HOT ENGINE START (CON'T.)

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

TAXI

Before Taxi Checklist . . . . . COMPLETED

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)

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~ CAUTION ~
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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 . . . . . 1700 RPM

BEFORE TAKEOFF (CON'T.)

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
Wing Flaps . . . . . CHECK operation.
SET AT TAKEOFF position (10 Degrees)
Flight Controls . . . . . CHECK free and correct movement
Cabin Door . . . . . CHECK SECURED
Seats, Seat Belts and Shoulder Harness . . . . . SECURED
Avionics and Auto Pilot . . . . . CHECK - (Refer to SECTION IX)
Annunciator Lights . . . . . CHECK
Internal/External Lights. . . . . AS DESIRED
Strobe Lights/Rotating Beacon . . . . . ON
Pilots Window. . . . . CLOSED
Emergency Gear Extension (RED) Handle . . . . . DOWN & LATCHED

Oil Temperature . . . . . 75°F (24°C) minimum
CHT . . . . . 250°F (121°C) minimum
Parking Brake . . . . . RELEASE

The preferred range of operation for engine OIL TEMPERATURE is between 100° & 170°F.

The typical operating range of engine OIL PRESSURE that will be seen is between 30 & 60 PSI.

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** (2400 RPM)
Annunciator . . . . . CHECK
Engine Instruments . . . . . CHECK for proper indications
Lift Off/Climb Speed . . . . . As specified in SECTION V (Takeoff Distance)
Landing Gear . . . . . **RETRACT IN CLIMB** after clearing obstacles.
Wing Flaps . . . . . UP

| **NOTE** |

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

Stabilizer Trim System

To provide pitch trim control, the entire empennage pivots around its main hinge points. The system consists of a manually operated (electrical operation optional) actuator that operates a series of torque tubes and universal joints connected to a jack screw on the aft tailcone bulkhead. A trim control wheel, located between pilot and co-pilot seats, allows pilot to set stabilizer trim angle. Trim position is indicated by an electrical gauge (LED) located in the center flight panel. The indicator is controlled by a potentiometer. This indicates stabilizer position relative to the aircraft thrust line.

Rudder Trim System

The M20S is NOT available with a factory installed Electric Rudder Trim System.

Wing Flaps

The wing flaps are electrically operated and interconnected through a torque tube and bellcranks. Total flap area is 17.98 square feet.
Nominal travel is 0 to 33°. Limit switches prevent travel beyond these limits. Wing flap position is controlled by a pre-select switch located on the lower center console. Located on the center flight panel is a flap position indicator showing which pre-select position has been selected: full up, takeoff (10°) or full down positions. A potentiometer controls the flap position indicator (LED). Generally, aircraft trim requirements will change with use of the flaps. Lowering of the flaps will cause a **nose down** pitching condition which can be easily corrected by application of nose up trim. Conversely, retraction of the flaps, from a trimmed flight condition, will cause a **nose up** pitching condition. Use of flaps should always be within the operational limits established in SECTION II. The flaps are very effective in lowering landing speed and can be used to slow the aircraft to approach speeds.

INSTRUMENT PANEL

The instrument panel is designed to provide functional grouping of all flight, radio, engine instruments, switches and controls required to operate various systems. All flight instruments are grouped on the shock-mounted panel directly in front of the pilot. Power plant instruments are grouped into two clusters and located to the right of the flight instruments. The radio panel is in two sections, slightly left and forward of co-pilot's seat. The annunciator panel and optional radio console are on the left section of the radio panels. The circuit breaker panel is located on the far right, in front of the co-pilot's seat.

FLIGHT PANEL & INSTRUMENTS

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

1. **CLOCK** -- The electric, digital, panel mounted Model 800 clock, may be used and set by the following procedures:

The SEL button selects what is to be displayed on the four digit window and the CTL button controls what is being displayed. Pressing select sequentially selects GMT, Local Time , Elapsed Time and back to GMT. The control button starts and resets Elapsed Time when momentarily pushed . Normal operation of the M800 cannot accidentally reset time.

