kg 108 KIAS
2232 lb/1012 kg 103 KIAS

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POWER LOSS - DURING TAKEOFF ROLL

POWER LOSS - AFTER LIFTOFF

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

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

NOTE
If high power is required, mixture may require enrichening.

POWER LOSS - IN FLIGHT (RE-START PROCEDURES)

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

After engine re-start:

| NOTE |

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

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

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

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

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

POWER LOSS - PRIMARY ENGINE INDUCTION AIR SYSTEM BLOCKAGE

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

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

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

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

[NOTE]

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

Throttle	INCREASE as desired
Propeller	INCREASE as required
Mixture	RELEASE to desired EGT
Flight	CONTINUE - request altitude with warmer air, if able.

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

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

After engine re-start:

Throttle	ADJUST as required
Propeller	ADJUST as required
Mixture	RELEASE as required for power setting
LOW Boost Pump Switch	OFF

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

ENGINE ROUGHNESS

Engine Instruments	.....	CHECK
Fuel Selector	.....	OTHER TANK
Mixture	.....	READJUST for smooth operation
Magneto/Starter Switch	.....	Select R or L or BOTH

If roughness disappears on single magneto, monitor power and continue on selected magneto.

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

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

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

HIGH CYLINDER HEAD TEMPERATURE

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

HIGH OIL TEMPERATURE

[NOTE]

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

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

PREPARE FOR POSSIBLE ENGINE FAILURE IF TEMPERATURE CONTINUES HIGH.

LOW OIL PRESSURE

Oil temperature and pressure gauges	.....	Monitor
Pressure below 10 PSI	.....	EXPECT ENGINE FAILURE,

..... proceed to **FORCED LANDING EMERGENCY**.

ENGINE DRIVEN FUEL PUMP FAILURE

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

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

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

HIGH BOOST Pump (guarded switch)	ON
Throttle	CRUISE Position or as required for engine operation
Mixture	ADJUST for smooth engine operation.

LAND AS SOON AS PRACTICABLE & CORRECT MALFUNCTION.

FUEL VAPOR SUPPRESSION (Fluctuating Fuel Flow)

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

FIRES

ENGINE FIRE - DURING START ON GROUND

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

ENGINE FIRE - IN FLIGHT

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

NOTE

If fire is not extinguished, attempt to increase airflow over engine by increasing glide speed. Proceed with **FORCED LANDING EMERGENCY**. DO NOT attempt an engine restart.

If necessary, use fire extinguisher to keep fire out of cabin area.

ELECTRICAL FIRE - IN FLIGHT (Smoke in Cabin)

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

Alternator Field Switch	OFF
Cabin Ventilation	OPEN
Heating Controls	CLOSED
Circuit Breakers	CHECK to identify faulty circuit if possible

LAND AS SOON AS POSSIBLE.

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

Master Switch	ON
Alternator Field Switch	ON

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

EMERGENCY DESCENT PROCEDURE

In the event an emergency descent from high altitude is required, rates of descent of at least 3,000 feet per minute can be obtained in two different configurations:

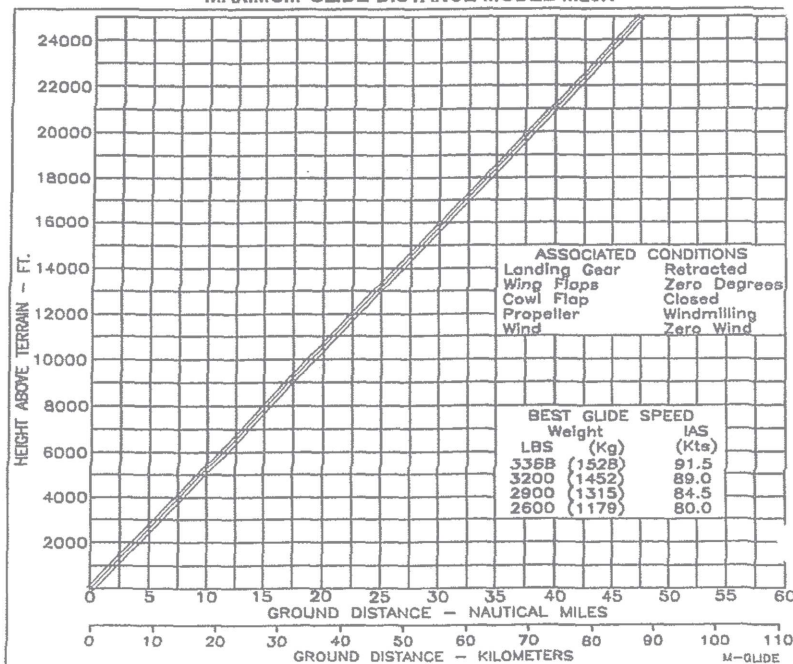
- (1) With landing gear and flaps retracted, an airspeed of 196 KIAS will be required for maximum rate of descent.
- (2) With the landing gear extended and flaps retracted an airspeed of 165 KIAS will also give approximately the same rate of descent. At 165 KIAS and the gear extended, the angle of descent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

