UNITED STATES AIR FORCE
AERO CLUB PROGRAM

T-41A
OPERATOR'S
MANUAL

AIR FORCE MANPOWER & PERSONNEL CENTER

USAF
SERVICES
Combat Support & Community Service

DESIGNED FOR INFORMATIONAL USE

CONTENTS

INTRODUCTION

SCOPE

This study guide contains the necessary information for safe and efficient operation of the T-41A. These instructions provide you with a general knowledge of this aircraft, its characteristics, and specific normal and emergency procedures.

SOUND JUDGMENT

This study guide provides the best possible operating instructions under most circumstances, but it is not a substitute for sound judgment. Multiple emergencies, adverse weather, terrain, etc., may require modification of the procedures.

WARNINGS, CAUTIONS, AND NOTES

The following definitions apply to "Warnings," "Cautions," and "Notes" found throughout this study guide.

WARNING

Operating procedures, techniques, etc., which may result in personal injury or loss of life if not carefully followed.

CAUTION: Operating procedures, techniques, etc., which may result in damage to equipment if not carefully followed.

NOTE: An operating procedure, technique, etc., which is considered essential to emphasize.

Section I

DESCRIPTION

CONTENTS

THE AIRCRAFT

The T-41A, designed and manufactured by Cessna Aircraft Company, is an all metal, single-engine, strut-braced, high wing monoplane. Distinguishable features of the aircraft are its single engine placed forward on the fuselage centerline and fixed tricycle landing gear. The propeller is all metal, fixed pitch, and designed for best climb. Aircraft are generally configured with two forward side-by-side seats with the capability of conversion to four place seating.

Dimensions

The overall dimensions of the aircraft are as follows: (Figure 1-1)

Wing Span	36′	2″
Height	8′	11″
Length	26′	6″
Wheel Base	7′	2″
Propeller	6′	4″

Gross Weight

This aircraft is FAA-certified in both the normal and utility categories. Maximum gross weights are as follows:

Normal	2,300 pounds
Utility	2,000 pounds

Refer to Section V, Weight Limitations, for additional information.

ENGINE

The aircraft is powered by a horizontally-opposed, six-cylinder Continental model 0-300-D engine, rated at 145 bhp at 2,700 rpm. Engine controls are of the push-pull type including the throttle, carburetor heat knob, and mixture control. The controls are mounted side by side in the lower center portion of the control panel. (Figures 1-2 and 1-5)

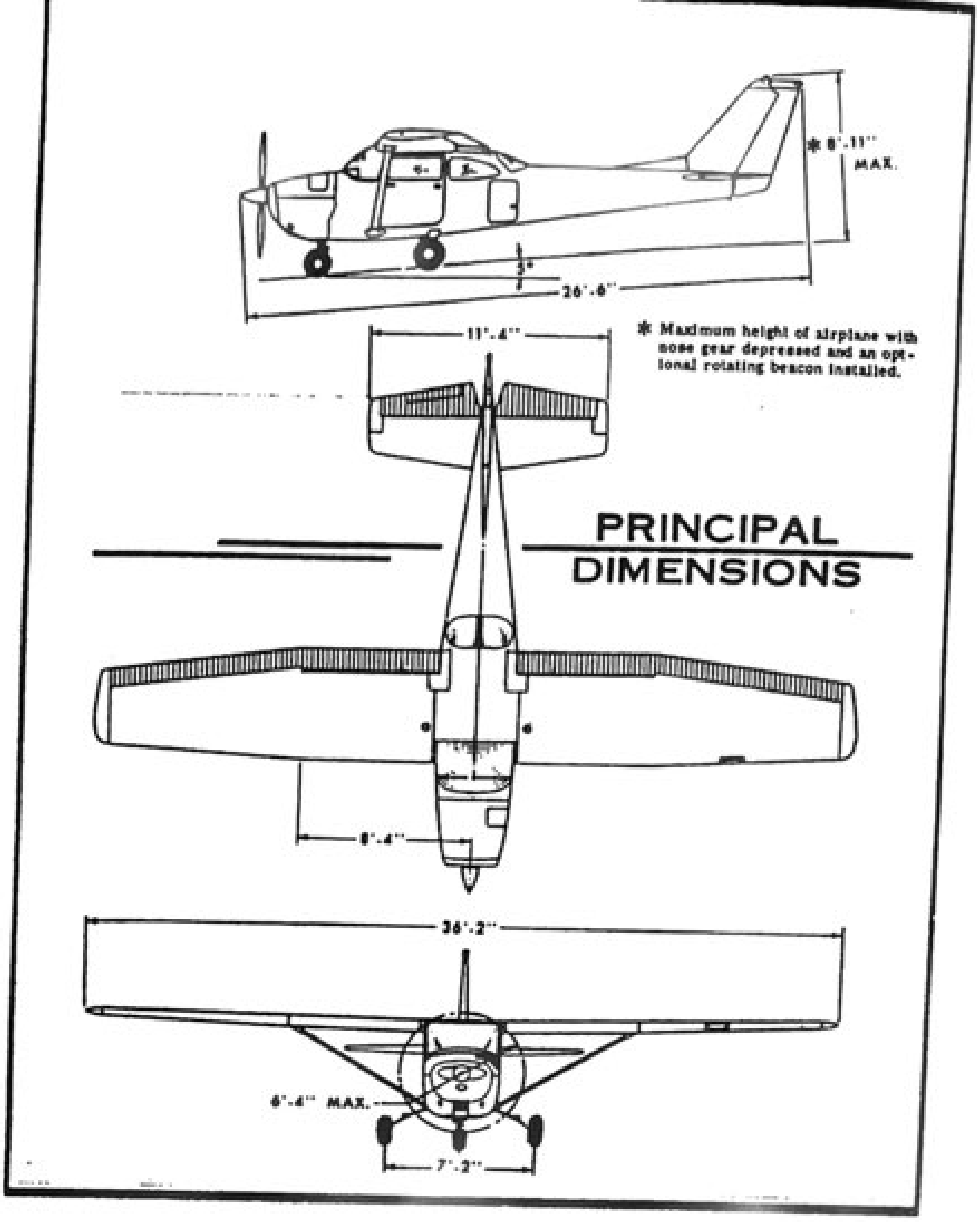


Figure 1-1: Aircraft Dimensions

hrottle (Figures 1-2 and 1-5)

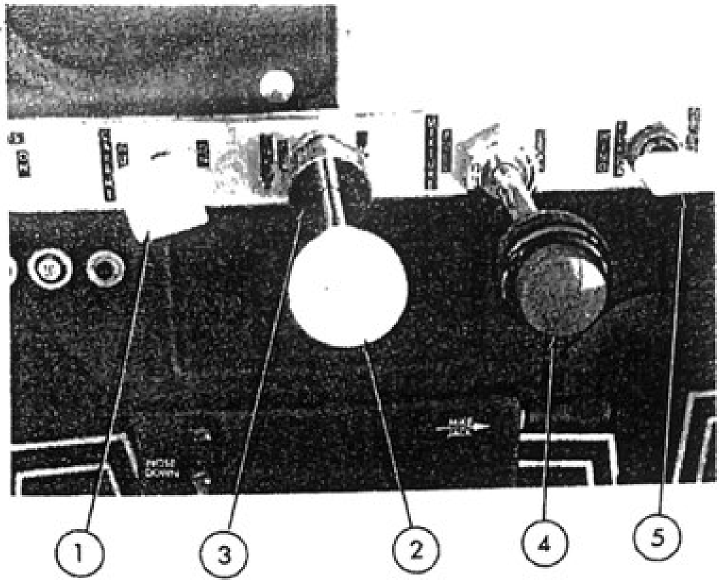
Engine power is controlled by the throttle. is identified by its smooth, round white knob. ıe throttle is operated in the conventional anner—in the forward position, the throttle open, and in the aft position, the throttle is ›sed.

iction-Lock Knob (Figure 1-2)

A friction-lock knob is located on the throttle ntrol. Rotation of the knob clockwise reases friction and prevents creeping of the throttle. Counterclockwise rotation decreases friction and permits free movement of the throttle.

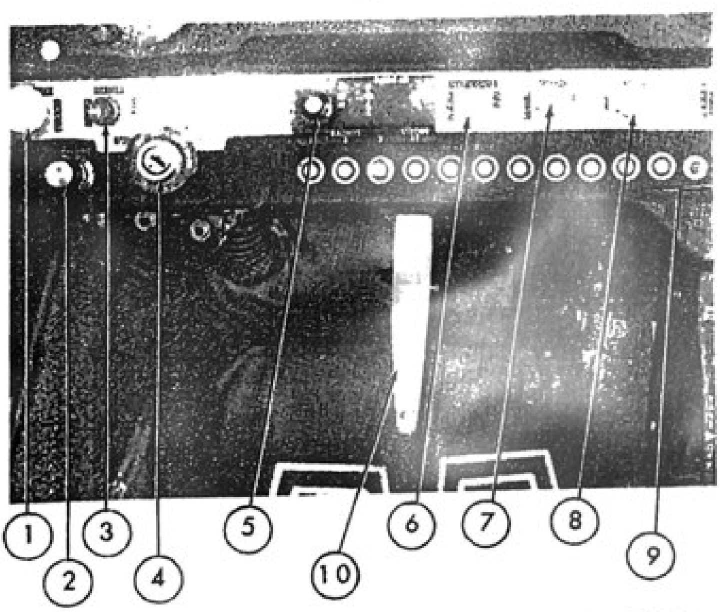
Mixture Control Knob (Figures 1-2 and 1-5)

The mixture control knob is to the right of the throttle and is identified by a black knob with a red push button lock in the center. The full rich position is forward toward the firewall while full lean is full aft. Moving the control knob forward or aft to adjust the mixture is accomplished by rotating the knob clockwise



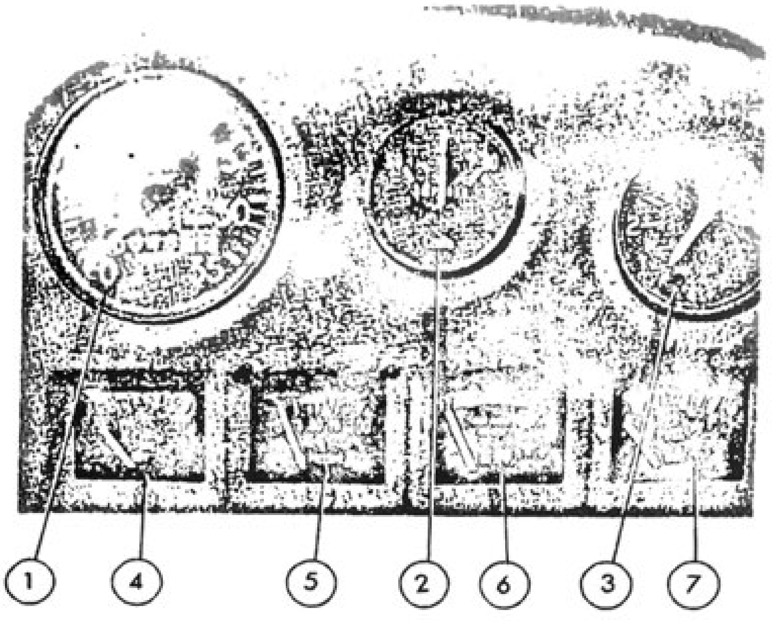
1. Carburetor heat knob
2. Throttle
3. Friction lock knob
4. Mixture control knob
5. Flap lever

Figure 1-2



1. Fuel strainer knob
2. Primer knob
3. Master switch
4. Ignition switch
5. Strobe lights switch
6. Navigation lights switch
7. Rotating beacon switch
8. Landing/taxi light switch
9. Circuit breaker panel
10. Parking brake

Figure 1-3



1. Tachometer
2. Ammeter
3. Suction gauge
4. Left fuel gauge
5. Oil pressure gauge
6. Oil temperature gauge
7. Right fuel gauge

Figure 1-4

.oward full rich or counterclockwise toward 'ull lean. If large or rapid changes are required, lepress the lock button on the control knob and position the control forward or aft as required.

gnition System

Engine ignition is supplied by two magnetos. Each magneto supplies power to its associated et of spark plugs. The magnetos are engine-riven and self-contained. They are indepen-ent of the aircraft electrical system and of ach other. Magneto operation is checked as utlined in Section II, Before Takeoff Check.

gnition Switch (Figures 1-3 and 1-5)

The ignition switch, located on the left ortion of the control panel, is operated by sing an aircraft ignition key. The switch is beled OFF, R, L, BOTH, and START, in a ockwise direction. The R and L positions are r checking the magneto system, or for nergency purposes only.

arting System

Electrical power for energizing the starter may be supplied by the aircraft battery or an external power source. When the ignition key is turned to the spring-loaded START position (with the master switch ON), the starter contactor is energized and the starter is engaged to crank the engine. As the key is released, it automatically returns to the BOTH position.

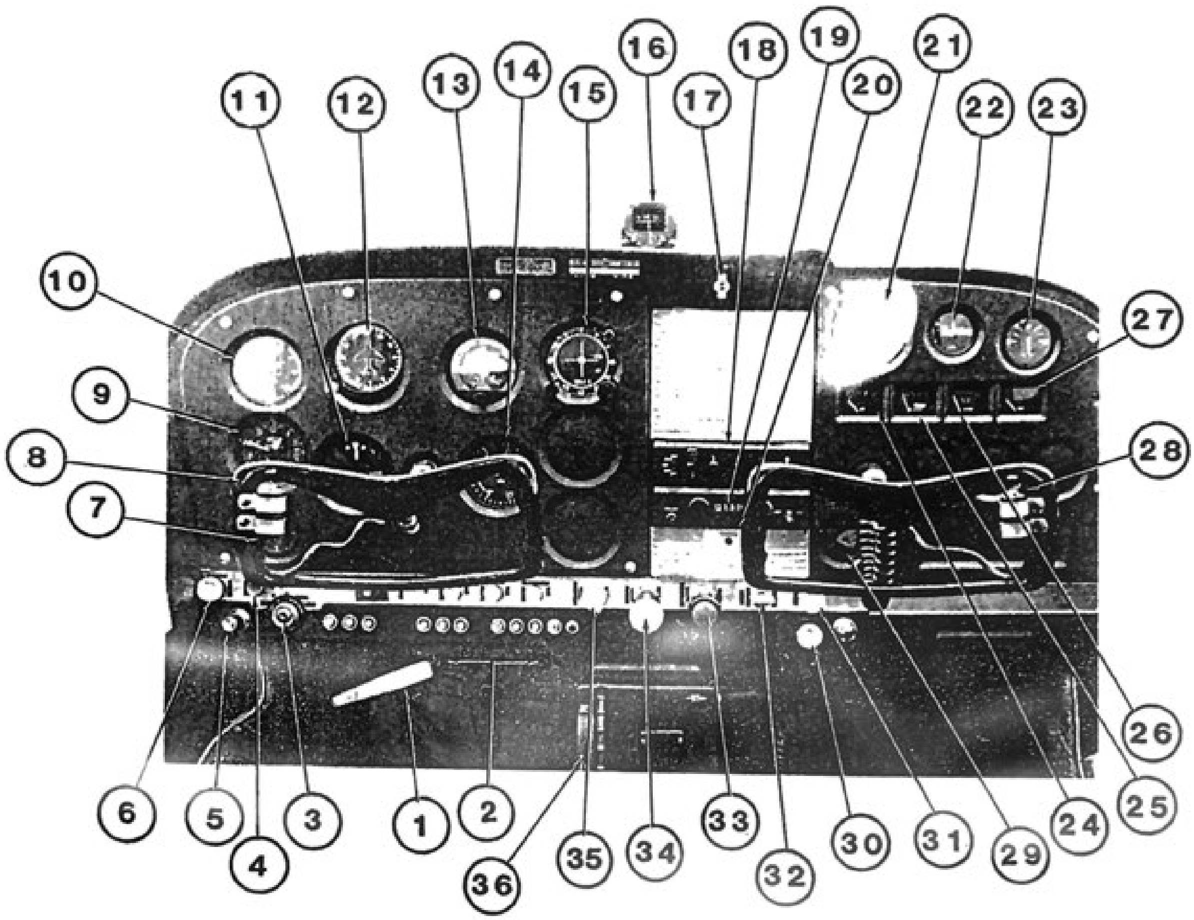
CAUTION: Release the starter as soon as the engine fires. Never engage the starter while the propeller is turning.

ENGINE INSTRUMENTS

Tachometer (Figures 1-4 and 1-5)

The tachometer is a mechanical indicator driven by a flexible shaft connected to the oil pump shaft. The tachometer indicates engine speed in rpm x 100 (that is, 12 = 1,200 rpm).

NOTE: A zero indication on the tachometer accompanied by zero oil pressure indicates the oil pump shaft has sheared. Refer to oil system malfunction in Section III.



1. Parking brake
2. Circuit brakers
3. Ignition switch
4. Master switch
5. Primer knob
6. Fuel strainer knob
7. Clock
8. Left mic button
9. Altimeter
10. Airspeed indicator
11. Turn-and-slip indicator
12. Heading indicator
13. Attitude indicator
14. Vertical velocity indicator
15. VOR (Nav) receiver
16. Magnetic compass
17. Overhead speaker switch
18. Transponder
19. Communications radio
20. Carbon monoxide detector
21. Tachometer
22. Ammeter
23. Suction gauge
24. Left fuel gauge
25. Oil pressure gauge
26. Oil temperature gauge
27. Right fuel gauge
28. Right mic button
29. Flap position indicator
30. Cabin heat knob
31. Cabin air knob
32. Flab lever
33. Mixture control knob
34. Throttle
35. Carburetor heat knob
36. Trim wheel

Figure 1-5

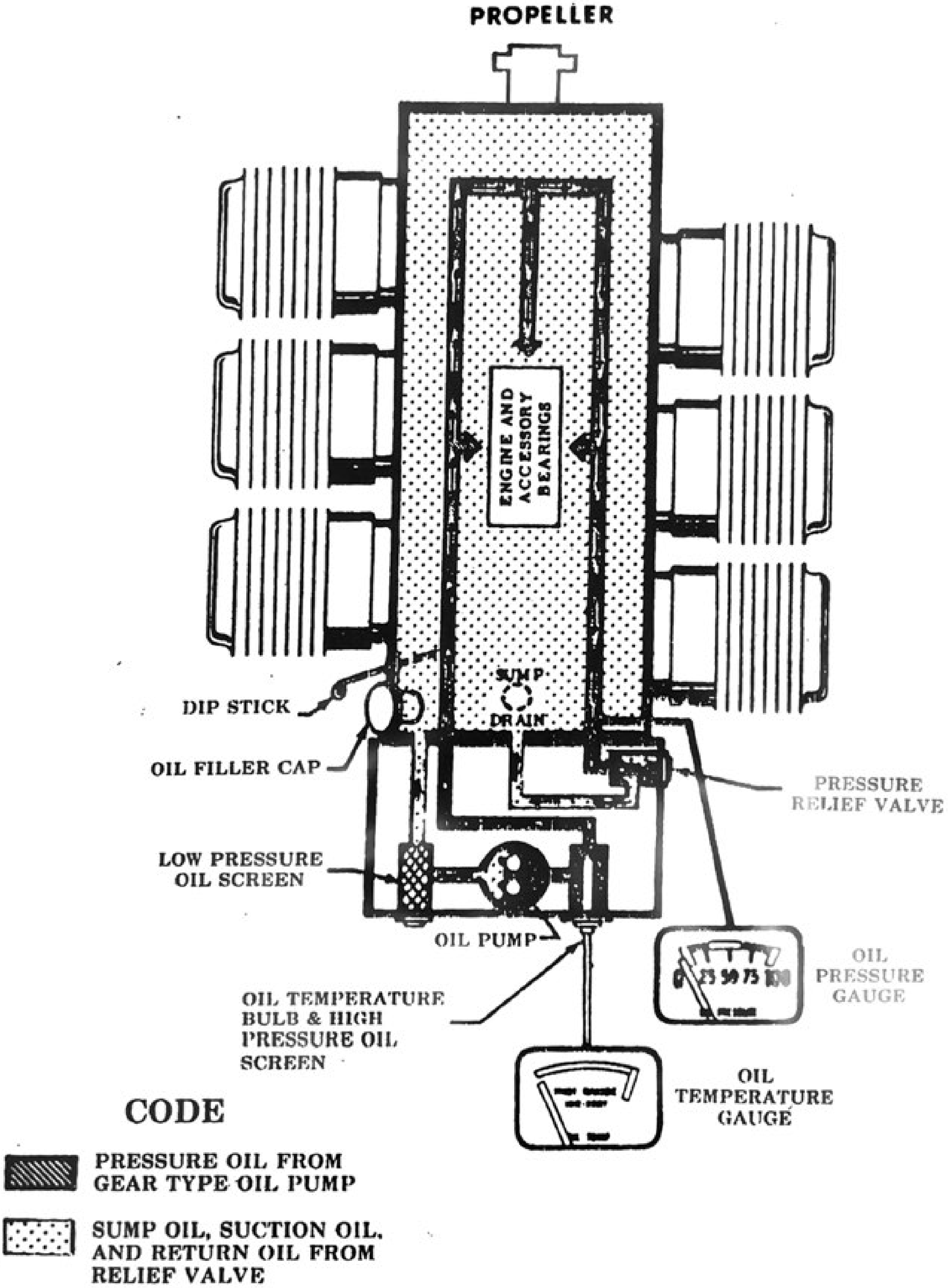


Figure 1-6. Oil System Schematic

Oil Temperature (Figures 1-4 and 1-5)

The oil temperature gauge is located in the right instrument panel. (Figure 1-6) Heat from the engine oil causes the liquid in the line connecting the oil system and the gauge to expand. The gauge is direct-reading and measures this expansion.

