PNEUMATIC SYSTEM

The aircraft has a dual pneumatic system. In case of failure of either pneumatic pump, the system will automatically select the operative source. (Inoperative source will be indicated by a red warning light on copilot's instrument panel stating pneumatic source is inoperative.)

Deicing

This aircraft is equipped with deicer boots. Select the following deice functions as needed, when icing conditions occur.

The following anti-ice and deicing equipment is available as optional equipment.

- Heated pitot tubes
- Electrically heated windshield
- Electric propeller anti-icing strip
- Deicing boots on wing and empennage leading edges
- Wing ice light

OPERATION

The above equipment is activated by switches on the overhead switch panel. Circuit breakers to prevent electric overload are provided. The wing and surface deice equipment draws considerable current. The electrical load should be monitored carefully, especially during single-engine operation. You can read the current draw, and control the current flow from the ammeter on the circuit breaker panel.

LIMITATIONS ON ELECTRICALLY HEATED EQUIPMENT

Pitot tube heat should not be used for extended periods during ground operations.
The electrically heated windshield should not be operated for extended periods during ground operation unless windshield ice is present to prevent overheating.

ENGINE CHARACTERISTICS

Under full throttle operations (such as takeoff and climb) the engines of this aircraft have been adjusted to provide 43 inches of manifold pressure at sea level and standard temperature. It is possible to read higher (up to 49 inches of manifold pressure) or lower than 43 InHg manifold pressures when ambient temperatures are higher or lower, respectively, than standard.

The engines of this airplane are equipped with dynamic counterweight systems. Therefore, avoid rapid closing or opening of the throttle in order to prevent severe damage which could cause malfunction.

When increasing power, increase engine speed prior to manifold pressure. When decreasing power, decrease manifold pressure before engine speed.

The engines are designed to use 100/130 octane fuel. If not available use next higher grade.

FUEL MANAGEMENT

Main tanks must be used for takeoff and landing. If the airplane is loaded with a rearward CG, outboard tanks should be used first. This procedure will tend to move the CG forward with fuel burn off.

Fuel quantity gauges are selected with the fuel selector valves on the Fuel Control module. See the Fuel System checklist for complete information.

Fuel flow warning lights indicate an impending fuel flow interruption which could result in power loss. The lights

are located above the center console of the main instrument panel.

Any time fuel pressure drops below 34 psi or is erratic the fuel booster pump should be turned on.

Full rich mixture must be used at power settings in excess of 75% power except for an 85% climb power setting.

CROSSFEED PROCEDURE

Crossfeed will normally be needed only for extended single engine cruise.

Fuel selector valve of inoperative engine.....	ON
Circuit breaker of inoperative engine fuel boost pump.....	CHECK IN
Crossfeed valve.....	ON
Emergency fuel pump of inoperative engine.....	ON
Fuel selector valve of operating engine.....	OFF
Emergency fuel pump of operating engine.....	OFF
Circuit breaker of operating engine fuel boost pump.....	OFF

To return to operating engine side of fuel system:

Fuel selector valve of operating engine side.....	ON
Circuit breaker of operating engine fuel boost pump.....	ON
Emergency fuel pump of operating engine.....	ON
Emergency fuel pump of inoperative engine.....	OFF
Crossfeed valve.....	OFF
Circuit breaker of inoperative engine fuel boost pump.....	OFF
Fuel selector valve of inoperative engine.....	OFF

Fire wall fuel shutoff valves should be OFF for all normal operations.

CAUTION

Fuel remaining in the tanks when the quantity indicator reaches zero cannot be used safely in flight.

Anti-collision Lights

LIMITATIONS

To avoid optical illusion and severe vertigo, turn anti-collision lights off upon entering clouds, fog or haze.

Supplementary White anti-Collision (Strobe) Lights

Turn off strobe lights when taxiing in vicinity of other aircraft or during flight through cloud, fog or haze.

Standard position lights to be on for all night operations.