SETTING GMT
Select GMT for display in the four digit window with the SEL button. Simultaneously press both the select and control buttons to enter the set mode. The tens of hurs digit will start flashing. The control button has full control of the flashing digit and each button push increments the digit. Once the tens of hours is set, the select button selects the next digit to be set. After the last digit has been selected and set with the control button, a final push of the select button exits the mode. The lighted annunciator will resume its normal flashing, indicating the GMT clock is running.

SETTING LOCAL TIME
Select Local Time, (LT) using the SEL button. Simultaneously push the SEL and CTL buttons to enter set mode. The tens of hours digit will start flashing. The set operation is the same as GMT, except that minutes are already synchronized with the GMT clock and cannot be set in Local Time.

TEST MODE-- Hold SEL button down for three seconds and the display will indicate 88:88 and activate all four annunciators.

All pilots should check the weather and use good judgment in planning flights. The VFR pilot should use extra caution in avoiding low visibility conditions.

Motion sickness often precedes or accompanies disorientation and may further jeopardize the flight.

STALLS, SPINS AND SLOW FLIGHT

Stalls, and slow flight should be practiced at safe altitudes to allow for recovery. Any of these maneuvers should be performed at an altitude in excess of 6,000 feet above ground level. Spins may be dangerous and should be avoided. In fact, most airplanes are placarded against intentional spins. Spins are preceded by stalls. A prompt and decisive stall recovery protects against inadvertent spins. All airplanes are required to have flight characteristics that give adequate advance warning of an impending stall or they must be equipped with an artificial stall warning device. Keep the artificial system in good working order. Do not operate the airplane with the device made inoperative by the use of circuit breakers or other means.

Stalls should be practiced at safe altitudes for ample recovery. Should a spin be encountered inadvertently, spin recovery should be initiated immediately.

As stall attitude is approached, be alert. Take prompt corrective action to avoid the stall or if you are practicing stalls, react the moment the stall occurs. The following is suggested:

1. Do not carry passengers. Be certain that the airplane's center of gravity is as far forward as possible. Forward CG aids spin recovery.
2. Be certain that both student pilot and instructor pilot have a full set of operable controls.
3. Conduct such practice at altitudes in excess of 6,000 ft. above ground level.

Remember that an airplane at or near traffic pattern altitude probably will not recover from a spin before impact with the ground. When descending to traffic pattern altitude and during operation in the traffic pattern and approach, maintain a safe margin above stall speed. During takeoff or go- around, be especially careful to avoid departure stalls associated with turns at low speed. Maintain speeds recommended in this handbook(Section II & V).

STANDARD PROCEDURE FOR SPIN RECOVERY

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** the direction of spin.
Control Wheel	**FORWARD** of neutral in a brisk motion to break stall.
	Additional **FORWARD** elevator control may be required if rotation does not stop.
Flaps (If extended)	**RETRACT** as soon as possible
Rudder	**NEUTRALIZE** when spin stops**.**
Control Wheel	Smoothly **MOVE AFT** to bring the nose up to a level flight attitude **after spin has stopped.**

VORTICES - WAKE TURBULENCE

Every airplane generates wakes of turbulence while in flight. Part of this is from the propeller or jet engine and part from the wing tip vortices. The larger and heavier the airplane the more pronounced wake turbulence will be. Wing tip vortices from large heavy airplanes are very severe at close range, degenerating with time, wind and space. These are rolling in nature from each wing tip. In test, vortex velocities of 133 knots have been recorded.
Exhaust velocities from large airplanes at takeoff have been measured at 25 mph, 2100 feet behind medium, large airplanes.

Encountering the rolling effect of wing tip vortices within two minutes or less after passage of large airplanes is hazardous to light airplanes. This roll effect can exceed the maximum counter roll obtainable in an airplane.

The turbulent areas may remain for as long as three minutes or more, depending on wind conditions, and may extend several miles behind the airplane. Plan to fly slightly above or to the upwind side of the other airplane's flight path.