Oil Pressure Gauge (Figures 1-4 and 1-5)

A direct-reading gauge displays oil pressure in psi. It is located adjacent to the oil temperature gauge on the right instrument panel.

OIL SYSTEM

(Figure 1-6)

Oil from engine lubrication is supplied from a sump on the bottom of the engine. The capacity of the sump is 8 US quarts. Oil is drawn from the sump through a low pressure filter screen into the engine-driven oil pump. From the pump, oil is forced through a high pressure screen. Oil is then circulated to various engine parts for lubrication and is returned to the sump by gravity flow.

An oil filler cap is located on the top side of the engine. The oil dipstick is located on the left side of the engine. Both the filler cap and the dipstick are accessible through the oil access door on the engine or cowling.

CAUTION: Do not operate the engine with less than 6 quarts of oil. Minimum oil quantity for normal flights of less than 3 hours is 7 quarts, for extended flights - 8 quarts (full).

FUEL SYSTEM

(Figure 1-7)

Fuel is supplied to the engine from two 19.5 gallon tanks, one in each wing. Fuel from each tank flows by gravity to a four-position selector valve, labeled LEFT, BOTH, RIGHT, and OFF. (Figure 1-14) Fuel then flows to a fuel strainer, located in the nosewheel compartment. The fuel strainer is the lowest portion of the fuel system and is provided as a means of collecting any water that may have accumulated in the system. By pulling the fuel strainer knob, located on the left instrument panel, (figure 1-3), any collected water will be vented overboard. Fuel is then routed to the carburetor. Due to gravity flow and fuel line placement, 1.5 gallons in each tank are unusable.

NOTE: With the fuel selector valve on BOTH, the total usable fuel for all flight conditions is 36 gallons. (Figure 1-8)

Fuel metering to the engine is controlled by a carburetor mounted on the lower side of the engine. Ram air to the carburetor enters the induction air box through an opening in the forward part of the lower engine cowling. The air passes through a filter which is located at the cowling opening.

From the induction air box, the filtered air is directed to the carburetor inlet. The induction air box contains a valve, operated by the carburetor heat control in the cabin, which permits air from an exhaust heated source to be selected in the event of carburetor icing, or filter icing.

NOTE: When carburetor heat is on, the air entering the carburetor is unfiltered.

Mixture Leaning Procedures

1. The mixture control is normally at full rich during operation of the T-41A; however, extended constant power operation at altitudes above 5,000 feet MSL require the pilot to manually lean the mixture for more efficient operation.

2. Since most of your training requires frequent and varied power changes, there are few occasions that manual leaning is required or desired. The engine may be damaged if the power is changed from that setting after leaning is accomplished. If it becomes necessary to lean the mixture, proceed as follows:

a. Set the throttle at the desired rpm.

b. Turn the mixture control knob counterclockwise until the rpm increases slightly and then begins to decrease.

c. When the decrease is first noted, turn the mixture control knob clockwise until the rpm reaches the highest value, then continue turning clockwise 1-2 complete revolutions.

d. Place the carburetor heat at hot and check for rpm drop and then return it to the cold position.

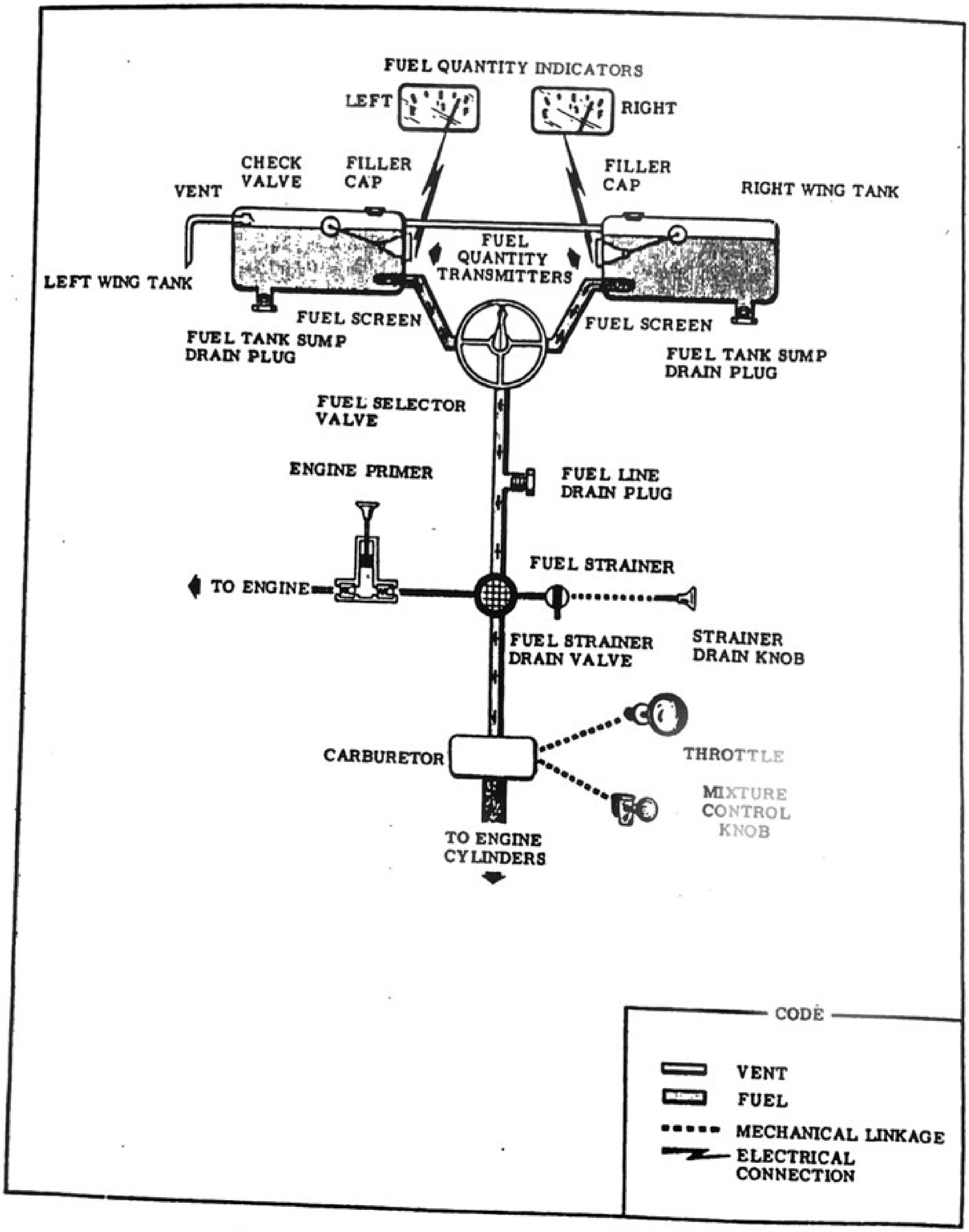


Figure 1-7. Fuel System Schematic

FUEL QUANTITY (US GALLONS)				
TANK	NO.	USABLE FUEL ALL FLIGHT CONDITIONS	UNUSABLE FUEL (LEVEL FLIGHT)	TOTAL FUEL VOLUME EACH
LEFT WING	1	18 gal.	1.5 gal.	19.5 gal.
RIGHT WING	1	18 gal.	1.5 gal.	19.5 gal.

Figure 1-8

Carburetor Heat (Figures 1-2 and 1-5)

The carburetor heat knob is located to the left of the throttle on the lower center portion of the instrument panel. The functions of carburetor heat are to (1) prevent ice formation in the carburetor, and (2) melt any ice which may have already formed there. To use carburetor heat, pull the knob full out. This takes heated but unfiltered air from around the exhaust collector and directs it into the induction system.

CAUTION: Since the heated air is unfiltered, keep the use of the carburetor heat to a minimum during ground operations. Dust injected into the engine can cause extensive wear and permanent damage.

WARNING

Do not use partial carburetor heat. Use of partial heat may bring the air temperature around the carburetor to within the critical range and cause icing that otherwise would not have occurred.

Manual Primer (Figures 1-3 and 1-5)

A manual primer, located on the lower left switch panel, is provided to aid in starting the engine. It sprays raw fuel into the elbows of the engine intake manifolds for improved starts during cold weather or at other times, as needed.

CAUTION: Use of the primer should be minimized as the unmetered fuel tends to wash the lubricating film off the cylinder walls, resulting in excessive engine wear.

Fuel Quantity Gauge (Figures 1-4 and 1-5)

The two electrically operated fuel quantity gauges are located on the right instrument panel. The instruments indicate the fuel in the tanks from empty to full, graduated in quarters. The indicators receive their inputs from fuel level transmitters in each wing tank any time the master switch is ON.

WARNING

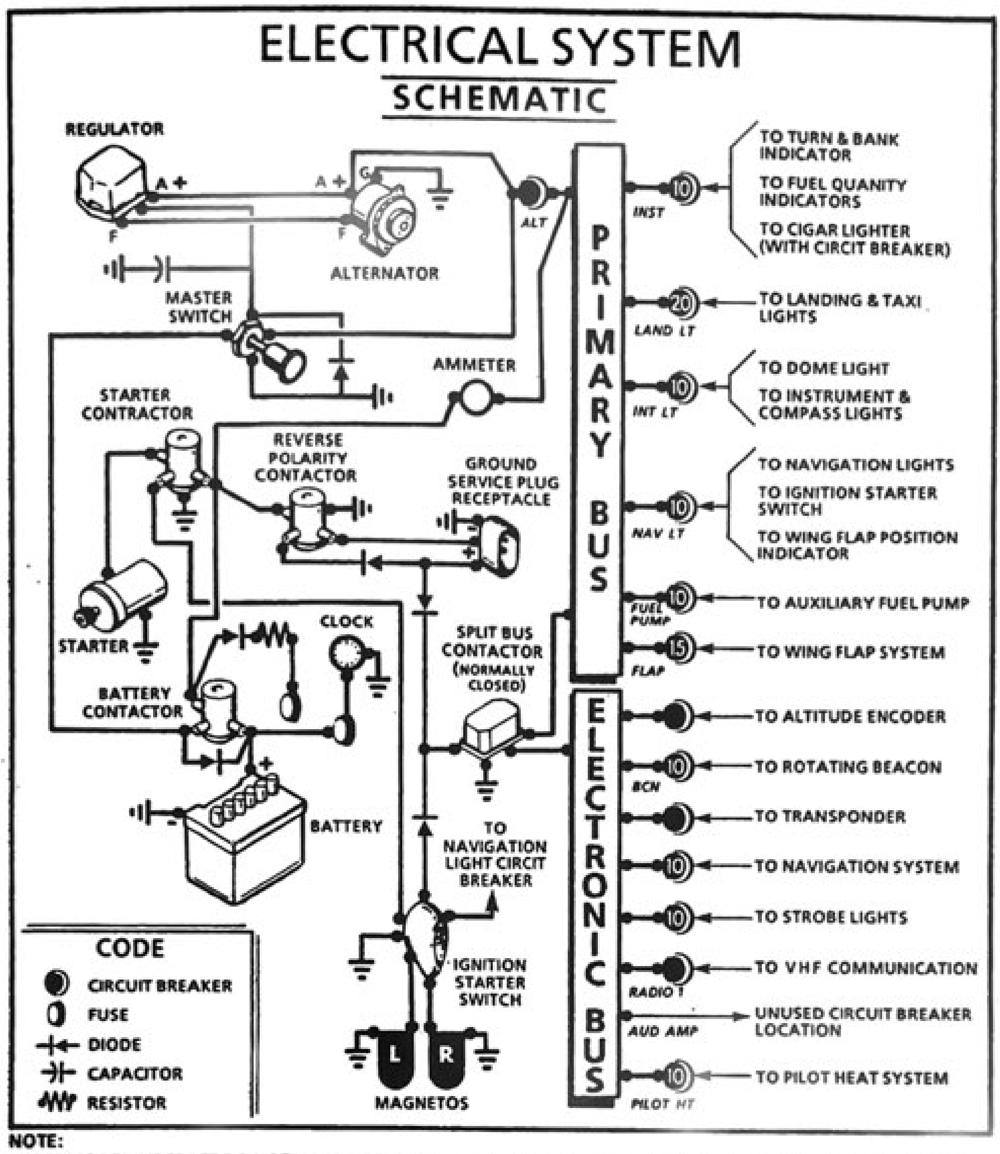
Fuel quantity gauges may not be reliable below one quarter in each tank. Fuel quantity gauges are accurate only in stabilized straight-and-level flight.

ELECTRICAL SYSTEM

(Figure 1-9)

Electrical energy is supplied by a 14-volt, direct current system powered by a 60-ampere, engine-driven alternator. A 12-volt battery, located on the fire wall in the engine compartment, is used to supply electrical power for starting. It also serves as an emergency source of electrical power in case of alternator failure.

Power is supplied to all electrical circuits through a split bus bar. The electronic bus contains the rotating beacon, the strobe lights, VHF radio, VOR receiver, transponder and the altitude encoder. The primary bus contains all other electrical system circuits. With the master switch on, both sides of the bus are normally powered. However, when either



NOTE:
1965 MODEL AIRCRAFT DO NOT HAVE A REVERSE POLARITY CONTACTOR, A SPLIT BUS, OR A SPLIT BUS CONTACTOR. SOME AIRCRAFT ARE EQUIPPED WITH WIND-UP CLOCKS.

Figure 1-9. Electrical Schematic (1967 Model)

an external power source is connected, or the ignition switch is turned to START, a power contactor automatically deactivates the circuit to the electronic bus. Isolating the electronic circuits prevents transient voltages from damaging the semiconductors in the electronic equipment.

NOTE: 1965 model aircraft have a single bus bar. The bus bar is powered anytime the master switch is on.

Master Switch (Figures 1-3 and 1-5)

The master switch controls electrical power to the aircraft electrical system. The switch is a push-pull type and is located on the lower left switch panel.

Ammeter (Figures 1-4 and 1-5)

All aircraft are equipped with an ammeter that indicates the amount of current flowing either to or from the battery. The ammeter is located between the tachometer and suction gauge on the right instrument panel. Normally, the ammeter will remain within 0 to +2 needle widths if the alternator is operating properly and the battery is in a normal state of charge. Extreme charge or discharge rates for any duration are indications of an electrical system malfunction.

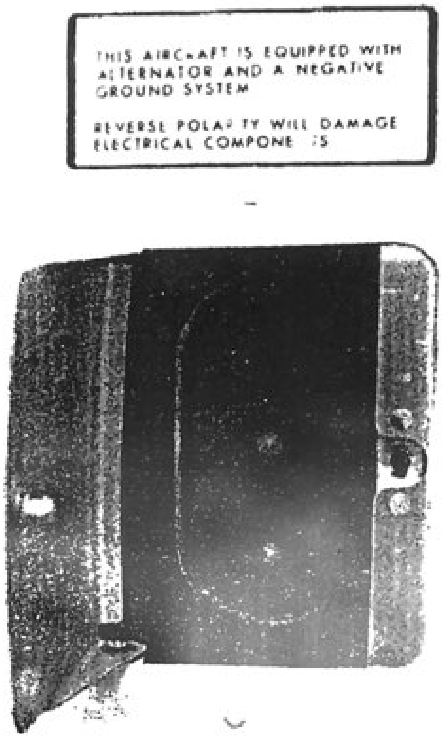


Figure 1-10. External Power Receptacle

External Power Receptacle (Figure 1-10)

A ground service plug receptacle is installed to permit the use of an external power source for cold weather starting or starts requiring the use of an alternate source. The receptacle is located on the left side of the engine cowling.

WARNING

1. The master switch shall be ON before connecting an external power source. Starting with external power with the master switch off may result in the battery not being charged. Without battery power, an engine airstart may not be possible.

2. Before starting the engine using an external power source, be sure that all ground personnel are well clear of the propeller danger areas.

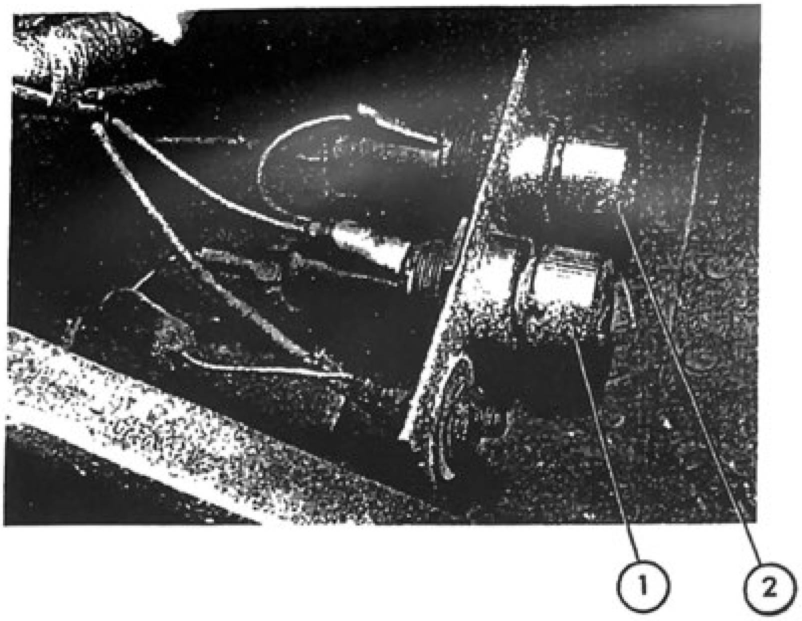
CAUTION: Use of other than a 12-volt power source may damage electrical systems.

Circuit Breakers (Figures 1-3 and 1-5) and Fuses (Figure 1-11)

The majority of electrical circuits in the aircraft are protected by "push to reset" circuit breakers located on the left lower switch panel. Exceptions are the battery contactor circuit, and the clock circuit, which are protected by fuses located near the battery. A label adjacent to each circuit breaker indicates the equipment protected.

NOTE: 1965 model aircraft have only a clock circuit whereas the 1967 model aircraft have both the battery contactor and clock circuits.

CAUTION: If a circuit breaker pops out, it may be reset once if no other electrical malfunctions exist. If the circuit breaker pops out after being reset, do not attempt to reset it again. Termi-



1. Clock fuse 2. Battery Contactor fuse

Figure 1-11.

...te the mission and land as soon as conditions permit.

NOSEWHEEL STEERING SYSTEM

Nosewheel steering is accomplished through use of the rudder pedals. The nosewheel is steerable up to approximately 10 degrees each side of neutral, after which it becomes free wheeling to a maximum deflection of 30 degrees right or left of center when differential braking is used. A shimmy damper is provided to minimize nosewheel shimmy.

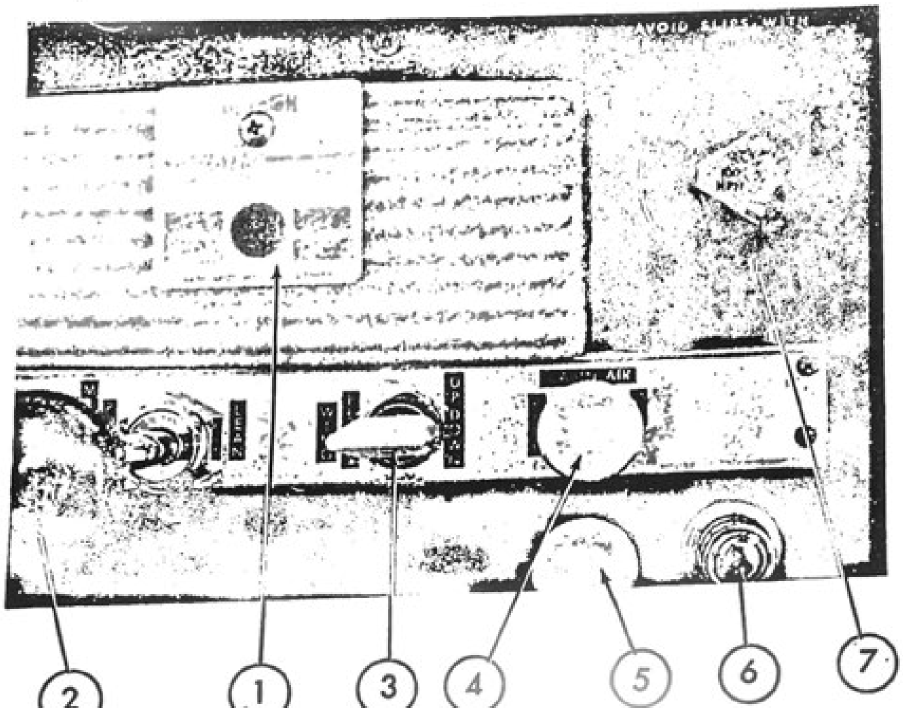
BRAKE SYSTEM

The hydraulic disc brakes on the main wheels are individually operated by applying pressure to the upper portion of either set of rudder pedals. Depressing the pedals activates the brake cylinders, resulting in a braking action on the main landing gear wheels. A master cylinder attached to each of the left seat (pilot) pedals transmits hydraulic pressure to the respective main wheel brake cylinder, thus applying brakes. The right seat brake pedals are connected by mechanical linkage to the pilot's brake pedals, and pressure applied to the right seat pedals is transmitted mechanically to the master cylinder.