Shutdown Check Of Battery

During engine shut down with engines turning 1000 rpm and all electrical equipment off, if ammeter shows a battery charging rate in excess of 25 amps the battery has a low charge. In this case do not stop engines until current drops below 25 or there may be insufficient battery current for starting.

Circuit Breakers

All circuit breakers are located in the cockpit in a single panel. The panel is located to the left of the pilot's knee on the cockpit side panel.

Circuit breakers are "Push to Reset" type.

Alternator Check

The ammeter indicates battery charging current. When the ammeter pointer indicates to the left of center, the battery is being discharged, when the pointer indicates to the right of center, the battery is being charged. During single engine operation this feature can be used to determine how much the electrical load should be reduced. Provisions for checking the output of each alternator are also provided.

Two test switches are located adjacent to the ammeter, labeled "ALTERNATOR PUSH TO TEST." The left switch, when depressed, will cause the ammeter to indicate left alternator output. The right switch, when depressed, will cause the ammeter to indicate right alternator output. These switches are the momentary type and must be depressed when reading the ammeter.

Preflight check of alternators will be conducted as follows:
Run engines at 1 500 RPM, push in either test switch and read output on ammeter push other test switch and read output. (Alternator outputs should be approximately equal.)

VOLTAGE REGULATING AND ALTERNATOR SYSTEM

An alternator paralleling system is installed on this aircraft. With this system each alternator is controlled independently by its own voltage regulator. The regulators are interconnected electronically so as to provide paralleled outputs from their respective alternators under normal operating engine speed ranges. The system can be monitored by the use of the ammeter that can be switched into either alternator output lead and by alternator "INOP" warning lights which will illuminate when their respective alternator is not producing a voltage.

If both alternators do not exhibit normal operation, turn ON Master Switch and turn OFF both alternator circuit breaker switches. Terminate flight as soon as possible.

Normal Takeoff And Climb

Before takeoff the following should be checked:

1. Seat belts/ no smoking sign - on (if installed)
2. Crossfeed - off
3. Fuel valves - on "inboard" tanks
4. Emergency fuel pumps - on, pressure up
5. ECS System - off
6. Mixture - rich (forward)
7. Prop controls - low pitch (forward)
8. Engine instruments - normal
9. Flaps - set 0° for normal takeoff
10. Autopilot - checked and off
11. Trim tabs - set for takeoff
12. Controls - free
13. Deicer elements as needed
14. Passenger briefing - complete
15. Pitot heat - as required
16. Transponder - on stand by

Takeoff is accomplished using full throttle, full rich mixture, and full increase RPM. Rotate the aircraft at 101 MPH.

After the takeoff has proceeded to a point where a landing can no longer be made wheels-down in the event of power failure, the wheels should be retracted. Once clear of all obstacles, the airplane has been cleaned up and the recommended climb speed has been reached, the power should be reduced to best climb settings. Cowl flaps should be set as needed and fuel booster pumps turned off one at a time while checking fuel pressure. Prolonged climb should be at 2400 RPM, 38 inches of manifold pressure and 106 KIAS.

Short Field Takeoff

A short field takeoff is preceded by a thorough check of all items as with a normal takeoff except the flaps, which should be set at 15°.

Takeoff is accomplished using full throttle, full rich mixture, and full increase RPM. Both engines should be operating normally at maximum continuous power prior to brake release. Rotate the aircraft at 103 KIAS.

After takeoff accelerate to barrier speed of 123 KIAS. Once clear of all obstacles retract the landing gear and flaps and accelerate to the best angle of climb speed of 140 KIAS. Proceed with normal climb.

Stall Warning

An approaching stall is indicated by a mild aerodynamic buffeting and deterioration in control response. A stall warning light located on the instrument panel above the flight instruments will illuminate. The light (activated by a vane in the leading edge of the wing) will come on at about 5 to 10 MPH before a stall would actually occur. A stall warning horn will sound before a stall.