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

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

GLIDE

MAXIMUM GLIDE DISTANCE MODEL M20R



NOT INTENDED FOR REAL FLIGHTS.

FORCED LANDING EMERGENCY

GEAR RETRACTED OR EXTENDED

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

OVERWEIGHT LANDING PROCEDURES

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

Approach Airspeed 80 KIAS

Use a flatter approach angle than normal, with power as necessary until a smooth touch-down is assured.

Expect landing distance over a 50 feet obstacle to increase at least 600 ft.

Conduct Gear and Tire Servicing Inspection as required.

SYSTEMS EMERGENCIES

PROPELLER

PROPELLER OVERSPEED

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

FUEL

LOW FUEL FLOW

Check mixture	ENRICH
Fuel Selector	SWITCH TANKS

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

ELECTRICAL

ALTERNATOR OVERVOLTAGE

(Alternator warning light illuminated steady and Alternator Field circuit breaker tripped.)

Alternator Field Circuit Breaker	RESET
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If circuit breaker will not reset, the following procedures are required:

SPINS

///WARNING///

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

---NOTE---

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

INTENTIONAL SPINS ARE PROHIBITED.

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

Throttle	.	.	.	.	.	.	.	.	.	.	.	RETARD to IDLE
Ailerons	.	.	.	.	.	.	.	.	.	.	.	NEUTRAL
Rudder	.	.	.	.	.	.	.	.	.	.	.	Apply FULL RUDDER opposite direction of spin
Control Wheel	.	.	.	.	.	.	.	.	.	.	.	FORWARD of neutral in a brisk motion

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

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

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



M20R
OVATION



NORMAL PROCEDURES



SPEEDS FOR NORMAL OPERATION

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

TAKEOFF:

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

ENROUTE CLIMB, GEAR and FLAPS UP:

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

LANDING APPROACH (3200 lbs.):

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

BALKED LANDING (3200 lbs.):

Maximum Power, Flaps 10 degrees	85 KIAS
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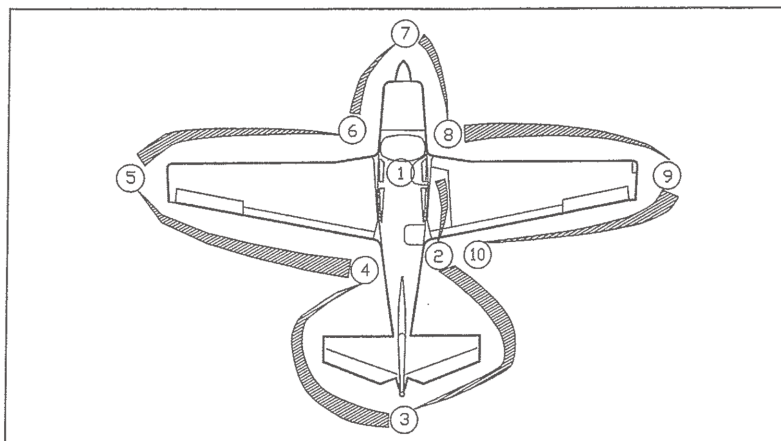
MAXIMUM RECOMMENDED TURBULENT AIR PENETRATION SPEED:

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

DEMONSTRATED CROSSWIND VELOCITY:

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

(See CROSSWIND COMPONENT CHART, SECTION V)