Parking Brake (Figures 1-3 and 1-5)

The parking brake handle is located beneath the left lower switch panel and is used to set the brakes. The handle-and-ratchet mechanism is connected by a cable to linkage at the master cylinders. Pulling out the handle depresses both master cylinder piston rods and the rachet locks the handle in this position until the handle is turned and released. To set brakes, apply pressure to the toe brakes, pull the parking handle out and turn it to the 6 o'clock position. Setting the brakes in this manner provides the best brake pressure and minimizes parking brake cable wear. To release the parking brake, rotate the handle 90 degrees clockwise to the 9 o'clock position and let it return to the original retracted position.

CAUTION: Full rudder deflection with the parking brake set may damage the parking brake cable.



1. Carbon monoxide
2. mixture control knob
3. Wing flap lever
4. Cabin air knob
5. Cabin heat knob
6. Cigarette lighter (Removed)
7. Wing flap indicator

Figure 1-12

WING FLAP SYSTEM

(Figures 1-5 and 1-12)

The wing flaps are electrically operated and are controlled by a three-position switch on the lower right switch panel. This switch, spring-loaded to the off position, controls an electric motor that raises or lowers the flaps by means of cables and push-pull rods. The motor is protected from shorts and overheating by a circuit breaker located on the circuit breaker panel. (Figure 1-3) The electrically-operated flap position indicator is calibrated in degrees of flap extension from 0 to 40 degrees.

FLIGHT CONTROL SYSTEM

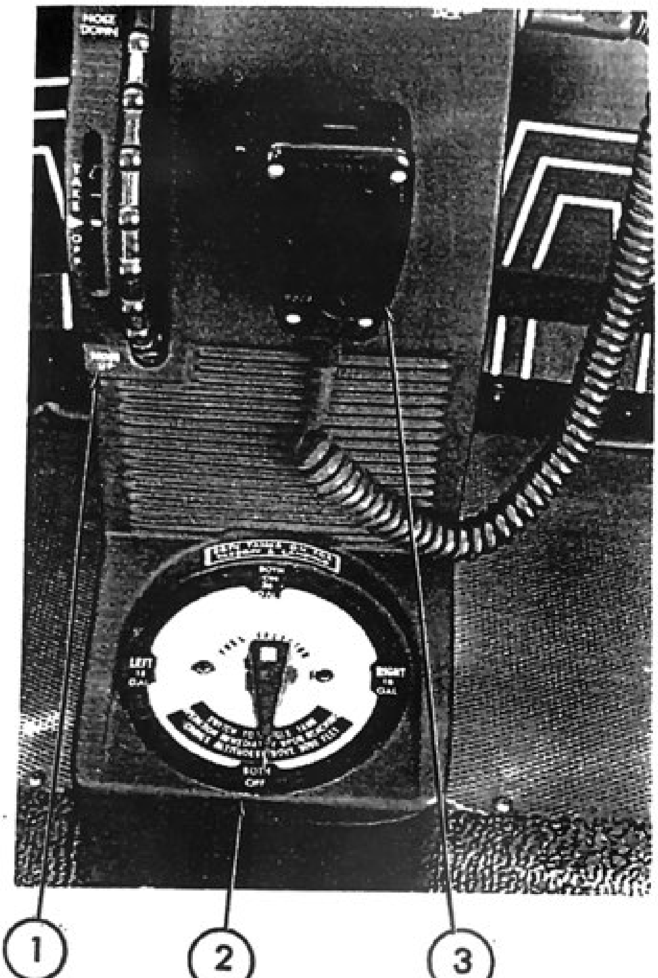
The aileron, elevator, and rudder control systems are comprised of push-pull rods, bellcranks, cables, and pulleys. The aileron and elevator systems are connected to the control wheel. The rudder system is connected to the rudder pedals.

Properly adjusted controls, when operated, move in the correct direction, are free of binding, and do not require excessive force for application.

CAUTION: Excessive force or abrupt control inputs can cause control system damage.

Trim System

A trim tab is provided on the trailing edge of the right elevator to reduce control wheel forces and to allow hands-off flight at normal airspeeds. An elevator trim wheel, mounted in the center pedestal (figure 1-13), provides manual adjustment of the trim tab. The trim wheel and the adjacent pointer are labeled from top to bottom, NOSE DOWN, TAKEOFF and NOSE UP. The pointer indicates the elevator trim position. Forward rotation of the wheel provides nosedown trim. Aft rotation provides a noseup setting. Positioning the pointer abeam the white marker at the TAKE-OFF label provides the normal takeoff trim setting.



1. Elevator trim wheel
2. Fuel selector switch
3. Auxiliary microphone

Figure 1-13

Control Lock/Gust Locks

When the aircraft is on the ground unattended, a control lock is used to lock the elevator and aileron control systems to prevent damage from wind gusts. The lock is designed to engage a hole in the pilot's control wheel shaft and instrument panel mounted bracket. A flag on the end of the control lock covers the ignition switch to warn against starting the engine with the lock installed. The rudder is protected from minor buffeting by the linkage between the nosewheel and rudder system. External gust locks are also provided for all flight control surfaces for use when strong winds are expected.

CAUTION: Crewmembers should be sure the control wheel is properly positioned prior to installing the control lock.

STALL WARNING SYSTEM

The function of the stall warning system is to warn the pilot of an impending stall. On 1965 model aircraft, the warning system is actuated by a disruption of the airflow over a switch installed in the leading edge of the left wing. 1967 model aircraft have a pneumatic device which is activated by means of a reed-type horn sensing a negative differential air pressure. This sensing device is also located in the leading edge of the left wing. Both systems are designed to provide an audible warning at 5 to 10 mph above an actual stall in all configurations.

INSTRUMENTS

(Figure 1-5)

The following paragraphs cover only those instruments which are not part of a complete system such as the fuel system, engine, etc. The flight instruments consist of an airspeed indicator, vertical velocity indicator, altimeter, turn-and-slip indicator, attitude indicator, heading indicator, magnetic compass, and clock. All flight instruments are located in the left instrument panel directly in front of the pilot except the magnetic compass which is located on the top of the dash panel.

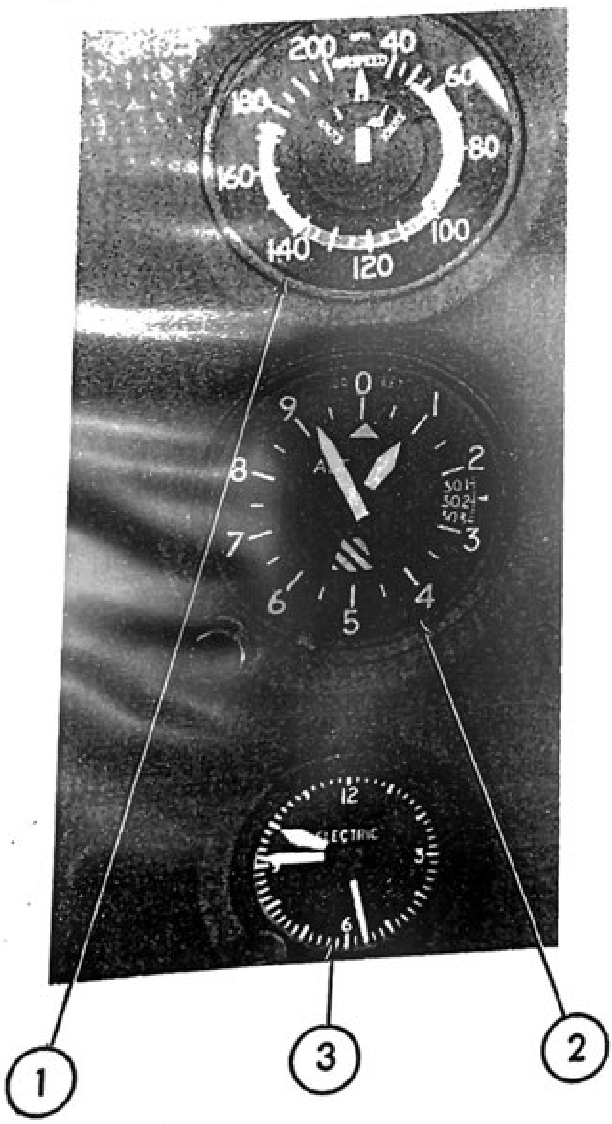
Pitot-Static System and Instruments

(Figures 1-14 and 1-15)

The pitot-static system supplies air pressure to operate the airspeed indicator. The static portion of the system supplies the operating pressures for the vertical velocity indicator and altimeter. The pitot-static system is composed of a pitot tube mounted under the left wing, an external static port, located on the left side of the aircraft fuselage, and the associated plumbing necessary to connect the instruments to their sources.

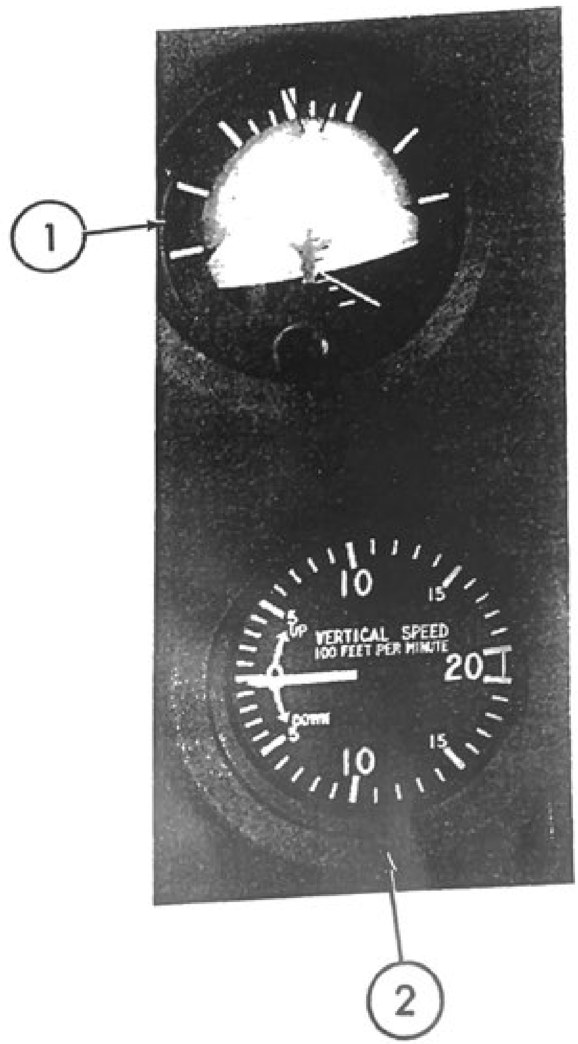
Airspeed Indicator (Figure 1-14)

The airspeed indicator is operated by pitot and static pressures sensed by the pitot-static system. Airspeed is indicated in miles per hour.



1. Airspeed indicator
2. Altimeter
3. Clock

Figure 1-14



1. Attitude indicator
2. Vertical velocity indicator

Figure 1-15

WARNING

Slips may result in airspeed errors. Also, large errors in indicated airspeed may occur near stalling speed.

Vertical Velocity Indicator (VVI) (Figure 1-15)

The vertical velocity indicator depicts aircraft rate of climb or descent up to 2,000 feet per minute. The pointer is actuated by an atmospheric pressure change sensed through the static port.

WARNING

The pointer does not stop at the 2,000 feet/minute rate of deflection. A climb in excess of 2,000 feet/minute could be indicated as a descent on the VVI, and vice versa.

Altimeter (Figure 1-14)

The altimeter is a barometric type instrument which operates on static pressure. A barometric pressure set knob on the lower left corner of the indicator provides adjustment of the barometric scale for changes in atmospheric pressure. The thin needle indicates tens of thousands of feet. The short thick needle indicates thousands of feet while the long thick needle indicates hundreds of feet.

Turn-and-Slip Indicator (Figure 1-17)

The turn-and-slip indicator is composed of a turn needle and an inclinometer. The principal functions of the turn-and-slip indicator are to provide an alternate source of bank control, and to indicate rudder coordination. The turn needle, driven by an electrical gyro, indicates the rate of heading change and direction of turn. The inclinometer, a ball in a liquid filled glass tube, indicates coordination. Gravity and centrifugal force act on the ball. When the aircraft is in coordinated flight, the ball will be centered.

Vacuum System

Suction to operate the heading indicator and attitude indicator gyros is provided by an engine-driven vacuum pump. The vacuum pump is mounted on the engine accessory case. A suction relief valve is used to control system pressure. The suction gauge, located on the right instrument panel (figures 1-4), is calibrated in inches of mercury and indicates the suction available for operation of the attitude and heading indicators.

NOTE: System leaks or other malfunctions may cause incorrect indications of attitude and heading.

Attitude Indicator (Figure 1-15)

The vacuum-powered attitude indicator gives a gyro stabilized visual indication of the aircraft's attitude. The attitude indicator has no pitch or bank limits. Bank is presented by a bank pointer relative to a bank scale. This scale is marked with degree indices.

The horizon bar provides sensitive reference near a level flight attitude. A pitch trim knob is included to adjust the miniature aircraft in relation to the horizon bar.

Heading Indicator (Figure 1-16)

The vacuum-powered heading indicator displays the aircraft's magnetic heading. The heading indicator has no bank or pitch limits.

Figure 1-16. Heading Indicator

To set the correct aircraft heading, refer to the magnetic compass when in straight-and-level, unaccelerated flight. Determine the magnetic heading from the compass and then push in on the heading indicator set knob, rotating the compass card until the desired heading is located under the top index.

Magnetic Compass (Figures 1-5 and 1-18)

A magnetic compass is centrally mounted on top of the glare shield. The compass is liquid filled, free floating, and reliable only in straight-and-level, unaccelerated flight.

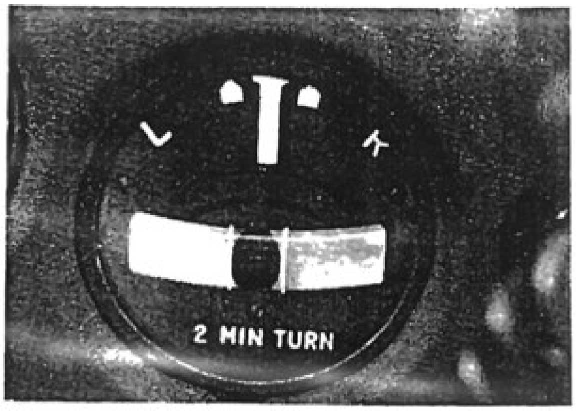


Figure 1-17. Turn-and-Slip Indicator

NOTE:

1. Use of the landing/taxi light causes erroneous indications in the magnetic compass due to the creation of an electromagnetic field. Do not use the magnetic compass to reset the heading indicator when the landing/taxi light is on.

2. When parked in, or adjacent to, metal structures, the magnetic compass reading may be affected. In this case, set the heading indicator to a known heading, or wait until well clear of the metal structure to set the heading indicator.

Clock (Figure 1-14)

The clock is electrically or manually operated, and is on at all times. The setting knob is located on the lower left side of the instrument.

COMMUNICATIONS/NAVIGATION EQUIPMENT

Interphone System

The interphone system consists of headsets and microphone buttons located on each control wheel. On aircraft equipped with a rear control wheel, a third interphone headset is provided for use by a rear seat passenger. The system allows:

(1) unrestricted communication within the aircraft,

Figure 1-18. Magnetic Compass

(2) communication outside the aircraft by integration with the VHF radio, and

(3) monitoring of the VHF radio and NAVAID signals.

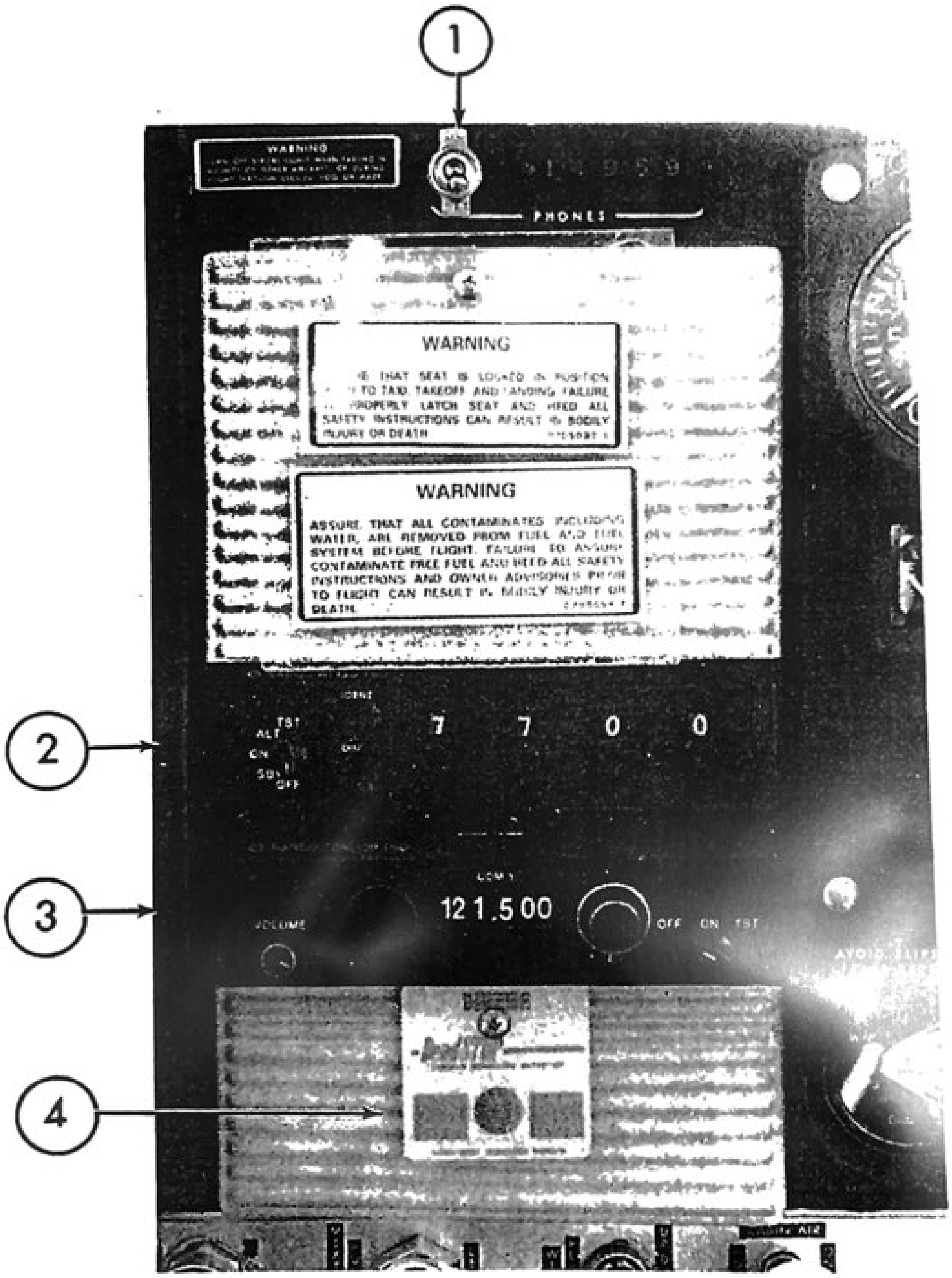
The system is powered by the electrical system and is activated by the radio function switch. Headset volume may be adjusted with the volume control knob on the left earphone.

Overhead Speaker System

An overhead speaker and hand-held microphone are provided should the interphone system fail. The microphone and microphone jack are located in the upper-right side of the center pedestal. (Figure 1-13) A toggle switch to turn on the overhead speaker is located in the upper portion of the center instrument panel. (Figure 1-19) The toggle switch is placed in the up position to activate the speaker.