Cruising

The cruising speed of the Navajo is determined by many factors including power setting, altitude, temperature, load, and equipment installed on the airplane. The Lycoming engines on the Navajo may be cruised at any power below 260 BHP. An engine speed of 2575 RPM is recommended for maximum cruise performance, while a lower engine speed, down to 2200 RPM, is recommended for more economical cruising conditions.

Best economy fuel consumption can only be obtained at peak EGT or leaner. At 260 BHP or less, the engines may be operated at peak EGT or on the lean side of peak EGT, as long as stable engine operation results without exceeding any engine limitations during steady state or transient conditions.

INSTRUCTIONS FOR LEANING

1. At the desired power setting, lean mixture slowly until EGT has stabilized at peak.

> CAUTION
> Do not exceed 1650 °F EGT.

2. If peak EGT is 1650°F or less, continue to lean if desired until a maximum of 500 °F reduction in EGT is obtained. Readjust manifold pressure as necessary to maintain the desired power setting.
3. If 1650° F is reached before peak EGT is obtained, lean according to the following procedure:
    a. With mixture leaned to 1650°, reduce manifold pressure until EGT is reduced approximately 75°F
    b. Lean mixture slowly until peak EGT is obtained.
    c. Lean mixture additionally until 50° - 100°F on the lean side of peak is obtained. Do not lean into engine roughness.
    d. Slowly increase manifold pressure to desired setting without permitting EGT to exceed 1650°F.
    e. Carefully adjust mixture until EGT is 1625 to 1650°F.
    f. Before enriching the mixture, reduce the manifold pressure as in step a., to prevent exceeding 1650°F EGT.

NOTES

With the aircraft loaded to a rearward center of gravity, use fuel from the outboard tanks first to move the center of gravity forward with fuel burn-off.

During an extended climb to altitude it may be necessary to turn on the fuel booster pumps to stabilize fuel pressure. If boost pump warning lights illuminate or if fuel pressure is erratic, turn on the emergency fuel pumps until leveling off at the desired cruising altitude. Leave the pumps on for a short period, check that the boost pump warning lights have extinguished, and then turn the emergency fuel pumps off one at a time. If pressure continues to fluctuate repeat the above procedure.

Any time fuel pressure falls below 34 PSI the fuel booster pumps should be turned on.

Descent

1. Prior to power reduction for descent, lean to an E.G.T. of at least 1350°.

> CAUTION
> Throttling back at high altitude (above 15,000 feet) without first ensuring that the mixture has been leaned could result in engine stoppage.

2. Fuel valves - on inboard tanks
3. Oxygen - off below 10,000 ft.

Approach And Landing

Extend the wing flaps as required. The maximum speed for 15° flap extension is 152 KIAS. The maximum speed for full flap extension is 130 KIAS. The landing gear may be lowered at airspeeds below 130 KIAS.

Landing lights should be turned on as required.

During a normal pattern use 160 KIAS on the downwind leg, 142 KIAS on base and 125 KIAS on the final leg with flaps down or 135 KIAS with flaps up. In high density terminal areas use speeds which are consistent with traffic conditions. The amount of flap used during landings and the speed of the airplane at contact should be varied according to the wind, the landing surface, and other factors. Engine speed should be set at 2400 RPM so that climb power will be available in the event a go-around is executed.

After Landing

After clearing the runway open the cowl flaps; then refract the wing flaps. The fuel booster pumps should then be turned off and the propellers set for high RPM. If the heater hasn't been turned off before landing, it should be turned to "FAN" position for a few minutes and then turned off.

After parking, the radios, lights, and all electrical equipment should be turned off.

Shut down the right engine by pulling the mixture control to idle cut-off. Then shut down the left engine by pulling the mixture control to idle cut-off. Turn off the magneto and master switches and set the parking brake as desired.