PREFLIGHT INSPECTION

1. Cockpit -	
Gear Switch	DOWN
Magneto/Starter Switch	OFF
All Rocker Switches	OFF
Master Switch	ON
All Circuit Breakers	IN
Battery Select Switch	SELECT from 1 to 2 or 2 to 1.
	CHECK Voltmeter after each selection. Leave on Battery with highest voltage.
Internal/External Lights	CHECK operation
	(Check for ammeter fluctuations as each light is checked)
Pitot Heat Switch	ON
	(Check Pitot Heat annunciator light illuminated BLUE *)
Fuel Quantity Gauges	CHECK QTY
Fuel Selector	
	It is recommended that wing tank sumps be drained prior to draining gascolator.
	Rt. Tank: Pull Gascolator ring (5 seconds)
	Lt. Tank: Pull Gascolator ring (5 seconds)
Oxygen Supply Control Knob (if installed)	OFF
Oxygen Pressure Gauge	CHECK

Also check that face masks and hoses are accessible and in good condition.

2. Right Fuselage/Tailcone	
Oxygen Filler Access Door and Filler Cap	SECURED
Battery # 2 Access Panel	SECURED
Instrument Static Pressure Port.	UNOBSTRUCTED
General Skin Condition	INSPECT
Tailcone/Emppennage Access Panel	SECURED
Tail tiedown rope/chain	REMOVE
3. Emppennage	
Elevator and rudder attach points and control linkage attachments	INSPECT
Emppennage Freeplay-Vertical/Horizontal	INSPECT
General skin condition	INSPECT
	Remove ice, snow, or frost.

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

4. Left Fuselage/Tailcone		
Cabin Fresh Air Vent (Dorsal Fin)		UNOBSTRUCTED
Tailcone/Empennage Access Panel		SECURED
Instrument Static Pressure Port		UNOBSTRUCTED
Avionics/Battery # 1 Access Panel		SECURED
Auxiliary Power Plug Access Door		SECURED
Static System Drain	PUSH Plunger UP, (Hold 3-5 Seconds)	
General Skin Condition		INSPECT
5. Left Wing		
General Skin Condition	INSPECT-Remove ice, snow, or frost.	
Wing Flap & attach points		INSPECT
Aileron & attach points		INSPECT
Control linkages		INSPECT
Wing Tip, Lights and Lens		INSPECT
Fuel Tank Vent		UNOBSTRUCTED
Pitot Tube		UNOBSTRUCTED/SECURED
		(Heat element Operative)
Landing/Taxi Lights		INSPECT Lens & Bulbs
Stall Switch Vane		CHECK operation
Fuel Tank	CHECK QUANTITY/SECURE CAP	

| NOTE |

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

Tiedown rope/chain		REMOVE
Wheel chock		REMOVE
Left Main Landing Gear, shock discs, tire & doors		INSPECT
Fuel Tank Sump Drain		DRAIN
Use sampler cup to VERIFY fuel is free of water, sediment & other contamination; VERIFY proper fuel (BLUE/100LL)(GREEN/100 octane).		

~CAUTION~

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

	VERIFY drain closes and does not leak.	
Pitot System Drain	PUSH plunger UP, (Hold for 3-5 seconds)	
6. Left Cowl Area		
Windshield		CLEAN
Cabin Air Inlet		UNOBSTRUCTED
Left Side Engine Cowl Fasteners		SECURED
Exhaust Pipes		INSPECT SECURED
Engine Oil Filler Door		OPEN & INSPECT AREA

| NOTE |

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

Engine Oil		CHECK QUANTITY
		8 Qts.(7.57 l)
Engine Oil Filler Door		CLOSE & SECURE
Cooling Air Inlet		Verify UNOBSTRUCTED
7. Propeller/Spinner & Front Cowl Area		
Propeller/Spinner	INSPECT for nicks, cracks, oil leaks/rotational movement.	
Prop De-Ice Boots (if installed)		INSPECT condition
Induction Air Inlet/Filter		UNOBSTRUCTED
Nose gear, shock discs, tire & doors		INSPECT
Wheel chock		REMOVE

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

9. Right Wing

Fuel Tank Sump Drain		DRAIN
Use sampler cup to VERIFY fuel is free of water, sediment & other contamination.		
	VERIFY proper fuel (BLUE/100LL) (GREEN/100 octane).	
	SEE CAUTION on diesel fuel on previous page	
	VERIFY drain closes and does not leak.	