VHF Radio (Figures 1-19 and 1-20)

A Narco Com 120 transistorized radio provides VHF communications capability. The radio has line-of-sight reception and provides voice transmission and reception on 720 frequencies in the range of 118.00 to 135.975 MHz by .025 MHz increments. The large control knobs on either side of the frequency



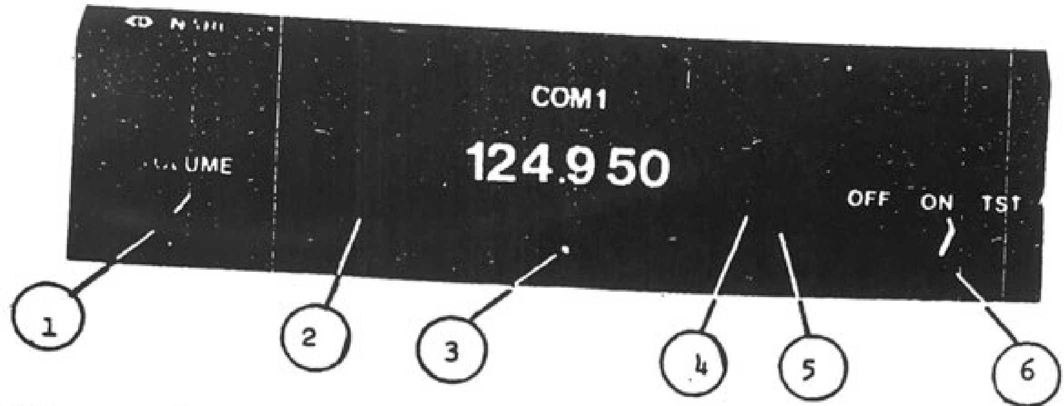
1. Overhead speaker switch
2. Transponder
3. VHF radio
4. Carbon monoxide detector

Figure 1-19

readout window control frequency selection. To activate the radio, turn the function switch clockwise to ON.

NOTE: No warmup time is required for the Com 120 radio due to its 100 percent solid state design.

To test the radio, rotate the function switch clockwise to TST. This position disables the



1. Volume control
2. Frequency control (whole MHz)
3. Transmit indicator
4. Frequency selector (.X MHz)
5. Frequency selector (.0XX MHz)
6. Function switch

Figure 1-20

unit's automatic squelching circuitry and allows the characteristic "rushing sound" of unsquelched receiver audio to be heard. The "rushing sound" indicates electrical power is present and key elements are operating properly. Volume is controlled by a small knob marked VOLUME. Rotating the knob clockwise will increase the volume and counterclockwise will decrease the volume. The small amber light, located below the frequency readout window, is a transmit-monitor light and illuminates when the transmitter is activated. The light varies in brightness to indicate transmitter strength.

VOR Receiver (Figures 1-5 and 1-21)

A Narco Nav 121 transistorized VOR receiver provides VOR navigation capability. The VOR unit has line-of-sight reception and may be tuned in the frequency range of 108.00 MHz to 117.95 MHz by .05 MHz increments. The concentric knobs, in the lower right corner of the instrument, control the frequency selection.

To activate the unit, turn the function knob, located in the upper right corner of the instrument, clockwise until it clicks on.

NOTE: No warmup period is required by the Nav 121 unit due to its 100 percent solid state design.

To identify a VOR station, pull out the function knob and rotate it clockwise until the audio signal can be heard. To select a VOR course, rotate the knob in the lower left corner of the instrument until the desired course appears beneath the vertical index line, located at the 12 o'clock position on the instrument. The course deviation indicator shows left or right deviation from the selected course, appearing under the vertical index. A TO/FROM indicator shows whether the selected course, if flown, would take the aircraft to or from the station.

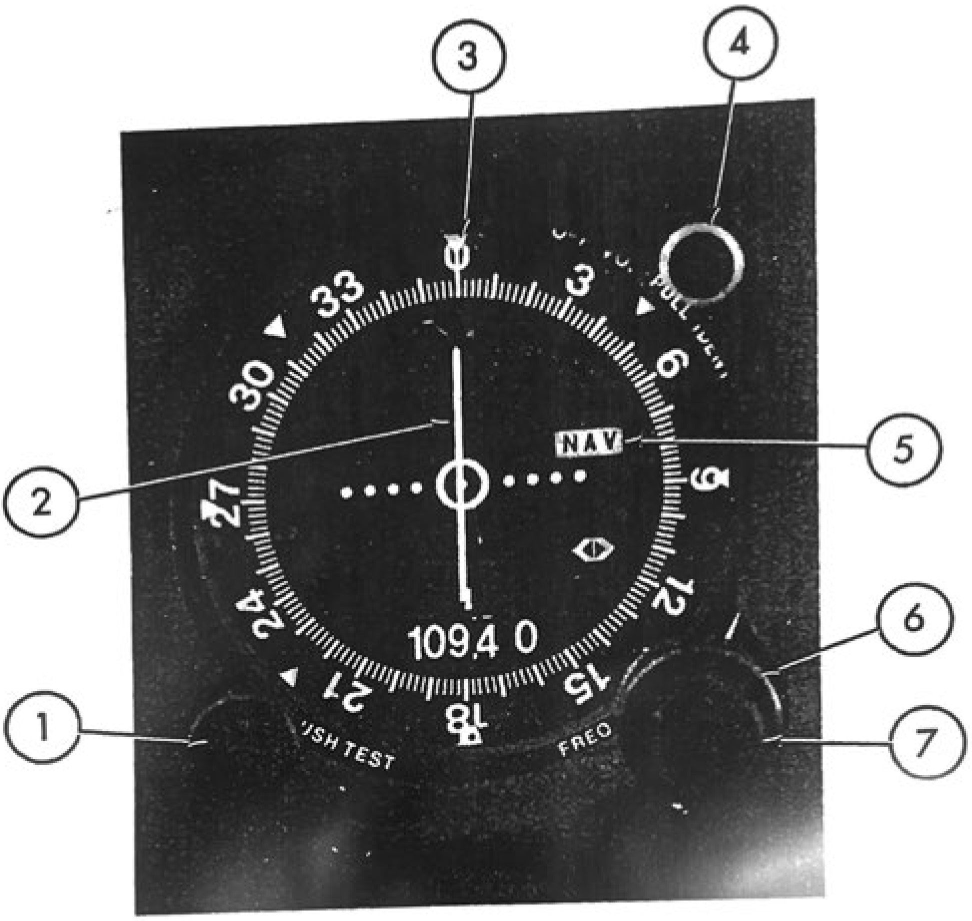
NOTE: A red flag labeled NAV will appear in place of the TO/FROM if:

1. *Signal reception is too weak.*
2. *The aircraft flies over the station (during station passage).*
3. *The NAV 121 unit is turned off.*

To test the unit, select a nearby VOR station, rotate the course selection knob until either 0 degrees or 180 degrees is under the vertical index, then push the course selection knob in and hold it for a few seconds. The course deviation indicator needle should center and the TO/FROM indicator should show TO if 0 degrees was selected or FROM if 180 degrees was selected.

Transponder (Figures 1-5 and 1-22)

A Narco AT 150 transistorized transponder provides positive radar identification to ground agencies and is capable of responding to interrogations on any of 4096 codes. These codes are selected by rotating the four, eight position code selector knobs.



1. Course selector/test knob
2. Course deviation indicator
3. Vertical index line
4. Function switch
5. TO/FROM indicator
6. Frequency selector (whole MHz)
7. Frequency selector (.XX MHz)

Figure 1-21

Altitude (Mode C) information is provided by the Narco Avionics ARU-850 Altitude Reporter. The unit converts pressure/altitude information into digitized altitude data. It is in operation any time the transponder is set to the altitude (MODE C) mode of operation. This data is transmitted to air trafffic control centers

A five-position, rotary function switch activates and controls unit operation. The five positions are:

OFF: Turns off all power to the transponder.

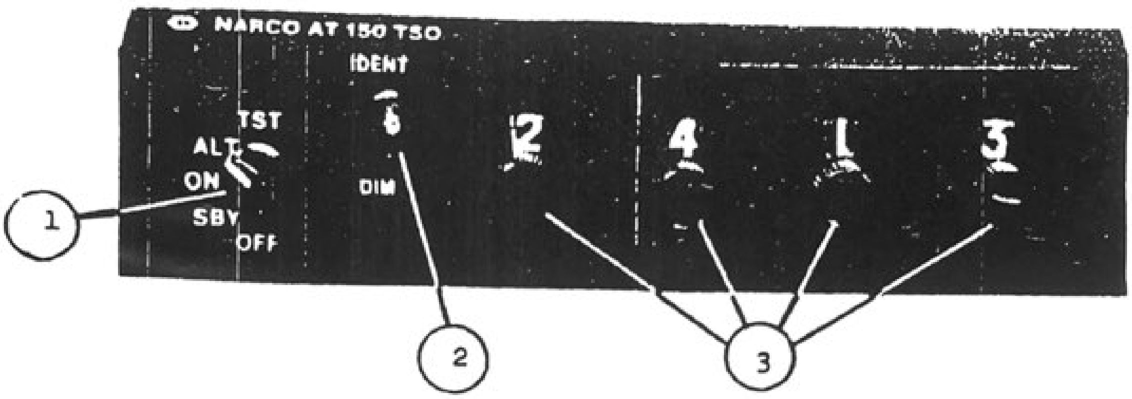
SBY: (Standby) Turns the transponder on for warmup but does not reply to any interrogations. (Warmup requires 20 seconds.)

ON: The transponder will respond to any interrogation.

ALT: (Altitude) MODE C (altitude reporting) information is transmitted.

TST: (Test) Causes an internal test signal to be generated which illuminates the reply lamp. This position is spring-loaded to ALT.

The IDENT push-button is used to reply to an agency when asked to "Squawk IDENT." Momentarily depressing the button will activate a special signal for approximately 20 seconds and will illuminate the reply lamp,



1. Function switch
2. IDENT push button/reply light
3. selectors

Figure 1-22

located within the IDENT push-button, for the duration of the special signal. During normal operation, the reply lamp will blink whenever the transponder is being interrogated. Rotate the button to control reply lamp brightness.

NOTE: A 3 minute warm-up is required for the altitude encoding outputs to become active.

LIGHTING

All exterior and interior lighting is controlled from within the cabin. Exterior lighting equipment consist of navigation lights, a rotating beacon, landing and taxi lights, and strobe lights. The switches for these lights are located on the lower left switch panel beneath the control wheel (figure 1-3), and are of the pull-on, push-off type. Interior lighting is composed of instrument and radio control panel lights and a cabin dome light. The switches for the interior lights are located on the ceiling console.

Navigation Lights

Conventional red (left), and green (right), navigation lights are mounted on the wingtips. A white navigation light is mounted on the upper aft portion of the vertical stabilizer.

Rotating Beacon

A rotating beacon, mounted on top of the vertical stabilizer, is red and visible through 360 degrees.

Landing and Taxi Lights

Landing and taxi lights are located in the leading edge of the left wing. The taxi light is focused to provide illumination of the area forward of the aircraft during ground operation and taxiing. The landing light is focused to provide illumination forward and downward during takeoff and landing. Pulling the landing/taxi light switch out one click turns on the taxi light, while pulling it out all the way illuminates both the landing and the taxi lights. Both lights are high intensity and require cooling airflow for continuous operation.

CAUTION: Excessive use of the landing/taxi lights, while on the ground may damage the protective lenses.

Strobe Lights

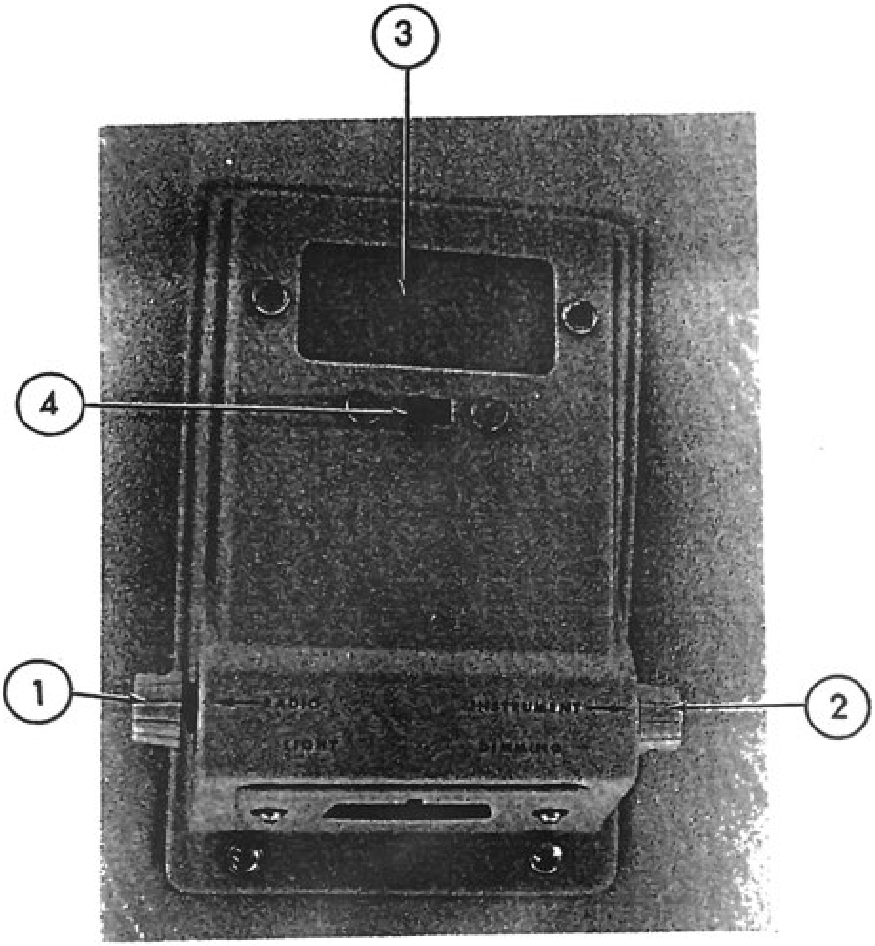
A strobe light is located in each wingtip next to the position light.

WARNING

The strobe lights produce intense light and heat. Do not look directly into operating lights, or touch bulbs during or immediately after operation.

Interior Light (Figure 1-23)

Interior instrument and radio lighting is controlled by a rheostat located above the seats



1. Radio light rheostat
2. Instrument light rheostat
3. Cabin dome light
4. Cabin dome switch

Figure 1-23

on the cabin ceiling. The rheostat on the right side controls instrument lights; the rheostat on the left side controls radio lighting. The cabin dome light is located behind the rheostat unit and is controlled by an on-off switch located adjacent to the light.

CABIN HEATING AND VENTILATION SYSTEM

(Figure 1-5)

Cabin heat, defrosting, and ventilation are provided by manifold heaters, ducting, and valves which allow the entry of heated or unheated air to the cabin. The cabin heat knob controls the amount of heat supplied to the cabin. The full out position provides maximum heating and defrosting. The cabin air knob controls the amount of fresh air entering the cabin from the air scoop door on the forward right side of the fuselage. The full out position provides maximum fresh air. Separate adjustable ventilators near each upper corner of the windshield supply additional fresh air. For cabin ventilation, pull the "CABIN AIR" knob out. To raise the air temperature, pull the "CABIN HT" knob out approximately ¼ to ½ inch for a small amount of cabin heat. Additional heat is available with the "CABIN HT" on the instrument panel just above the radios. On the lower center of the detector is an indicator that is sensitive to carbon monoxide. If carbon monoxide is introduced into the cabin, the indicator will darken.

WARNING

Should the center spot on the carbon monoxide detector become dark, proceed with the Smoke and Fume Elimination procedure in your checklist. As the carbon monoxide dissipates, the center spot will return to its normal color.

NOTE: As the carbon monoxide detectors approach the end of their life cycle, dark speckles may appear on the indicator. This is normal and does not indicate the presence of carbon monoxide. If dark speckles are observed, have the detector replaced.

CABIN DOORS

Cabin doors are located on each side of the cabin. They incorporate an exterior door handle, interior three-position door handle (open, closed, locked), and a door stop mechanism. 1965 model aircraft interior handles are two-position (open, closed). The left door has a movable window. The right door has a fixed window.

Cabin Door Movable Window

The movable window in the left cabin door is hinged at the top. The window is secured under the left front of each seat. The manual releases for the seat backs are located on the right rear corner of each seat. Rollers permit the seats to slide fore and aft on seat rails. Pins which engage various holes in the seat rails lock the seats in selected positions. A seat stop limits travel of the left seat.

SEAT BELTS AND SHOULDER HARNESSES

Seat belts and shoulder harnesses are provided for both front seats. The rear seat, on four-seat models, is equipped with seat belts only. The shoulder harnesses are attached to cables which are routed to inertia reels located on the cabin side walls just aft of the rear door posts near floor level. A two-position control lever is mounted on the left side of each seat to control the operation of the inertia reels. When the control lever is placed in the aft position, the shoulder harnesses will permit free movement fore and aft, as long as a sudden forward movement is not attempted. Sudden forward movement will lock the inertia reel and permit only aft movement. To unlock the reel, the control lever must be cycled to the forward position, then back to the aft position. Placing the control lever in the forward position will lock the shoulder harness at the existing position and will allow aft movement only.

NOTE: Seat adjustment may be difficult if the seat belts and shoulder harness are tightened prior to adjusting the seat.

Section II

NORMAL PROCEDURES

CONTENTS

INTRODUCTION

Visual inspection of the aircraft is a very important part of each mission. Start your preflight inspection as you approach the aircraft. Look at the overall aircraft condition, chocks, tiedowns, and any unusual wet spots under the aircraft which may indicate leaks. Look at the proposed taxiing routes for any possible obstruction, such as ground repair work, fire extinguishers on the ramp, or other equipment that could cause a taxi accident. The checklist outlines logical steps, but never takes the place of good judgment.

INTERIOR INSPECTION

1. AFTO Form 781 - CHECK.

The AFTO Form 781 is the official log of aircraft operation, refueling, and maintenance. Do not accept an aircraft unless the Form 781 properly indicates the aircraft status and that the aircraft has been cleared for flight.

2. Carbon Monoxide Detector - CHECK.

NOTE: Check the carbon monoxide detector to ensure the color of the center spot approximates the side references. Also, ensure no dark speckles are present on the center spot.

3. Required Publications - ON BOARD.

4. Parking Brake - SET.

5. Tiedowns, Gust Locks, Grounding Wire - REMOVE.

6. Control Lock - REMOVE.

CAUTION: Allowing the control yoke to slam forward when removing the control lock could cause damage to the controls and (or) instrument panel.

NOTE: IF SOLO, LOCK RIGHT SEAT IN FULL AFT POSITION WITH SEAT BELT AND SHOULDER HARNESS FASTENED.

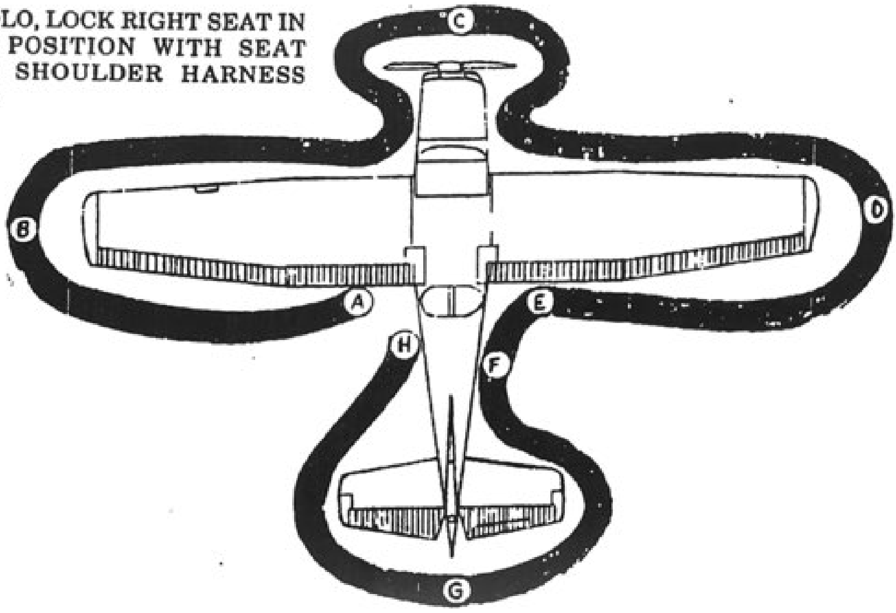


Figure 2-1. Exterior Inspection

7. Master Switch - OFF.

8. Ignition Switch - OFF.

9. Circuit breakers - IN.

10. NAV/COMM/IFF Radios - OFF.

11. Trim - SET at TAKEOFF.

12. Fuel Selector - BOTH.

13. Master Switch - ON. (Check fuel, lights, and stall warning horn, as required.)

WARNING

Clear the propeller area prior to turning the master switch on in case of a starter malfunction.

14. Master Switch - OFF.

15. Fuel Strainer Knob - PULL OUT (4 seconds; first flight of day and after each refueling) if not accomplished by maintenance.

16. Loose Articles - SECURE.

EXTERIOR INSPECTION

(Figure 2-1)

During the exterior inspection, note condition of all aircraft surfaces, antennas, and the security of all access panels. In addition, control surfaces should be checked for clearance, security of attachment and actuator bolts, and the condition of hinges, rollers, slides, actuator cables, counter weights, etc.

A. Left Main Landing Gear Section.

1. Chock - REMOVE.

2. Tire - CHECK inflation, cuts, or blisters. If any cord is showing either from wear or a cut, the tire will be changed.

3. Brake Assembly - CHECK brake pucks for thickness (minimum 3/32 inch) and brake lines for security and leakage.

B. Left Wing Section.

1. Flap - CHECK.

2. Aileron - CHECK.

WARNING

Placing hands or fingers into the slot between the aileron and wing could result in injury.

3. Strobe/Navigation Lights - CHECK condition.

4. Landing/Taxi Lights - CHECK casing and security.

5. Stall Warning Horn - CHECK for obstructions.

6. Fuel vent - CHECK for obstructions and excessive leakage.

7. Pitot Tube - CHECK for obstructions.

CAUTION: The pitot tube should be inspected carefully. Improper handling may misalign the pitot tube, causing incorrect airspeed indications.

C. Engine Section.

1. Static Port - CLEAR.

CAUTION: Check visually; rubbing your finger across the static port may introduce dirt into the static pressure system resulting in erroneous flight instrument indications.

2. Oil Quantity - CHECK. Secure dipstick.

CAUTION: If dipstick is not secure, oil may be lost during flight.

3. Oil Cap - SECURE.

4. Engine Compartment - CHECK for leakage from the fuel strainer valve or excessive oil leakage.

5. Access Door - SECURE.

6. Nose Strut - CHECK. *(NOTE: Nose gear strut extension should be 1 inch minimum to approximately 3 inches. Excessive strut extension can normally be corrected by lifting slightly on the fuselage near the horizontal stabilizer. The nose gear strut should be clean and free of hydraulic leaks. The shiny machined surfaces should be free of dust and dirt.)*

7. Nose Tire - CHECK inflation, cuts, or blisters. If any cord is showing either from wear or a cut, the tire will be changed.

8. Propeller - CHECK for nicks (1/8 inch maximum) or damage.

WARNING

Stay clear of propeller danger area.

D. Right Wing Section.

1. Strobe/Navigation Lights - CHECK.

2. Aileron - CHECK.

3. Flap - CHECK.

E. Right Main Landing Gear Section.

1. Chock - REMOVE.

2. Tire - CHECK.

3. Brake Assembly - CHECK.

F. Tail Section.

1. Right Elevator - CHECK.

2. Trim Tab Alignment - CHECK within 1/4 inch with the elevator held in the trail position.

3. Rudder - CHECK.

4. Rudder and Elevator Cables - CHECK.

Control cable bolts for the rudder and elevator should be checked to ensure they are properly installed and are not binding or rubbing when these control surfaces are moved.

5. Navigation Light - CHECK.

6. Left Elevator - CHECK.

7. Fuel Caps - CHECK.

G. Left Fuselage Section.

1. Baggage Door - SECURE, closed and locked.

BEFORE STARTING ENGINE

1. Seat - ADJUST AND LOCK.

WARNING

Be sure seats are locked in position prior to flight, or they may inadvertently move in flight.

2. Seat Belt and Shoulder Harness - FASTEN.

WARNING

Seat belts should be checked for proper routing to ensure you are secure. The seat belt could hang up on the seat back reclining lever and appear secure, but not hold the pilot securely. The shoulder harness inertia reel should also be checked for binding and proper operation.

3. Parking Brake - RELEASE.
4. Flight Controls - CHECK for free and proper movement.
5. Parking Brake - SET.

STARTING ENGINE

NOTE: You may refer to the cold weather starting procedures for temperatures of 20 degrees and below. See Section VII, All Weather Operation. If the battery is weak and contains an insufficient charge to start the engine, or the overnight temperature was below 40°F, starting with an alternate power source may be applicable. Items indicated by a star (★) will be accomplished by maintenance personnel, but the pilot will ensure they are accomplished.

1. Mixture - RICH.
2. Throttle - OPEN (approximately ¼).

WARNING

Do not pump the throttle during start since excessive fuel forced into the carburetor could cause an engine fire.

3. Carburetor Heat - COLD.
4. Navigation Lights - ON.
5. Primer - AS REQUIRED. (Two strokes for the first flight of the day or one stroke if the engine has already been started.)

★ 6. Left Tire - CHOCK (if applicable).

WARNING

The primer should be visually checked in the closed and locked position after use. Failure to accomplish this may result in a rough running engine.

7. Propeller Area - CLEAR.

WARNING

Clear the area around the aircraft for a full 360 degrees and call "CLEAR."

8. Master Switch - ON.

★ 9. External Power Cord - CONNECT (if applicable).

WARNING

Maintenance will perform this function. Be certain all maintenance personnel are clear of the propeller area prior to engaging the starter.

10. Ignition Switch - START, release when engine starts. (If engine fails to start, accomplish Engine Clearing Checklist.)

CAUTION: Do not operate the starter more than 30 seconds at one time. If the engine fails to start within 30 seconds, allow a 3-minute cooling period before re-engaging the starter.

NOTE:

1. The engine should start in two to three revolutions.

2. Engine mis-starts characterized by weak, intermittent explosions followed by puffs of black smoke from the exhaust are caused by overpriming or flooding. This situation is more apt to develop in hot weather, or when the engine is hot. If it occurs, and an engine fire is not suspected, accomplish the Engine Clearing Checklist.

3. Engine mis-starts characterized by sufficient power to disengage the starter but quitting in 3 to 5 revolutions are the result of an excessively lean mixture and can occur in warm or cold temperatures. Repeat the starting procedure, but use additional priming.

11. Throttle - MINIMUM 1,000 RPM.

CAUTION: Excessive rpm during ground operations may result in FOD damage to the propeller, stabilizer, or other aircraft.

NOTE: A throttle setting of at least 1,000 rpm while stopped on the ground aids in engine cooling and lubrication, prevents spark plug fouling, and provides adequate electrical power.

★12. External Power Cord - DISCONNECT (if applicable).

★13. Left Tire - CHOCK REMOVE (if applicable).

14. Engine Instruments - CHECK.

NOTE:

1. The oil pressure gauge should show a positive indication within 30 seconds of engine start (1 minute in cold weather).

2. A weak battery or a prolonged starting period may cause a high ammeter reading. This is normal; however, do not take off until the ammeter is within the normal range of 0 to +2 needle widths.

BEFORE TAXIING

1. COMM Radio - ON.
2. NAV/IFF Radios - AS REQUIRED.
3. Clock - SET.
4. Flight Instruments - CHECK AND SET.

a. Altimeter - CHECK. Set field elevation.

b. Airspeed Indicator - CHECK pointer for proper indication.

c. Magnetic Compass - CHECK for accuracy of the heading information, cracks in the glass, bubbles in the fluid, and ensure that the compass is free floating.

d. Heading Indicator - SET.

e. Attitude Indicator - SET the miniature aircraft on the artificial horizon and check the bank pointer aligned with the 0-degree bank index.

f. Vertical Velocity - CHECK pointer for proper indication.

5. Flaps - CHECK. Visually check flap operation through at least 20 degrees and then back to 0 degrees. The flap indicator reading should correspond to the flap extension.

CAUTION: Holding the wing flap switch in the full up or down position for extended periods may cause the flap motor to overheat and the circuit breaker to pop.

NOTE: With the flap motor circuit breaker popped, the flaps will be inoperative.

6. COMM Radio - CHECK. The call for taxi serves as the radio check.

7. Flight Controls - POSITION FOR WIND (figure 2-2).

8. Parking Brake - RELEASE.

TAXIING

1. Brakes - CHECK proper operation when pulling out of the chocks. The aircraft need not be brought to a complete stop to adequately check the brakes.

2. Turn-and-Slip Indicator - CHECK for the needle to be deflected to the left and the ball to right during a left turn and vice versa for a right turn.

BEFORE TAKEOFF

CAUTION: Use caution for aircraft "creeping" during this check. Ensure proper clearance on aircraft beside, in front of, and behind you.

NOTE: The parking brake may be set during the Before Takeoff check.

1. Throttle - 1,700 rpm.

2. Engine Instruments and Suction Gauge - CHECK proper indications.

3. Carburetor Heat - CHECK. The carburetor heat check during engine runup serves two purposes: (1) to ensure that the carburetor heat control is operative, and (2) to indicate whether carburetor ice has formed during taxi. With the throttle at 1,700 rpm, the rpm should drop when the heat control is pulled out. If the rpm does not drop, the carburetor heat is inoperative. Do not fly the aircraft until maintenance repairs the malfunction. If the rpm drops, monitor the tachometer for several seconds with the heat on. If the rpm begins to increase, this indicates the presence of ice. Allow the rpm to stabilize, then push the heat control in. If the ice has melted, the rpm will increase to a reading above 1,700 rpm because the engine efficiency was returned to normal.

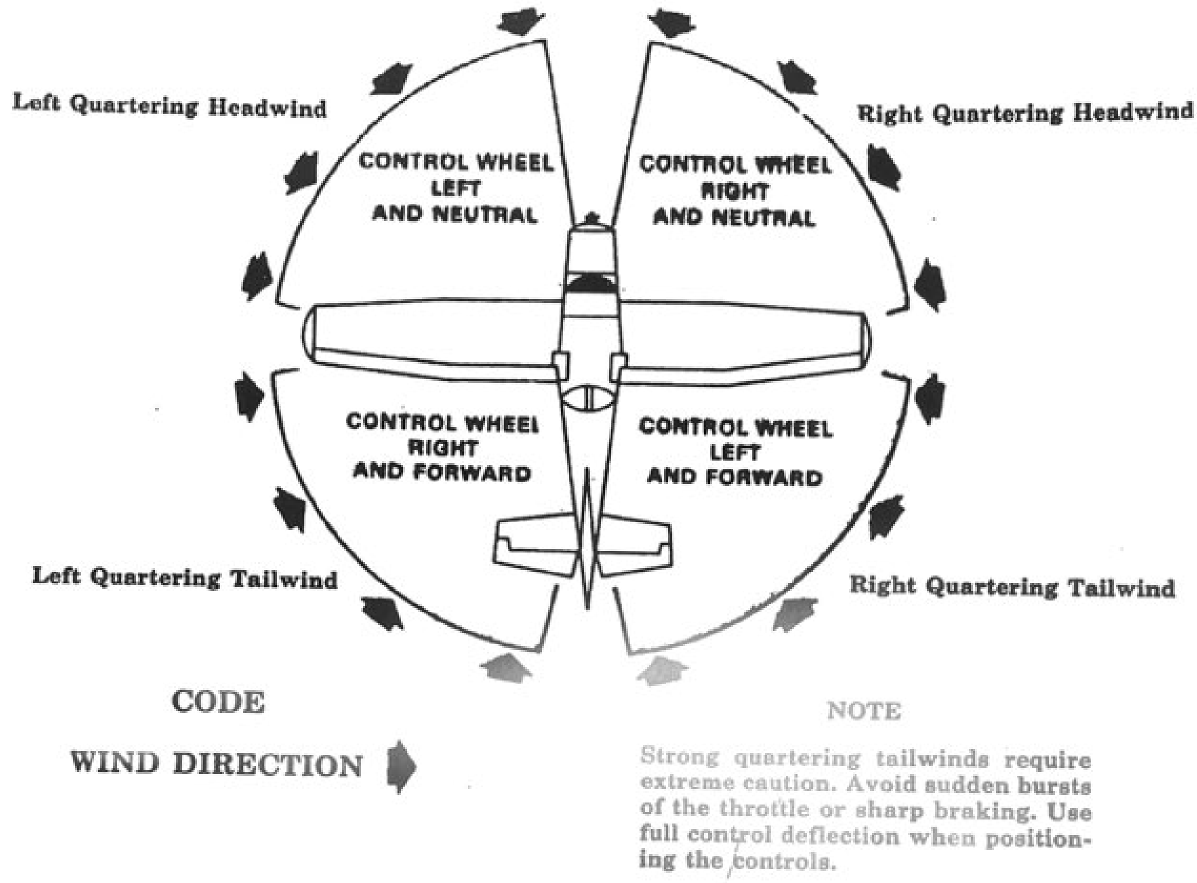


Figure 2-2

CAUTION: Since the heated air is unfiltered, keep the use of carburetor heat to a minimum during ground operations. Dust injected into the engine can cause extensive wear and permanent damage.

4. Ignition System - CHECK.

a. Ignition Switch - RIGHT. Check the amount of rpm drop, then return to BOTH. Ensure rpm returns to 1,700.

b. Ignition Switch - LEFT. Check the amount of rpm drop, then return to BOTH. Ensure rpm returns to 1,700.

NOTE: Maximum allowable rpm drop is 125, with a maximum difference between magneto drops of 75 rpm. If no rpm drop or an excessive rpm drop is noted, abort the aircraft.

NOTE: Do not operate on a single magneto for an extended period of time. Normally, 2 to 3 seconds are sufficient to check for an rpm drop. This will minimize spark plug fouling.

5. Throttle - IDLE CHECK. With the throttle in idle, engine rpm should be 550 to 625. If the engine does not idle within this range, do not take the aircraft. Call for maintenance assistance.

6. Throttle - MINIMUM 1,000 rpm.

7. Lights - AS REQUIRED.

a. Strobe Lights - ON.

CAUTION: Do not use the strobe lights until just prior to takeoff if an excessive delay is expected.

b. Rotating Beacon - ON.

8. IFF - AS REQUIRED.

9. Doors and Window - CLOSE and LOCK.

TAKEOFF

WARNING

Avoid wake turbulence. The T-41 is particularly susceptible to wake turbulence because of its short wingspan and light gross weight. The vortex-produced rolling moment can exceed the aileron authority of the aircraft. Allow a minimum of 2 minutes before takeoff behind a large aircraft or helicopter. This time should be extended to 4 minutes behind heavy aircraft. With effective crosswinds of over 5 knots, the time requirement may be reduced, but attempt to remain upwind of the preceding aircraft's flightpath.

Normal Takeoff

Refer to Appendix 1 for the takeoff chart showing distances required at varying gross weights, temperatures, field elevations, wind, and runway conditions.

Maintain directional control by use of rudder and nosewheel steering. Exercise care in compensating for the effect of torque to prevent overcontrolling with the rudder. Hold the elevator slightly aft of neutral to keep weight off the nosegear and hold sufficient aileron into the wind to keep the wings level. At 50 to 60 mph, raise the nose smoothly to takeoff attitude. Maintain this attitude and allow the aircraft to fly off the ground, which will normally occur between 65 and 75 mph.

Crosswind Takeoff

When strong crosswinds approaching the maximum allowable wind limits are encountered, it is advisable to retain nosewheel steering as long as possible. During the takeoff run, additional aileron must be held into the wind to keep the upwind wing from rising. Delay rotation to takeoff attitude until 60 mph.

Obstacle Clearance Takeoff

Obstacle clearance takeoffs are performed with flaps up, at 63 mph. After liftoff, accelerate (if required) to the best angle-of-climb speed, which varies from 63 mph at sea level to 69 mph at 10,000 feet MSL. Once clear of obstacles, accelerate to normal climb speed of 90 mph.

Short Field Takeoff

Short field takeoffs are performed with 10 degree flaps, which will shorten the ground run by approximately 10 percent. Once safely airborne, and at a minimum of 80 mph, raise the flaps and accelerate to climb speed.

Soft Field Takeoff

Soft field takeoffs are performed with 10 degrees flaps by lifting the nosewheel off the ground as soon as practical and leaving the ground in a slightly higher than normal attitude. However, the aircraft should be leveled off immediately to accelerate to a safe climb speed.

AFTER TAKEOFF

1. Engine Instruments - CHECK.
2. Flaps - UP.
3. Landing/Taxi Lights - AS REQUIRED.

CLIMBS

Normal climbs are accomplished with full power and at a constant airspeed of 90 mph. See chapter 6 for more information on climb performance.

CAUTION: When initiating a climb from level flight with speeds above 100 mph, control the rate of power increase to avoid overspeeding the engine.

LEVEL OFF

1. Fuel Quantity - CHECK total and balance.
2. Engine Instruments - CHECK.
3. Mixture - AS REQUIRED. (Lean as required for extended navigation missions.)
4. NAV/IFF Radios - AS REQUIRED.

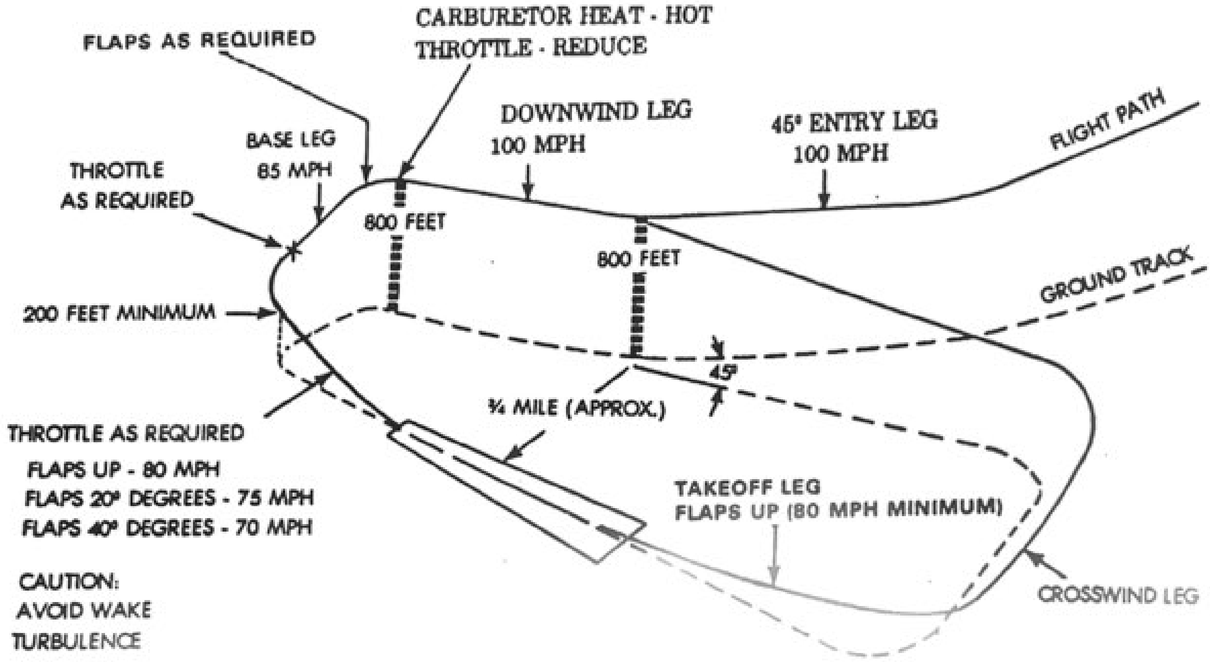


Figure 2-3. Traffic Pattern

FUEL MANAGEMENT PROCEDURES

With a combination of highly volatile fuel, high fuel temperature, high operating altitude, and low fuel flow rate in the tank outlet lines, there is a remote possibility of accumulating fuel vapor and encountering power irregularities on some airplanes. To minimize this possibility, the following operating procedures are to be followed.

1. Takeoff and climb to cruise altitude on "Both" tanks. (This is consistent with current procedures.)

2. When reaching cruise altitude above 5,000 feet MSL, promptly switch the fuel selector from "Both" to either the "Left" or the "Right" tank and then to the opposite tank to ensure both tanks are feeding.

3. During cruise use "Left" or "Right" tank as required.

NOTE: Pilots should manage fuel balance throughout the flight.

BEFORE DESCENT

Before making a descent from cruise altitude, proceed as follows:

1. Fuel Quantity - CHECK total and balance.
2. Mixture - RICH.

WARNING

Descending to low altitude without enriching the mixture may cause engine damage or possible fuel starvation and engine failure.

---

3. Flight Instruments - AS REQUIRED.

   a. Crosscheck the heading indicator with the magnetic compass and reset if necessry.

   b. Check the altimeter as required.

4. Fuel Selector - BOTH.

NOTE: Setting the fuel selector to BOTH allows fuel to flow from both tanks and prevents engine failure from running one fuel tank dry.

BEFORE LANDING

The following steps will be accomplished as necessary before each landing.

1. Carburetor Heat - HOT.
2. Flaps - AS REQUIRED.
3. Landing/Taxi Light - AS REQUIRED.

WARNING

Because of wake turbulence, allow minimum of 2 minutes before landing behind a large aircraft or helicopter. This time should be extended to 4 minutes behind heavy aircraft. With effective crosswinds of over 5 knots, the time requirement may be reduced, but attempt to remain above and upwind of the preceding aircraft's flightpath.

LANDING

Normal Landing

The normal landing is accomplished from a rectangular pattern. Downwind should be approximately ¾ of a mile from the runway and flown at 800 feet AGL and 100 mph. A pattern that is other than 800 feet AGL will require an adjustment to the downwind displacement. The pattern should be planned to arrive on final approach approximately ¾ of a mile from the runway, on a proper glidepath for conditions. Normal configuration is 20 degrees of flaps, lowered (below 100 mph) after beginning the turn to base. Airspeeds are 85 mph on base, 75 mph on final.

WARNING

Retracting the flaps on final approach combined with low airspeed may cause the aircraft to stall.

During the final approach, adjust power to arrive over the runway threshold at an altitude and airspeed which will permit a smooth reduction in power and gradual increase in pitch attitude for touchdown on the main wheels. Attempting to touch down at an excessive airspeed may result in a three-point or nosewheel first landing, which may cause porpoising or wheelbarrowing. Ensure that the nosewheel is smoothly lowered to the runway prior to losing elevator effectiveness. Maintain directional control using rudder, nosewheel steering, and differential braking as necessary.