Right main gear, shock discs, tire & doors		INSPECT
Wheel chock		REMOVE
General Skin Condition	INSPECT	Remove ice, snow and frost.
Fuel Tank	CHECK QUANTITY/SECURE CAP	

NOTE

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

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

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

RETURN TO COCKPIT — MASTER/ROCKER SWITCHES OFF

BEFORE STARTING CHECK

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

RED Emergency Gear Extension Handle	DOWN AND LATCHED
Internal Lights	OFF
Passenger Briefing	COMPLETED
(Emergency and general information briefing)	

Obtain local information prior to engine start.

ENGINE START

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

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

| NOTE |

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

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

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

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

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

| NOTE |

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

| NOTE |

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

| NOTE |

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

Throttle	IDLE 600 - 700 RPM
* Engine Oil Pressure	CHECK in GREEN ARC
	If minimum oil pressure (10 PSI) is not indicated within 30 seconds, accomplish engine shutdown procedures.
Low Fuel Boost Pump Switch	OFF
* Ammeter	CHECK
	Turn LDG LT ON & observe Negative movement of needle.
* Interior/Exterior Lights	AS DESIRED
* Engine Instruments	CHECKED
* Fuel Flow Indicator	TEST/RESET (if desired)
* Throttle	900/1000 RPM
* Mixture	ADJUST FOR SMOOTH OPERATION

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

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

FLOODED ENGINE START

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

SEE ENGINE START PROCEDURES ABOVE * FOR REMAINING SEQUENCES.

WARM ENGINE START

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

SEE ENGINE START PROCEDURES ABOVE * FOR REMAINING SEQUENCES.

HOT ENGINE START

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

SEE ENGINE START PROCEDURES ABOVE * FOR REMAINING SEQUENCES.

BEFORE TAXI

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

BEFORE TAXI (con't.)

Stand-by vacuum operational indicator red button - NOT VISIBLE	OFF
STBY VAC Switch	Normal Operation
Instruments	CHECKED and SET
Radios	SET
Altimeter	SWITCH TANKS verify engine runs on other tank
Fuel Selector	AS DESIRED
Cabin Heat	AS DESIRED
Defroster	AS DESIRED
Cabin Vent	AS DESIRED
Optional Equipment Checks	Reference SECTION IX.

TAXI

Before Taxi Checklist	COMPLETED
Rudder Trim	AS DESIRED

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

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

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

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

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

BEFORE TAKEOFF

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

NOTE

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

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



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

TAKEOFF

Proper engine operation should be checked early in the takeoff roll. Any significant indication of rough or sluggish engine response is reason to discontinue takeoff. When takeoff must be made over a gravel surface, it is important that the throttle be applied **SLOWLY**. This will allow the aircraft to start rolling before high RPM is developed, and gravel or loose material will be blown back from the propeller area instead of being pulled into it.

TAKEOFF (NORMAL)

Power	FULL THROTTLE (2500 RPM)
Annunciator	CHECK
Engine Instruments	CHECK for proper indications
Lift Off/Climb Speed	CHECK
Landing Gear	RETRACT IN CLIMB after clearing obstacles.
Wing Flaps	UP

NOTE

If maximum performance takeoffs are desired obtain full power before brake release.

CLIMB

CLIMB (CRUISE)

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

CLIMB (BEST RATE)(V_y)

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



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

Leaning may be required during CLIMB depending on atmospheric conditions.

CRUISE

[NOTE]

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

Airspeed	.....	ACCELERATE to cruise airspeed
Throttle	.....	SELECTED SETTING
(Ref. CRUISE PERFORMANCE CHARTS in SECTION 5)		

[NOTE]

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

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

[NOTE]

Cruise operation at BEST POWER will result in a substantial increase in fuel flow, greatly decreasing range and endurance;

Engine instruments		CHECK
--------------------	-------	-------

[NOTE]

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

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

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

FUEL TANK SELECTION

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

OXYGEN SYSTEM

(OPTIONAL EQUIPMENT)

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

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

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

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

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

| NOTE |

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

Oxygen Supply Control Knob	ON.
Face Mask Hose Flow Indicator	CHECK
Delivery Hose	UNPLUG from outlet when discontinuing use of oxygen.
Oxygen Supply Control Knob	OFF - when oxygen is no longer required.