Crosswind Landing

Use the wing-low method, crab, or a combination of both to maintain runway alignment on final approach. Touch down using the wing-low method. Use aileron throughout the landing roll to counteract the effect of the crosswind. After touchdown, lower the nose smoothly to the runway as soon as possible, and maintain directional control by using rudder and nosewheel steering. To preclude wheelbarrowing, avoid using excessive forward control wheel pressures at high speeds. In strong or gusty crosswinds, fly a no-flap approach and add 5 to 10 mph to the no-flap final approach speed.

No-Flap Landing

Traffic pattern procedures are similar to the normal landing except that flaps are not used. Fly a final approach with a slightly higher than normal pitch attitude. Final approach airspeed is 80 mph.

Full Flap Landing

The full flap landing permits a slightly steeper final approach and a slower final approach speed. The base turn for a full flap pattern is flown using normal pattern procedures. You should roll out on final some what higher than normal. Once on final, lower the flaps to full, reduce the power to idle, and slow to 70 mph.

WARNING

Slips are prohibited when using over 30 degrees of flaps due to a possible downward pitch under certain combinations of airspeed and sideslip angles.

Short Field Landing

For a short field landing, fly a full flap approach at 65 mph (utility category) or 67 mph (normal category), using enough power to clear any obstacles. Immediately after touchdown, lower the nose and apply maximum braking. Raising the flaps after landing will provide more effective braking.

Soft Field Landings

For landing on a soft or unprepared surface, fly a full flap approach as for a short field landing. Plan to touchdown with the minimum descent rate practical. After touchdown, hold the nosewheel off the ground as long as possible.

Braking Procedure

Braking effectiveness increases as forward speed decreases. Use the brakes as necessary to decelerate the aircraft to a safe taxi speed before turning off the runway.

NOTE: Holding the control wheel aft of neutral will decrease aircraft weight on the nosewheel and increase braking effectiveness.

If maximum braking is required, lower the nosewheel to the runway, raise the flaps (if used), and apply the brakes, constantly increasing pedal pressure as the aircraft's speed decreases.

CAUTION: Applying heavy braking immediately after touchdown may result in a skid and possible blown tire.

Straight-In Approach

If it is necessary to land from a straight-in approach, the aircraft should normally be positioned for at least a 2-mile final. Flap setting, appropriate final approach airspeed, and interception of an extended glidepath should be attained prior to ¾ of a mile from the runway.

Landing on Slippery Runways

Touchdown should be made close to the approach end of the runway in order to utilize all the available runway length. Use of a full flap pattern and landing will allow for the slowest touchdown speed. Higher landing speeds will result in greater stopping distances. Maintain the landing attitude as long as practical. If brakes are applied hard and suddenly, a skid may result. For maximum braking effectiveness after all three wheels are on the ground, retract the flaps, hold full noseup elevator and use brakes lightly applying pedal pressure evenly and slowly. Use nosewheel steering for directional control. If skidding occurs, reduce or release pressure on both brake pedals, use nosewheel steering to regain directional control, then cautiously reapply the brakes.

GO-AROUND

If a landing or approach appears unsafe, make a go-around. Make the decision to go around as soon as possible. If touchdown is unavoidable, do not try to hold the aircraft off the runway, but continue to fly the aircraft to touchdown. If a touchdown is made, lower the nose slightly to a normal takeoff attitude and allow the aircraft to accelerate to takeoff. When a go-around is required at low altitude, proceed as follows:

1. Set the throttle full in. Maintain directional control and a safe pitch attitude.
2. Set the carburetor heat - COLD.
3. Raise the flaps to 20 degrees as soon as conditions permit. Raise the flaps to 0 degrees after attaining a minimum of 80 mph.

WARNING

Avoid using excessive bank angles at low altitudes because stall speed increases as bank angle increases and sufficient altitude may not be available for a stall recovery.

TOUCH-AND-GO PROCEDURES

To make a touch-and-go landing:

1. Establish takeoff attitude and apply full power.

WARNING

If a full flap landing was accomplished, raise the flaps to 20 degrees or less prior to applying power for the touch-and-go.

NOTE: Engine instruments should be checked as soon as practical after applying full power to confirm that the engine is operating normally.

2. Set carburetor heat - COLD.

3. When safely airborne and at a minimum of 80 mph, raise the flaps.

WARNING

Touch-and-go landings encompass all aspects of the landing and takeoff procedures in a relatively short period of time. Be constantly alert for aircraft malfunctions during this critical phase of flight.

AFTER LANDING

After completing the landing roll and clearing the runway, proceed as follows:

1. Carburetor Heat - COLD.

NOTE: To minimize the possibility of engine damage, carburetor heat may be set to "COLD" while on landing roll provided the aircraft has slowed to a safe taxi speed.

2. Flaps - UP.

3. Trim - SET AT TAKEOFF.

4. Lights - AS REQUIRED.

a. Landing/Taxi Light - OFF.

b. Rotating Beacon - OFF.

c. Strobe Lights - OFF.

5. NAV/IFF Radios - OFF.

ENGINE SHUTDOWN

1. Throttle - IDLE.

2. Magneto Grounding - CHECK. (Ensure the engine will run on each magneto and will quit when the ignition switch is momentarily turned to OFF.)

3. Mixture - CHECK. Set throttle at 1,000 rpm. Slowly lean mixture for a 25-rpm increase. Run engine for 1 minute at this setting. (Note absence of an rpm increase, or an increase greater than 25 rpm in the AFTO 781A.)

4. COMM Radio - OFF.

5. Cabin Vents, Air and Heat Knobs - CLOSE.

6. Mixture - FULL LEAN.

7. Propeller - CHECK STOPPED.

8. Navigation Lights - OFF.

9. Ignition Switch - OFF.

10. Master Switch - OFF.

11. Fuel Selector - OFF (last flight of the day only).

12. Control Lock - INSTALL.

CAUTION: Ensure proper positioning of the control prior to installing the control lock.

BEFORE LEAVING AIRCRAFT

1. Parking Brake - SET.

2. Seat Belts - FASTEN.

3. Chocks - INSTALL.

4. Tiedowns, Grounding Wire - INSTALL.

5. Gust Locks - AS REQUIRED.

ENGINE CLEARING

Use this procedure to remove excessive fuel prior to attempting restart.

1. Mixture - FULL LEAN.

2. Throttle - OPEN (approximately ¼").

3. Ignition Switch - START, hold for several revolutions.

NOTE: IF ENGINE STARTS, allow it to run until it stops from fuel exhaustion.

4. Repeat STARTING ENGINE checklist.

Section III

EMERGENCY PROCEDURES

CONTENTS

This section contains the recommended procedures for various emergency conditions. No attempt has been made to cover every conceivable malfunction or emergency. A sound knowledge of these procedures and the basic aircraft systems will, however, provide the necessary background to evaluate and cope with most emergencies. The procedures presented in **BOLD FACE TYPE** are considered critical actions.

CRITICAL ACTIONS

Those actions which must be performed immediately if the emergency is not to be aggravated, and injury or damage is to be avoided. These critical steps will be committed to memory.

NONCRITICAL ACTIONS

Those actions which contribute to an orderly sequence of events, ensure that all supporting preparations are made after initiating the critical emergency actions, improve the chances for the emergency action to be successful, and serve as cleanup items.

To assist the pilot when an emergency occurs, three basic rules are established which apply to all emergencies:

1. Maintain aircraft control.
2. Analyze the situation and take proper action.
3. Land as soon as conditions permit.

NOTE: Even though the procedures here are considered to be correct under most circumstances, the pilot must still use sound judgment and modify the procedures if required when confronted with multiple emergencies, bad weather, marginal terrain clearance, etc.

EMERGENCY GROUND EGRESS

During most emergencies you will normally want to egress the aircraft as soon as conditions permit. To accomplish this, pull the mixture to full lean, turn the fuel selector off, turn the ignition and master switches off, and set the parking brake. Varying circumstances will dictate how many of the above actions can be accomplished before leaving the aircraft.

Rapid egress is best accomplished by following an orderly sequence. Remove the headset, disconnect the seat belt and shoulder harnesses, slide the seat full aft and open the door. If time permits, the easiest exit route is via the right side since the right seat slides farther aft than the left seat.

WARNING

While abandoning the aircraft, use caution for other aircraft, spinning propellers, and any other obstructions.

GROUND OPERATION EMERGENCIES

Engine Fire on The Ground

If you observe fire or smoke coming from the engine section while on the ground, remove the fuel and ignition sources as follows and then egress the aircraft.

1. MIXTURE - FULL LEAN.
2. FUEL SELECTOR - OFF.
3. IGNITION SWITCH - OFF.

Abort

If an abort during takeoff or landing is necessary for any reason, accomplish the following:

1. THROTTLE - IDLE.
2. BRAKES - AS REQUIRED.

CAUTION: Avoid heavy braking at high speeds as skids or blown tires are possible. Unless the condition causing the abort requires stopping the aircraft immediately, use as much of the remaining runway as needed to safely bring the aircraft to a stop or to slow the aircraft sufficiently to turn off the runway.

Departing a Prepared Surface

Any time the aircraft departs, or is about to depart, a prepared surface, immediately shut down the engine by pulling the mixture control knob to full lean. This will minimize internal damage should the propeller strike the ground or other objects. Accomplish Emergency Ground Egress procedures and abandon the aircraft.

IN-FLIGHT EMERGENCIES

Establishing Glides

Engine failures to shutdowns while airborne require the pilot to establish a glide in order to prevent a stall while accomplishing the appropriate emergency procedures.

WARNING

With an engine malfunction, select a field and begin setting up for a possible forced landing while analyzing the problem.

The desired glide airspeed will depend on such factors as altitude, configuration, and distance to the planned touchdown zone.

Engine malfunctions at very low altitudes, such as during takeoff, may not allow sufficient time to stabilize on the optimum glide airspeeds listed below. In such cases it is critical that the pilot maintain a glide airspeed with a safe margin above stall while executing the forced landing.

Circumstances will dictate the desired configuration during glides. For maximum distance glides, the optimum configuration and airspeed are flaps UP and 80 mph. (Figure 3-1) Lowering flaps will increase both the angle and rate of descent. Optimum glide speeds are 75 mph for 20 degrees flaps and 70 mph for over 20 degrees flaps.

NOTE: Full flap glides are very steep, and require an aggressive flare just prior to touchdown in order to prevent a nosewheel-first landing. Control wheel forces will be heavier than normal and up to full aft control will be required.

Engine Failure Immediately After Takeoff (or Low Altitude)

If the engine should fail immediately after becoming airborne, or at low altitude, and altitude precludes the possibility of aborting on the runway or restarting the engine, land straight ahead, turning only as necessary to avoid obstructions. Apply the following procedures as time and conditions permit:

1. GLIDE - ESTABLISH.
   a. Flaps UP - 80 mph.
   b. Up to 20 degrees flaps - 75 mph.
   c. Over 20 degrees flaps - 70 mph.
2. MIXTURE - FULL LEAN.
3. FUEL SELECTOR - OFF.
4. IGNITION SWITCH - OFF.

The desired flap setting will depend on altitude, ground distance available for the glide, and the condition of the intended forced landing field. A full flap landing is recommended for forced landings on unprepared surfaces. If time permits, turn the master switch off prior to touchdown.

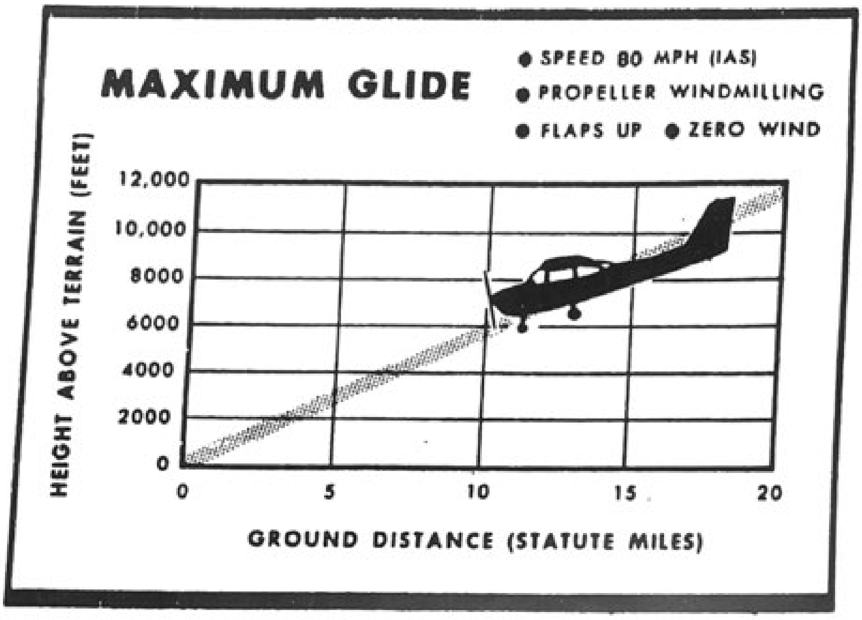


Figure 3-1

WARNING

1. Position flaps to the desired setting prior to turning the master switch off.

2. Do not attempt to turn back to the runway or spend excessive time trying to accomplish the checklist. A stall and (or) loss of aircraft control may result.

Partial Engine Failure During Flight

Partial engine failure may occur for several reasons. The most common cause is carburetor icing. Carburetor icing is usually indicated by a loss of power (drop in rpm) which may be accompanied by engine roughness. Monitoring engine instruments throughout the flight will aid early recognition of carburetor icing. Any time icing conditions are ideal or actual carburetor icing has been reported, make periodic checks by pulling the carburetor heat knob to HOT. To correctly use carburetor heat, first apply full heat until all ice is removed. The rpm will decrease more than usual and will momentarily run rough. After the ice has cleared, the rpm will begin to increase slightly and the engine will run smoothly. Return the carburetor heat to COLD. Then make frequent, periodic checks for further icing by pulling the carburetor heat knob to HOT. If no new ice has accumulated, the rpm will make a stabilized drop. Failure of the rpm to stabilize indicates further icing. Leave the heat control HOT until the ice melts and the engine returns to smooth operation. Make subsequent checks for carburetor icing more frequent.

Since carburetor icing can occur when the outside air temperature is above freezing, always apply carburetor heat if the throttle setting will remain below 1,700 rpm for an extended period of time. Carburetor icing is most likely to occur at temperatures of 32° to 80°F. Conversely, due to the danger of engine overheating and detonation, remove carburetor heat as soon as the throttle is advanced above 1,700 rpm. For the same reasons, the mixture should be full rich when using carburetor heat.

WARNING

Do not use partial carburetor heat. Use of partial heat may bring the air temperature around the carburetor to within the critical range, and cause icing that otherwise would not have occurred.

NOTE: If carburetor icing is encountered, notify the appropriate controlling agency.

Other causes of partial engine failure may include malfunctions such as a fuel leak, abnormal combustion, faulty timing, or improper positioning of a switch or knob. Several indications usually accompany a partial power loss. These include fluctuating rpm, possible high oil temperature, and (or) a rough vibrating engine. A check of the engine instruments may provide you with valuable information for regaining power. Proper glide speeds will provide optimum glide performance under partial power. Apply the following procedures if a partial engine failure is suspected:

1. Mixture - Rich.
2. Carburetor Heat - Hot.
3. Fuel Selector - Both.
4. Master Switch - On.
5. Primer - In and Locked.
6. Ignition Switch - As required.

NOTE: If abnormal combustion or faulty timing is suspected, the engine may perform better with the ignition switch in either the LEFT or RIGHT position rather than BOTH.

7. Mixture - adjust to maintain smooth engine operation.

WARNING

If unable to maintain level flight, make a forced landing. Partial power will increase glide distance.

CAUTION: If a partial engine failure is encountered that allows level flight to be maintained, fly to the nearest suitable field and land. Extended flight under this condition may result in engine damage.

Power Irregularities Caused by Vapor in The Fuel Tank

During flight above 5,000 feet MSL with a combination of highly volatile fuel, high fuel temperature, and low fuel flow rate in the tank outlet lines there is a remote possibility of accumulating fuel vapor and encountering power irregularities. In the event that vapor is present in sufficient mounts to cause a power irregularity, the following power recovery techniques should be followed:

Operation on a Single Tank. Should power irregularities occur when operating on a single tank, power can be restored immediately by switching to the opposite tank. In addition, the vapor accumulation in the tank on which the power irregularity occurred will rapidly dissipate itself such that that tank will also be available for normal operation after it has been unused for approximately 60 seconds.

Operation on Both Tanks. Should power irregularities occur with the fuel selector on both tanks, the following steps are to be taken to restore power:

1. Switch to a single tank for a period of 60 seconds.

2. Then switch to the opposite tank and power will be restored.

Complete Engine Failure During Flight

An engine failure may or may not give you prior warning. Prior warning is normally in the form of a rough running engine, loss of oil pressure, sudden or uncontrollable rise in oil temperature, sudden rise in oil pressure, or fluctuating rpm. If an engine failure occurs:

1. GLIDE - ESTABLISH.
   a. Flaps UP - 80 mph.
   b. Up to 20 degrees flaps - 75 mph.
   c. Over 20 degrees flaps - 70 mph.

If an airstart is warranted:

2. Fuel selector - Both.
3. Mixture - Rich.
4. Throttle - As Required.
5. Master Switch - On.
6. Ignition Switch - Both.

NOTE:. If engine structual damage is suspected, accomplish a forced landing. However, if the engine fails for no apparent reason and time and conditions permit, attempt an airstart.

CAUTION: If the engine does not start, do not waste time in futile attempts to restart the engine. Maintain the glide and make a forced landing.

If an engine restart is not warranted or is unsuccessful, proceed with forced landing procedures.

Engine Fire During Flight

Apply the following procedures in the event of an engine fire during flight:

1. **MIXTURE - FULL LEAN.**
2. **FUEL SELECTOR - OFF.**
3. **IGNITION SWITCH - OFF.**

WARNING

Do not attempt to restart an engine that has been shut down due to an engine fire. Pick a suitable field and continue with forced landing procedures.

Forced Landing (Figure 3-2)

In the event of an engine failure, and airstarts are unsuccessful or not deemed advisable proceed as follows:

1. **GLIDE - ESTABLISH.**
   a. Flaps UP - 80 mph.
   b. Up to 20 degrees flaps - 75 mph.
   c. Over 20 degrees flaps - 70 mph.
2. Mixture - Full Lean.
3. Fuel Selector - Off.
4. Ignition Switch - Off.
5. Flaps - As Required.
6. Master switch - Off.

A suitable field should be picked as early as possible so that maximum time will be available to plan and execute the forced landing.

WARNING

1. Slips are to be avoided when using over 30 degrees of flaps due to the possible downward pitch encountered under certain combinations of airspeed and sideslip angles.

2. If time permits, each crewmember should ensure that seat belts are tightened and shoulder harnesses locked. If time permits, the cabin doors should be unlatched, especially if landing in rough terrain.

For forced landings on unprepared surfaces, use full flaps and a 70-mph glide, time and conditions permitting. Land on the main gear, holding the nosewheel off the ground as long as possible.

Electrical Fire

If an electrical fire is detected by the presence of fumes or smoke, proceed as follows:

1. **MASTER SWITCH - OFF.**

CAUTION: If turning off the master switch eliminates the fire situation, **leave the master switch off.** Do not attempt to isolate the source of the fire by checking each individual electrical component with the master switch on.

NOTE: Circuit breakers protect most of the aircraft electrical systems and will automatically isolate the affected system if a short circuit occurs.

Smoke and Fume Elimination

1. Cabin Heat Knob - In.
2. Cabin Air Knob - In.
3. Upper Air Vents - Open.
4. Pilot's Window - As Required. If necessary, the window may be opened (below 100 mph) to assist in clearing the smoke or fumes from the cabin.

WARNING

Any time a crewmember or passenger experiences dizziness or a sudden headache, immediately accomplish the above procedure.

If any occupant of the aircraft is suspected of suffering physical impairment, a landing will be accomplished at the nearest suitable airport where medical assistance can be obtained.

High Ammeter Reading

A high ammeter reading is normally the result of a malfunction in the battery or alternator circuitry. If the ammeter indicates full scale rate of charge or stabilizes at more than 2 needle widths positive deflection, apply the following procedure:

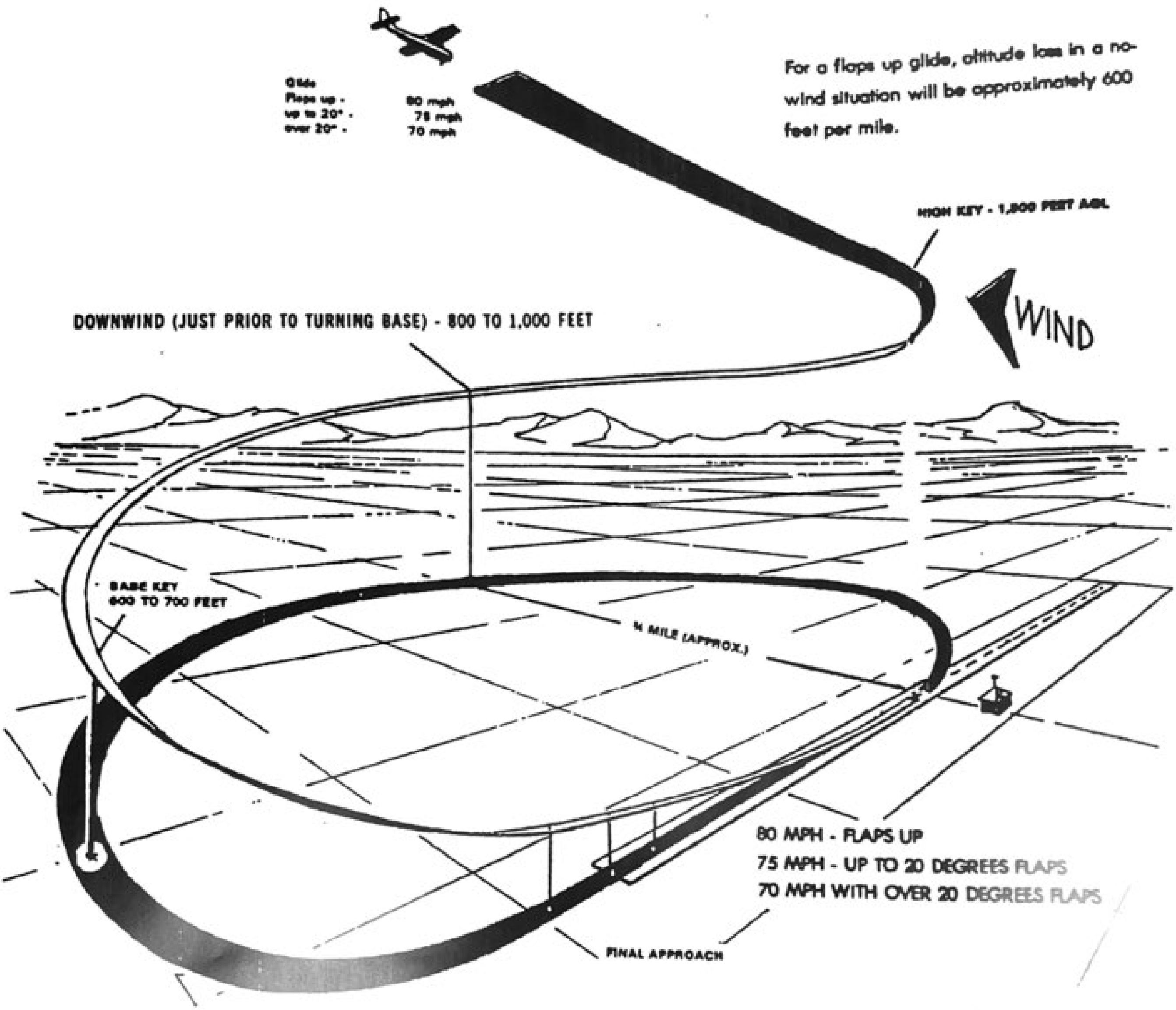


Figure 3-2. **Typical Forced Landing Pattern**

1. **Master Switch - Off.**

WARNING

Continued operation of the battery/alternator circuitry with a high ammeter reading may cause the battery to burn, boil over, or explode.

NOTE: Turning the Master Switch OFF removes all electrical power to aircraft components.

Negative Ammeter Reading

If, at normal power settings, the ammeter is showing a discharge, the alternator is not producing sufficient electrical power. The battery is supplying current to the electrical system. If this occurs, use the following procedure:

1. *Electrical Load.* Reduce the electrical load by turning off unnecessary electrical compo-

nents accessible to the pilot. Exterior lights are high drain items. This should not be accomplished by turning off the master switch. If the master switch is turned off after the battery has been drained below the current level required to actuate the battery contactor, subsequent activation of the master switch for electrical usage will be ineffective.

NOTE: Prior to turning communication equipment off, advise the controlling agency of the situation, if possible.

Oil System Malfunction

Any type of oil system malfunction is serious since it may result in engine failure. In the event of an oil system malfunction, apply the following procedures and land as soon as conditions permit:

1. Throttle - As Required. If possible, adjust the throttle to maintain the oil pressure within normal limits.

2. Mixture - Rich.

CAUTION: Do not operate the engine on the ground with the oil pressure above 100 psi or below 10 psi as engine damage may result.

Structural Damage or Controllability Check

NOTE: Do not reset the flaps if significant structural damage is located in the wings.

1. Climb to at least 1,500 feet above the terrain (if practical) at a controllable airspeed.

2. Simulate a landing approach and determine the airspeed at which the aircraft becomes difficult to control (minimum controllable airspeed).

WARNING

Do not allow the aircraft to stall. If the aircraft becomes difficult to control or approaches a stall, lower the nose and increase power to recover. Rudder will assist the ailerons to counter roll.

3. Plan to fly a straight-in approach. Fly the normal final approach airspeed for your flap setting, or 5 to 10 mph above minimum controllable airspeed, whichever is higher.

4. Plan to touch down at no less than minimum controllable airspeed. Do not begin to reduce final approach speed until the aircraft is very close to the runway.

LANDING EMERGENCIES

Landing With a Flat Tire

If a flat tire or tread separation occurs during takeoff and conditions do not permit an abort, land as soon as conditions permit. If a main tire is flat, land on the side of the runway corresponding to the good tire. Maintain directional control with a differential braking and nosewheel steering. If the nose tire is flat, land in the center of the runway and hold the nosewheel off the ground as long as possible. Stop the aircraft and accomplish a normal engine shutdown.

Brake Failure

If an inoperative brake is suspected, land on the side of the runway corresponding to the inoperative brake. Use a combination of nosewheel steering and the good brake to maintain directional control. If both brakes are inoperative, land in the center of the runway. Shut down the engine and use nosewheel steering to avoid any obstacles.

Section IV
CREW DUTIES

CREW DUTIES

Crew duties are not applicable in this aircraft.

Section V

OPERATING LIMITATIONS

CONTENTS

OPERATING LIMITATIONS

This section includes aircraft and engine limitations which must be observed during normal operation. These limitations are derived from extensive wind tunnel and flight testing to ensure your safety and to help obtain maximum utility of the equipment.

MINIMUM CREW REQUIREMENTS

The minimum crew required for this aircraft is one pilot in the left seat.

INSTRUMENT MARKINGS

Airspeed Limitations

The following are the calibrated airspeed limits for the aircraft:

Maximum..........................174 mph
(Red Line) (glide, dive, or smooth air)

Normal Operating Range......59 to 140 mph
(Green Arc)

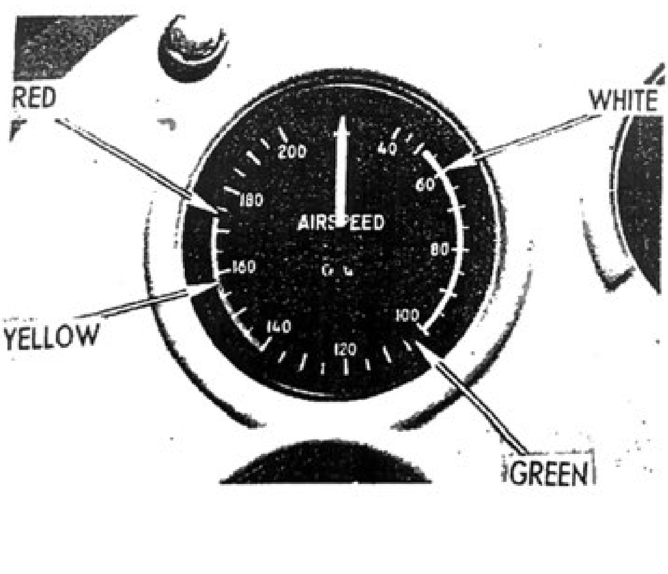
Caution Range...............140 to 174 mph
(Yellow Arc)

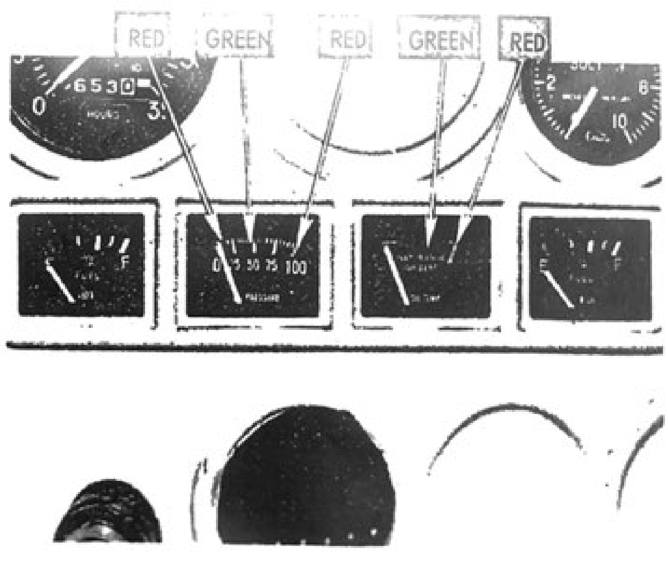
Flaps (maximum) ....100 mph
(Top of the White Arc)

Maneuvering Speed ....122 mph*

Maximum Speed, window open .....100 mph

*The maximum speed at which you can use abrupt control travel without exceeding the design load limit.





Oil Temperature Gauge

Normal Operating Range ....Green Arc

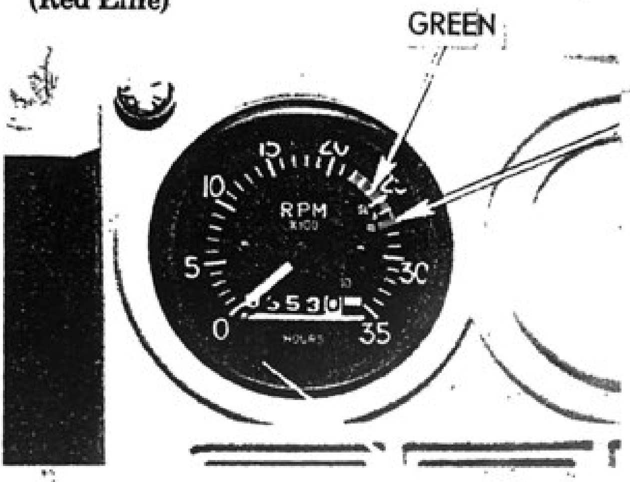
Maximum Allowable ....Red Line

Oil Pressure Gauge

Minimum Idling ....10 psi
(Red Line) (ground)

Normal Operating Range ....30 to 60 psi
(Green Arc) *Exception:* Aircraft modified with a heavy duty oil pump have a normal operating range of 35 to 70 psi. Minimum and maximum oil pressure remain unchanged.

Maximum ....100 psi
(Red Line)



Tachometer

Normal Operating Range:

At sea level ....2,200 to 2,500 rpm

At 5,000 feet MSL ....2,200 to 2,600 rpm

At 10,000 feet MSL ....2,200 to 2,700 rpm

Maximum ....2,700 rpm
(Red Line) (Engine Rated Speed)

Full Throttle ....2,230 to 2,420 rpm
(Static Runup)

Idle (on the ground)...........550 to 625 rpm

Fuel Quantity Gauges

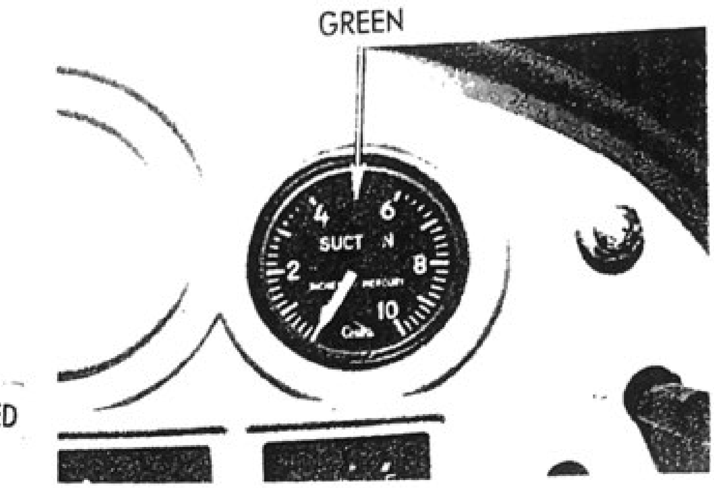
Full Mark..........39 gal (19.5 gal each tank)

Usable Fuel ....36 gal (18 gal each tank)
(level flight)

Empty ....E (Red Line)
(1.5 gal unusable, each tank)

WARNING

Fuel quantity gauges may not be reliable below one quarter in each tank. Fuel quantity gauges are accurate only in stabilized straight-and-level flight.



Vacuum Gauge

At 1,700 rpm or above ....4.6 to 5.4 inches
Hg (Green Arc)

Ammeter

Normal ....0 to +2 needle widths

Maximum ....+2 needle widths

PROHIBITED MANEUVERS

The following maneuvers are prohibited:

1. Maneuvers requiring zero or negative "G" flight.

2. IMC flight.
3. Slips with over 30 degrees flaps extended.
4. Spins.
5. Night flying.
6. Practice actual engine shutdown in flight.
7. Whip stalls.
8. Aerobatic maneuvers.
9. Touchdowns from SFLs (except on prepared surfaces at authorized airfields).

WEIGHT LIMITATIONS

Normal Category

This aircraft is certified in both the normal and utility category. The normal category is applicable to aircraft intended for nonaerobatic operations. These include any maneuvers incidental to normal flying, and turns in which the angle of bank is not more than 60 degrees. In connection with factors the following gross weight and flight load factors apply:

Gross Weight ....2,300 pounds

Flight Load Factor* ....-1.52Gs to +3.8Gs
Flaps Up

Flight Load Factor* ....-1.52Gs to +3.5Gs
Flaps Down

The design load factors are 150 percent of the above and, in all cases, the structure meets or exceeds design loads.

Utility Category

This aircraft is not designed for purely aerobatic flight. However, certain maneuvers are allowed when the aircraft is operated in the utility category. In the utility category, the area behind the pilot's and instructor's seats must not be occupied, and the following gross weight and flight load factors apply:

Gross weight....................2,000 pounds

Flight Maneuvering ....-1.76Gs to +4.4Gs
Load Factor, Flaps Up

Flight Maneuvering Load ...-1.76Gs to +3.5Gs
Load Factor, Flaps Down

For center of gravity and weight and balance computations, refer to the Appendix.

Section VI

FLIGHT CHARACTERISTICS

CONTENTS

GENERAL FLIGHT CHARACTERISTICS

Control forces are light. Adequate stability and control are available throughout the operating speed range. When properly trimmed, in the clean configuration, the aircraft will remain in straight-and-level flight with little attention from the pilot.

STALLS

The stall characteristics of the aircraft are conventional in all configurations. Stall warning is provided by the stall warning horn between 5 and 10 mph above the stall, and in some instances, by a noticeable aircraft buffeting. In a power-on situation, the aircraft may or may not buffet prior to stalling. If recovery is not initiated at this point, the nose will fall abruptly even if full aft elevator is held. One wing may drop before the other if the aircraft is in uncoordinated flight when it stalls. The factors that affect the stalling characteristics are: weight, load factor, airspeed, flap setting, power setting, and coordination (slips or skids). Refer to figures 6-1 and 6-2 for stall speeds.

When the aircraft approaches a stall, the control surfaces lose some, if not all, of their effectiveness. As the angle of attack increases, the order in which the loss of control surface effectiveness occurs is: ailerons, elevator, and rudder. During the recovery from a stall, the control surfaces will regain their effectiveness in the reverse order. The aircraft is constructed so that the wing will stall progressively outward from the wing root to the wingtip. This is called "washout" and provides aileron control effectiveness as long as possible.

SPINS

The T-41A is inherently resistant to spins; however, an inadvertent spin may occur if the aircraft is mishandled during a stall or stall recovery.

If the aircraft enters a spin, use the following recovery technique:

1. Check the throttle in idle and the ailerons are neutral.

2. Apply and hold the full rudder opposite to the direction of rotation.

NOTE: If disorientation precludes a visual determination of the direction of rotation, refer to the turn needle. The needle deflects in the direction of rotation.

3. After the rudder reaches the stop, briskly move the control wheel far enough forward to break the stall.

NOTE: Full down elevator may be required at aft center of gravity loadings to ensure optimum recovery.

4. Hold these controls until rotation stops.

WARNING

Premature relaxation of the control inputs may delay the recovery, resulting in additional altitude loss.

STALLING SPEEDS POWER OFF MPH, CAS 2000 POUNDS GROSS WEIGHT				
Condition	Angle of Bank			
	0°	20°	40°	60°
Flaps Up	53	55	61	75
Flaps 10°	51	52	58	72
Flaps 40°	46	48	53	65

Figure 6-1

STALLING SPEEDS POWER OFF MPH, CAS 2300 POUNDS GROSS WEIGHT				
Condition	Angle of Bank			
	0°	20°	40°	60°
Flaps Up	57	59	65	81
Flaps 10°	52	54	59	74
Flaps 40°	49	51	56	69

Figure 6-2

5. As the rotation stops, neutralize the rudder and make a smooth recovery from the resulting dive.

Application of this recovery technique will normally produce recoveries within ¼ turn.

FLIGHT CONTROLS

Elevator control forces are relatively light in cruising flight at all aircraft weights and CGs.

Aileron control forces are light. The ailerons are effective at all speeds up to the actual stall. Rudder forces are comparatively light and only slight rudder pressure is required when rolling into and out of turns. Elevator trim is effective throughout most of the speed range of the aircraft. At very low airspeeds, sufficient trim may not be available to relieve all control pressures.

CLIMB PERFORMANCE

All optimum climb profiles are achieved with flaps up and full throttle. Normal climbs are performed at 90 mph for best engine cooling. The best rate-of-climb airspeed varies with altitude, from 79 mph at sea level to 77 mph at 10,000 feet MSL. The best angle-of-climb airspeed also varies with altitude, from 63 mph at sea level to 69 mph at 10,000 feet MSL. The best angle-of-climb profile is recommended when obstacle clearance dictates a steep climb angle.

AIRSPEED CORRECTION TABLE												
FLAPS	IAS	40	50	60	70	80	90	100	110	120	130	140
UP	CAS	48	55	63	71	80	89	98	108	117	128	138
DOWN	CAS	48	56	64	72	81	90	99	●	●	●	●

Section VII

ALL WEATHER OPERATION

CONTENTS

INTRODUCTION

This section discusses special all-weather procedures and techniques which either emphasize or add to procedures and techniques presented in Sections II and III.

INSTRUMENT FLIGHT

IMC flight in the T-41A is prohibited.

ICE AND RAIN

Ice

WARNING

Do not take off with ice, snow, or frost on the wings, windows, or tail (including all control surfaces). Ice, snow, or frost may reduce forward visibility, change the lift, and stall characteristics of the aircraft and (or) cause possible binding of the control surfaces.

Rain

When landing on a wet runway, full flap approach and landing is recommended. Raising the flaps on landing roll will increase the aircraft weight on the main landing gear and decrease the possibility of hydroplaning. When landing on a wet runway, expect a longer landing roll as braking effectiveness is reduced.

WARNING

Crosswinds present more directional control difficulty on a wet runway than on a dry runway. Maintain proper crosswind control inputs throughout the landing roll to aid in directional control.

TURBULENCE AND THUNDERSTORMS

WARNING

Flights through thunderstorms or other areas of severe turbulence must be avoided.

Penetrating a thunderstorm is not recommended under any circumstances. Remain VFR and land at a suitable field where a safe landing can be made.

If unexpected turbulence is encountered, use smooth, positive control inputs. Extreme up and down drafts can cause large attitude, airspeed, and altitude deviations. Do not chase airspeed or altitude; maintain aircraft attitude and attempt to exit the area of turbulence as soon as possible.

NIGHT FLYING

The aircraft is equipped with interior and exterior lighting for night flying operations.

COLD WEATHER STARTING PROCEDURES

Use cold weather starting procedures when the temperature is 20°F or below. If starting the engine with an alternate power source is desired and available, additional procedures, indicated by a star (★), will be accomplished. The "starred" items will be accomplished by maintenance personnel, but it is the pilot's responsibility to ensure they are accomplished. The IP will make all starts when using cold weather starting procedures.

Starting Engine

1. Pull propeller through several revolutions (IP or FP only).

WARNING

Check Master Switch and Ignition Switch OFF before manual operation of the propeller.

2. Mixture - RICH.

3. Throttle - OPEN (approximately ¼").

4. Carburetor Heat - COLD.

5. Propeller Danger Area - CLEAR.

★ 6. Left Tire - CHOCK (if applicable).

7. Master Switch - ON.

★ 8. External Power Source - CONNECT (if applicable).

9. Primer - 2 to 4 FULL STROKES (leave primer charged but use only if the engine appears to be starting).

WARNING

Overpriming may cause excessive fuel to accumulate in and around the carburetor creating a fire hazard. Any delay between the excessive priming and starting may allow raw fuel to leak from the carburetor creating a potential fire hazard.

WARNING

Be certain all maintenance personnel are clear of the propeller area prior to engaging the starter.