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

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

DESCENT

| NOTE |

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

NORMAL DESCENT - GEAR UP

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

| NOTE |

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

~ CAUTION ~

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

NORMAL DESCENT - GEAR DOWN

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

| NOTE |

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

APPROACH FOR LANDING

~ CAUTION ~

The airplane must be within allowable weight and balance envelope for landing. It will require a minimum of one hour of flight before a permissible landing weight is attained when takeoffs are made at maximum gross weight. If landing at a weight exceeding maximum landing weight (3200 Lbs.)(1452 Kgs.)

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

~ CAUTION ~

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

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

| NOTE |

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

GO AROUND (BALKED LANDING)

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

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

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

LANDING

LANDING (NORMAL)

Approach for Landing Checklist	.....	COMPLETED
Approach Airspeed	.....	CHECK
Touchdown	.....	MAIN WHEELS FIRST (aligned w/ runway)
Landing Roll	.....	LOWER nose wheel gently
Brakes	.....	MINIMUM required

| NOTE |

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

| NOTE |

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

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

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

TAXI AFTER LANDING

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

[illegible]

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

TIE DOWN AIRCRAFT at wing and tail points.



M20R
OVATION



PERFORMANCE

STALL SPEED VS. ANGLE OF BANK

STALL SPEED VS. ANGLE OF BANK										
ASSOCIATED CONDITIONS: FORWARD C.G. POWER IDLE			WEIGHT LANDING GEAR FLAPS			3000 LBS (1361 KGS) DOWN 10°			ANGLE OF BANK	
NOTE: UP TO 500 FEET ALTITUDE LOSS MAY OCCUR DURING STALLS AT MAXIMUM WEIGHT			EXAMPLE:			ANGLE OF BANK			STALL SPEED	
									72.5 KCAS (73.0 KIAS)	
GROSS WEIGHT	GEAR AND FLAP POSITION	ANGLE OF BANK								
		0°		30°		45°		60°		
		KCAS	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS	KIAS	
3368 LBS (1528 KGS)	GEAR UP, FLAPS 0°	66.0	66.0	71.0	71.5	78.5	79.0	93.5	94.0	
	GEAR DOWN, FLAPS 10°	64.5	65.0	69.5	69.5	76.5	77.5	91.0	92.0	
	GEAR DOWN FLAPS 33°	59.0	59.0	63.5	63.5	70.0	70.0	83.5	84.5	
3000 LBS (1361 KGS)	GEAR UP, FLAPS 0°	62.5	62.5	67.0	67.5	74.5	75.0	88.5	89.5	
	GEAR DOWN, FLAPS 10°	61.0	62.0	65.5	65.5	72.5	73.0	86.5	87.5	
	GEAR DOWN FLAPS 33°	55.5	55.5	59.5	59.5	66.0	66.0	78.5	79.5	
2700 LBS (1225 KGS)	GEAR UP, FLAPS 0°	59.0	59.5	63.5	64.0	70.0	70.5	83.5	84.0	
	GEAR DOWN, FLAPS 10°	58.0	58.0	62.5	62.5	69.0	69.0	82.0	83.0	
	GEAR DOWN FLAPS 33°	53.0	53.0	57.0	57.0	63.0	63.0	75.0	76.0	

CRUISE POWER SETTINGS AND FUEL FLOWS

EXAMPLE:

M20R CRUISE POWER SETTINGS AND FUEL FLOWS

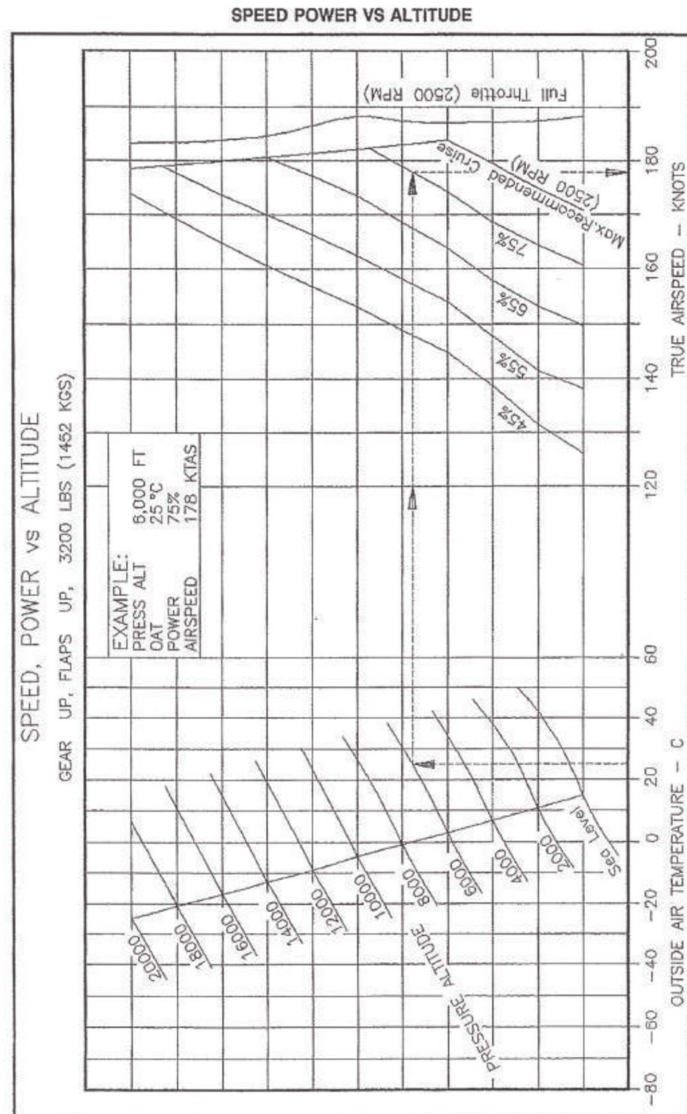
Cruise Alt. 8000 ft.
OAT 9° C (SEE NOTE)
Power Setting Desired 75%

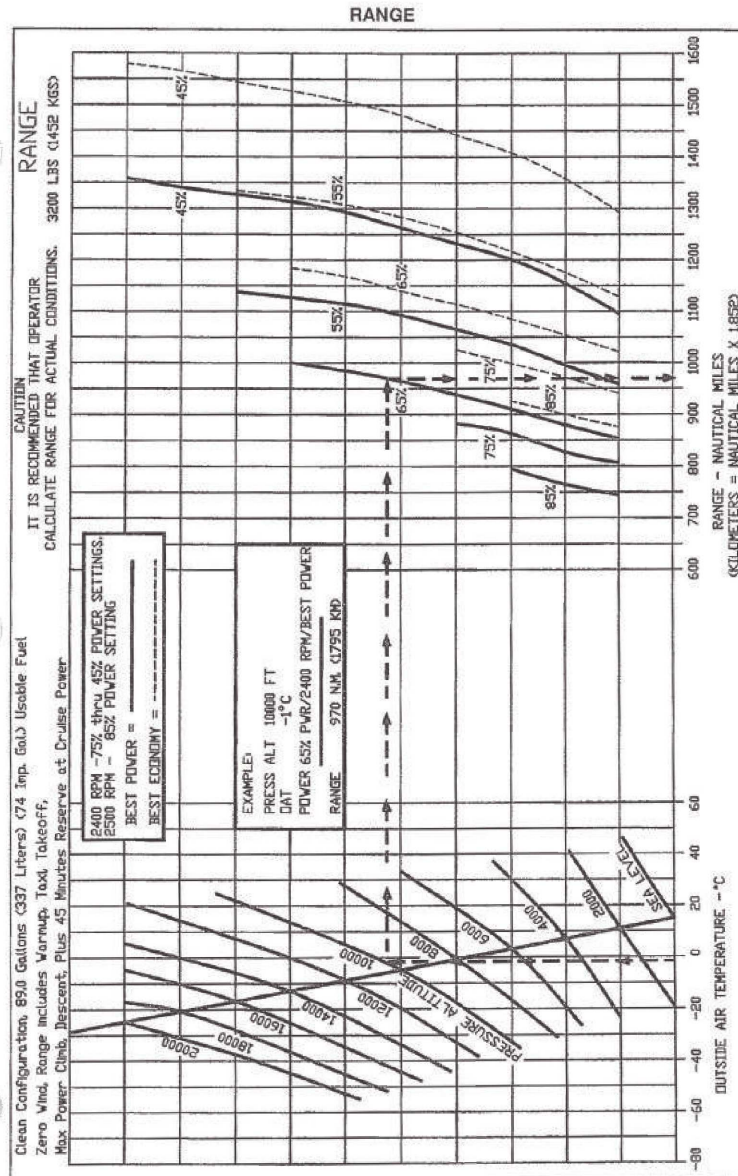
1. BEST POWER is 50 °F Rich of Peak. 2. ECONOMY CRUISE is 50 °F Lean of Peak.