10. Navigation Lights - ON.

11. Ignition Switch - START (release when engine starts).

NOTE: If engine fails to start, complete "Engine Clearing" checklist prior to subsequent starting attempts.

12. Primer - AS REQUIRED to keep engine running.

13. Oil Pressure Gauge - CHECK (indication within 1 minute).

★14. External Power Source - DISCONNECT (if applicable).

★15. Left Tire - REMOVE CHOCK (if applicable).

16. Ammeter - CHECK (if applicable).

17. Carburetor Heat - HOT until engine is running smoothly.

18. Primer - LOCK.

19. Carburetor Heat - COLD.

WARNING

Be extremely alert for the possibility of an engine fire while using cold weather starting procedures.

NOTE: If engine does not start during first few attempts, turn ignition and master switches OFF and request maintenance assistance.

If the engine is very cold, no indication will be apparent on the oil temperature gauge and the oil pressure gauge will read low. It may require up to 5 minutes in cold temperatures and 10 minutes in extremely cold temperatures for the oil pressure to indicate in the normal operating range. The takeoff will be delayed until normal oil pressure is indicated. If no oil

temperature reading is apparent after engine warmup, accelerate the engine to at least 2,000 rpm. If the engine accelerates smoothly and the oil pressure remains normal and steady, the airplane is ready for takeoff. Continue monitoring oil temperature during the flight. If no temperature indication is evident, make an appropriate entry in the AFTO Form 781A after the mission.

HOT WEATHER OPERATIONS

For hot weather operations, use normal procedures and note the following. Avoid prolonged engine operation on the ground as the heat from the engine may cause vapor lock to develop in the fuel lines. If the engine quits or a vapor lock is suspected, abort the aircraft and make an appropriate entry in the AFTO Form 781A.

Appendix

PERFORMANCE DATA

CONTENTS

INTRODUCTION

The performance data shown on the following pages are compiled from actual tests with the aircraft and engine in good condition and using average piloting technique and best power mixture. This data is a valuable aid for flight planning.

A power setting selected from the range chart usually will be more efficient than a random setting, since it will permit you to estimate your fuel consumption more accurately. Using the chart will pay dividends in overall efficiency.

Cruise and range performance is based on flight tests using a McCauley 1C172/EM7651 propeller. Other conditions of the tests are shown in the chart headings. Allowance for fuel reserve, headwinds, takeoffs and climb, and variations in mixture leaning technique should be made and are in addition to those shown on the charts. Other variables such as fuel metering characteristics, engine and propeller conditions, and turbulence may account for variations of 10 percent or more in maximum range.

WEIGHT AND BALANCE

The following information will enable you to operate the airplane within the prescribed weight and center of gravity limitations. To figure the weight and balance for your particular airplane, use the pertinent Sample Problem, and the Loading Graph and Center of Gravity Moment Enveolpe as follows:

Take the licensed Empty Weight and Moment/1,000 from the Weight and Balance Data sheet, plus any changes noted on Forms FAA-337, carried in your airplane, and write them down in the proper columns. Using the Loading Graph, determine the moment/1,000 of each item to be carried. Total the weights and moments/1,000 and use the Center of Gravity Moment Envelope to determine whether the point falls within the envelope, and if the loading is acceptable.

SAMPLE LOADING PROBLEM (NORMAL CATEGORY)	SAMPLE AIRPLANE		YOUR AIRPLANE	
	Weight (lbs.)	Moment (lb. - ins. /1000)	Weight (lbs.)	Moment (lb. - ins./1000)
1. Licensed Empty Weight (Sample Airplane)...	1321	50.4		
2. Oil - 8 Qts ★	15	-0.3	15	-0.3
3. Pilot & Front Passenger.....................	340	12.2		
4. Fuel - (39 Gal at 6 lbs/Gal)............................	234	11.2		
5. Rear Passengers......................	340	23.8		
6. Baggage (or Passenger on Auxiliary Seat..............	50	4.7		
7. Total Aircraft Weight (Loaded)....................	2300	102.0		

8. Locate this point (2300 at 102.0) on the center of gravity envelope, and since this point falls within the envelope the loading is acceptable.

★ Note: Normally full oil may be assumed for all flights.

SAMPLE LOADING PROBLEM (UTILITY CATEGORY)	SAMPLE AIRPLANE		YOUR AIRPLANE	
	Weight (lbs.)	Moment (lb. -ins. /1000)	Weight (lbs.)	Moment (lb. -ins. /1000)
1. Licensed Empty Weight (Sample Airplane) . . .	1321	50.4		
2. Oil (8 qts - Full oil may be assumed for all flights)	15	-0.3	15	-0.3
3. Fuel (39 gal at 6 lbs/gallon)	234	11.2		
4. Pilot and Instructor	400	14.4		
5. TOTAL WEIGHT AND MOMENT	1970	75.7		

6. Locate this point (1970 at 75.7) on the center of gravity moment envelope, and since this point falls within the envelope, the loading is acceptable.

Golden West Avionics Inc.

6873 Flight Road
Riverside, CA, 92504
909-351-8422

Weight and Balance Change

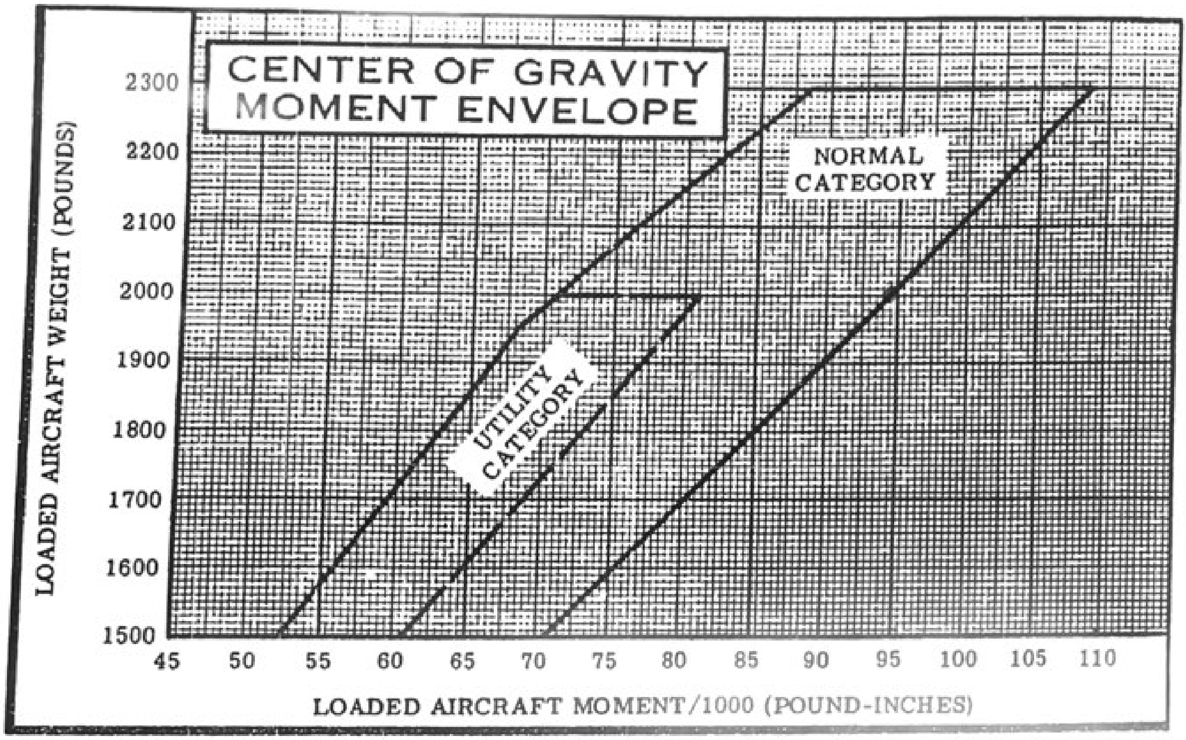
g. Number:	N5215F	Date:	08-08-2001
Make/Model:	CESSNA 172F	Tach:	
Year:		Max Weight:	2299
Serial Number:	17253233	Work Order:	

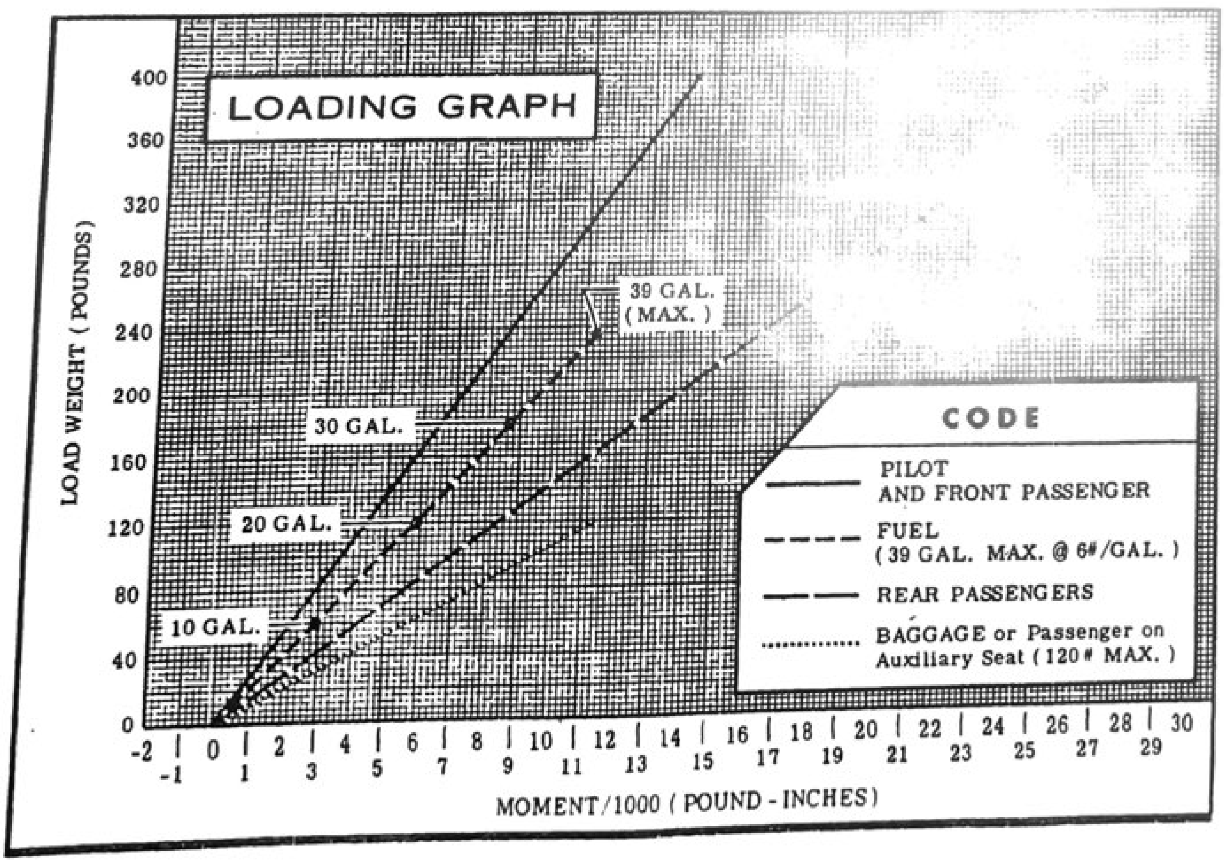
New A/C Empty Weight:	1384.60	Landing C.G. Range:
New A/C Empty C.G.:	37.22	Gear Extended C.G. Range:
New A/C Useful Load:	914.40	Empty Weight C.G. Range:

Description	Serial Number	Weight	Arm	Moment	Installed/Re
Previous Aircraft Empty	17253233	~~1375.40~~ 1353.4	~~37.38~~ 36.71	~~51412.5~~ 49688.0	n/a
Removed					
1 ea AUDIO PANEL					
2ea TX920		2.00	12.00	24.0	
2ea TRI-NAV		5.00	10.00	50.0	
1ea TRT-250		2.50	12.00	30.0	
1ea AT-3000		2.00	10.00	20.0	
		1.50	10.00	15.0	
Installed					
KMA24		1.50	13.00	19.5	X
KX155/GS		5.20	11.00	57.2	X
KX155		5.00	11.00	55.0	X
KT76A		3.00	11.00	33.0	X
KLN89B		2.55	10.00	25.5	X
FN200		1.25	10.00	12.5	X
AK950-L		0.50	14.00	7.0	X
?PA400		0.50	14.00	7.0	X
?I209A		1.20	[illegible]	14.4	X
KI208		1.0[illegible]	[illegible]	12.0	X
KA91		0.5[illegible]	[illegible]9.00	19.5	X
Installed spin on oil filter. [signature] AP505776o231A 22/10/3		+4.0	[illegible]	[illegible]	
New Aircraft Values		1366.6 ~~1362.6~~ ~~1384.60~~	36.47 ~~36.56~~ ~~37.22~~	49843.6 ~~49811.6~~ ~~51636.0~~	

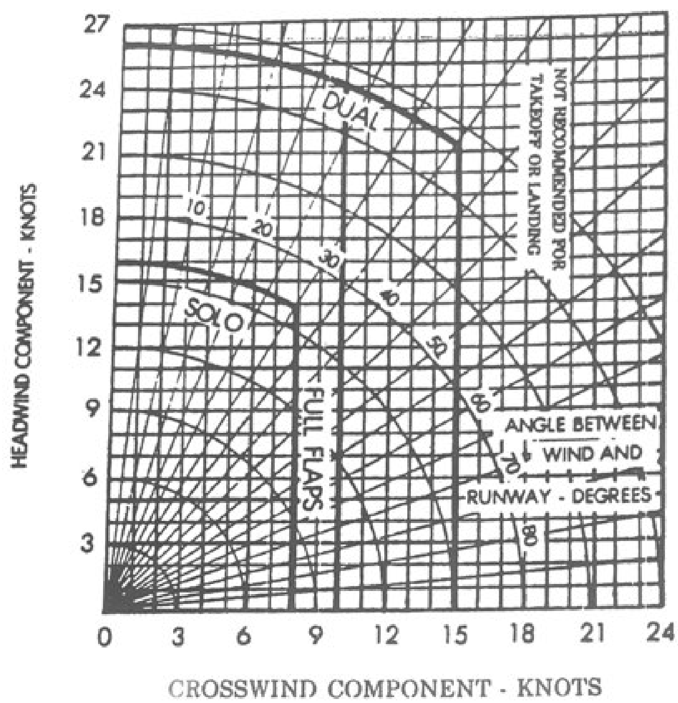
It is the responsibility of the aircraft owner/operator and the pilot to insure that the aircraft is properly loaded. All subsequent changes in weight and balance are the responsibility of the aircraft owner/operator.

[signature]
Les Flammang, KA3R624L


CENTER OF GRAVITY
MOMENT ENVELOPE
NORMAL
CATEGORY
UTILITY
CATEGORY
LOADED AIRCRAFT WEIGHT (POUNDS)
2300
2200
2100
2000
1900
1800
1700
1600
1500
45 50 55 60 65 70 75 80 85 90 95 100 105 110
LOADED AIRCRAFT MOMENT/1000 (POUND-INCHES)


LOADING GRAPH
LOAD WEIGHT (POUNDS)
400
360
320
280
240
200
160
120
80
40
0
39 GAL.
(MAX.)
30 GAL.
20 GAL.
10 GAL.
CODE
PILOT
AND FRONT PASSENGER
FUEL
(39 GAL. MAX. @ 6#/GAL.)
REAR PASSENGERS
BAGGAGE or Passenger on
Auxiliary Seat (120# MAX.)
-2 0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30
-1 1 3 5 7 9 11 13 15 17 19 21 23 25 27 29
MOMENT/1000 (POUND - INCHES)

TAKEOFF AND LANDING CROSSWIND CHART



CROSSWIND COMPONENT - KNOTS

Wind Limitations

Aircraft will not be moved without ground handling personnel when wind exceeds 2[illegible] knots. Taxi operations will cease when winds exceed 35 knots.

	Maximum	Crosswind Component (0-20° Flaps)	Crosswind Component (Full Flaps)
DUAL	26 Knots	15 Knots	10 Knots
SOLO	16 Knots	8 Knots	

TAKE-OFF DATA

TAKE-OFF DISTANCE FROM HARD SURFACE RUNWAY, FLAPS UP

GROSS WEIGHT LBS.	IAS AT 50 FT MPH	HEAD WIND KNOTS	@ S.L. & 59° F		@ 2500 ft. & 50° F		@ 5000 ft. & 41° F		@ 7500 ft. & 32° F	
			GROUND RUN	TOTAL TO CLEAR 50' OBS.	GROUND RUN	TOTAL TO CLEAR 50' OBS.	GROUND RUN	TOTAL TO CLEAR 50' OBS.	GROUND RUN	TOTAL TO CLEAR 50' OBS.
1700	60	0	435	760	520	830	625	1085	765	1370
		10	280	570	355	680	430	830	535	1060
		20	175	345	215	470	270	575	345	745
2000	65	0	630	1085	755	1325	905	1625	1130	2155
		10	435	820	530	1005	645	1250	810	1685
		20	275	580	340	730	425	910	505	1255
2300	70	0	865	1525	1040	1910	1255	3480	1565	3855
		10	615	1170	750	1485	930	1855	1160	3110
		20	405	850	505	1100	630	1460	810	3425

Note: Increase distance 10% for each 25°F above standard temperature for particular altitude.

LANDING DATA

LANDING DISTANCE ON HARD SURFACE RUNWAY
NO WIND – 40° FLAPS – POWER OFF

GROSS WEIGHT LBS.	APPROACH IAS MPH	@ S.L. & 59° F		@ 2500 ft. & 50° F		@ 5000 ft. & 41° F		@ 7500 ft. & 32° F	
		GROUND ROLL	TOTAL TO CLEAR 50' OBS.	GROUND ROLL	TOTAL TO CLEAR 50' OBS.	GROUND ROLL	TOTAL TO CLEAR 50' OBS.	GROUND ROLL	TOTAL TO CLEAR 50' OBS.
2000/2300	65	520	1250	560	1310	605	1385	650	1455

Note: Reduce landing distance 10% for each 5 knot headwind. Landing data is same at 2000 and 2300 lbs.

USAF T-41A MAXIMUM RATE-OF-CLIMB DATA

Gross Weight Pounds	At Sea Level & 59° F			At 5000 Ft. & 41° F			At 10,000 Ft. & 23° F			At 15,000 Ft. & 5° F		
	IAS MPH	Rate of Climb Ft/Min.	Gals. of Fuel Used	IAS MPH	Rate of Climb Ft/Min.	From S. L. Fuel Used	IAS MPH	Rate of Climb Ft/Min.	From S. L. Fuel Used	IAS MPH	Rate of Climb Ft/Min.	From S. L. Fuel Used
2000	79	840	1.0	78	610	2.2	77	380	3.6	76	145	6.3
2300	80	645	1.0	78	435	2.6	77	230	4.8	76	22	11.5

NOTE: Flaps up, full throttle, and mixture leaned for smooth operation above 5000. Fuel used includes warm-up and take-off allowance.

T–41A CRUISE AND RANGE PERFORMANCE

Gross Weight 2000 lbs. .... Standard Conditions
Zero Wind .... **Normal Lean** .... 36 Gal. of Fuel (No Reserve)

NOTE: Maximum cruise is normally limited to 75% power.

ALTITUDE	RPM	% BHP	TAS MPH	GAL./ HOUR	ENDR. HOURS	RANGE MILES (STATUTE)
2500	2700	87	134	9.9	3.6	485
	2600	78	129	8.9	4.0	515
	2550	74	126	8.5	4.2	530
	2500	71	123	8.0	4.5	555
	2400	64	118	7.3	4.9	580
	2300	57	112	6.7	5.4	600
	2200	51	106	6.1	5.9	625
	2100	45	99	5.6	6.4	635
5000	2700	81	134	9.2	3.9	525
	2600	74	128	8.4	4.3	555
	2500	67	123	7.6	4.7	575
	2400	60	117	6.9	5.3	620
	2300	54	111	6.4	5.6	625
	2200	48	104	5.8	6.2	640
	2100	43	96	5.4	6.7	640
7500	2700	76	133	8.7	4.1	545
	2650	73	131	8.3	4.3	560
	2600	69	128	7.9	4.5	575
	2500	63	122	7.2	5.0	610
	2400	57	116	6.6	5.5	640
	2300	51	109	6.1	5.9	650
	2200	45	101	5.6	6.4	650
	2100	40	93	5.2	6.9	660
10,000	2700	72	133	8.2	4.4	585
	2600	65	127	7.5	4.8	615
	2500	59	121	6.9	5.2	625
	2400	53	114	6.3	5.7	645
	2300	48	106	5.8	6.2	660
	2200	43	98	5.4	6.9	675
	2100	28	88	5.0	7.2	630
12,500	2600	62	125	7.1	5.1	630
	2500	56	119	6.5	5.5	655
	2400	50	111	6.0	6.0	665
	2300	45	103	5.5	6.5	670
	2200	40	93	5.2	6.9	640

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