RPM/MP Fuel Flow	2400/22.9 15.6 (Best Power)	Max. Recommended	MANIFOLD PRESSURE — INCHES OF MERCURY												
			75% Power 210 HP	65% Power 182 HP	55% Power 154 HP	45% Power 126 HP									
Pressure		2400	2500	2300	2400	2500	2300	2400	2500	2300	2400	2500	2300	2400	2500
Altitude	Best ECON.	15.2	15.3	13.5	13.6	13.7	11.8	11.9	12.0	10.0	10.1	10.2	8.2	8.3	8.4
Fuel Flow	Best POWER	17.5	17.6	15.5	15.6	15.7	13.9	14.0	14.1	11.7	11.8	11.9	9.6	9.7	9.8
Std. Day															
S. L.	15°C 59°F	27.0	26.2	25.3	24.3	23.0	22.4	21.4	20.3	19.5	18.6	17.7	16.6	15.8	15.0
2,000	11°C 52°F	27.0	25.7	24.8	23.8	22.6	22.0	21.1	20.0	19.1	18.2	17.3	16.2	15.4	14.6
4,000	7°C 45°F		25.2	24.2	23.2	22.3	21.7	20.8	19.7	18.7	17.7	16.8	15.7	14.9	14.3
6,000	3°C 38°F		24.7	23.6	22.8	22.0	21.2	20.3	19.2	18.2	17.2	16.3	15.3	14.6	14.0
8,000	-1°C 31°F			22.5	21.7	20.7	19.8	18.7	17.7	16.8	16.0	14.9	14.2	13.7	
10,000	-5°C 23°F					20.2	19.3	18.2	17.2	16.4	15.8	14.6	13.9	13.4	
12,000	-9°C 16°F						19.5	18.7	17.9	16.7	16.0	15.6	14.3	13.6	13.1
14,000	-13°C 9°F							18.1	17.7	16.3	15.8	15.4	14.0	13.3	12.9
16,000	-17°C 2°F									16.1	15.6	15.2	13.7	13.0	12.7
18,000	-21°C -5°F											15.0	13.5	12.8	12.5
20,000	-25°C -12°F												13.3	12.6	12.3

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

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







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

V / SPEED		KCAS/KIAS	REMARKS
V _{NE}	Never Exceed Speed	196/195	Do not exceed this speed in any operation.
V _{NO}	Maximum Structural Cruising Speed	175/174	Do not exceed this speed except in smooth air, and then only with caution.
V _A	Maneuvering Speed at:		
	lbs. /Kg.		
	2232/1012	104/103	Do not make full or abrupt control movement above this speed.
	2430/1102	109/108	
	3300/1497	127/126	
	3368/1528	128/127	
V _{FE}	Maximum Flap Extended Speed	111/110	Do not exceed this speed with flaps in full down position.
V _{LE}	Maximum Landing Gear Extended Speed	166/165	Maximum speed at which the aircraft can be safely flown with the landing gear extended.
V _{LO} (EXT)	Max. Speed for Gear Extension	141/140	Max. speed at which the landing gear can be safely extended.
V _{LO} (RET)	Max. Speed for Gear Retraction	107/106	Maximum speed at which the landing gear can be safely retracted.
	Maximum Pilot Window Open Speed	133/132	Do not exceed this speed with pilot window open.

NOT INTENDED FOR REAL FLIGHTS.

Altitude Preselector

Select the desired altitude using the MOUSE WHEEL, turn the outer knob for 1000s and inner knob for 100s then press the ALT ARM button for pursuing a selected altitude.

When you select an altitude and press the ALT ARM button, the aircraft will climb or descent to that altitude at 500ft/min, you can change this value by pulling the inner knob and move the mousewheel on VC or hovering over the inner knob of **VS** view and moving the mousewheel.

If you select VS ENG the aircraft will climb or descent to the desired vertical speed and will not stop at any altitude.

When the ALT button in the AP control panel is pressed, all setting will be erased and the aircraft will perform an altitude hold.



(Use the MOUSE WHEEL for selecting the desired altitude).

NOT INTENDED FOR REAL FLIGHTS.



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