Propeller Synchrophaser Operating Procedure (Hartzell System)

The propeller syncophaser switch is located on the lower left side of the instrument panel. It has two positions, "Man." for manual or stand by and, "Prop Sync." for automatic propeller syncophasing.

The left engine is established as the master engine. The right engine is equipped with a slave governor which automatically maintains its engine RPM with the left engine RPM.

For taxiing, take-off and landing, set the syncophaser switch to "Man."

For Cruise, synchronize the propellers as close as possible manually, then set the syncophaser switch in the "Prop Sync." position.

NOTE

Normally, propeller syncophasing is achieved in a few seconds but occasionally it may take a full minute to achieve full propeller syncophasing.

If a change in power setting is desired, set the syncophaser switch to "Man." position and wait 30 seconds. Then adjust the power setting and set the syncophaser switch in the "Prop Sync." position.

Propeller phase is preset at the factory. For further information on phase control and the propeller syncophasing System, consult the aircraft service manual.

Autopilot

LIMITATIONS

Note
The maximum altitude for autopilot operation has not been determined. The maximum demonstrated flight test altitude was 24,000 feet.

1. Autopilot OFF during take-off and landing.
2. Do not engage autopilot if airplane is out of trim.
3. Maximum airspeed for autopilot operation is 230 KIAS.
4. During autopilot operation, the pilot must be in his seat with the safety belt fastened.
5. Do not manually override autopilot to produce or prevent pitch attitude changes or to increase bank angle.

PITCH TRIM INDICATOR - Centering the pitch trim indicator (by rotating the pitch command) prior to engagement will insure that the aircraft will continue in its present attitude. However, if the trim indicator is not centered, aircraft will smoothly take up the attitude dictated by the pitch command.

IN-FLIGHT PROCEDURES

1. ENGAGEMENT - Manually adjust aircraft trim prior to engaging autopilot.
2. Place aircraft in wings-level attitude. Adjust pitch trim indicator on controller to center needle by rotating pitch command wheel. Press the AP/ENG button which will light upon engagement.
3. To climb:
    a. Engage the ALT button
    b. Select your target altitude. Rotate the selector wheel UP to increase target altitude, and DN to decrease.
    c. The change in pitch ANGLE is determined by the autopilot.
    d. To make turns, use HDG mode.

e. Automatic pitch trim is provided whenever the autopilot is engaged. Any attempt to overpower the autopilot pitch axis will cause the pitch trim to oppose the applied force, resulting in an out-of-trim condition and high stick forces. To manually operate the elevator trim tab, the autopilot must be disengaged. Pushing the AP/ENG button again will disengage the autopilot.

4. Heading Selector. The heading knob on the HSI may be used to select a heading prior to pushing the (HDG) heading button. When the heading button is pressed, the aircraft will turn to the selected heading in the direction which is less than 180° and at a bank angle of no more than 25° and the HDG light on the heading button will light.

INTERCEPTING A VOR

There are two methods of intercepting a VOR.

1. Variable intercept angle - With this method, the pilot may pre-select any intercept angle desired. After identifying desired VOR station select desired omni course on the HSI indicator by rotating the OBS knob.
   a. Position the heading bug to select the desired intercept angle by rotating the HDG knob on the heading indicator. The number of degrees between the OBS and the heading bug is the intercept angle. For obvious reasons, the pilot should not select an intercept angle less than 20° or more than 90°.
2. Fixed intercept angle – Press NAV on the autopilot. The aircraft will turn toward the heading selected until the lateral deviation needle moves approximately one dot away from full deflection. At this time the aircraft will assume an approximate 45° intercept angle.

AUTOMATIC APPROACH COUPLER

1. Set course to the published inbound course by rotating the OBS knob on the NAV indicator.
2. Position the heading bug and select the desired intercept angle by rotating the HDG knob on the heading indicator.
3. Aircraft will remain on the heading selected until the lateral deviation needle moves approximately one dot away from full deflection. At this time, the HDG button on the controller will go out and the aircraft will assume an automatic 45° intercept angle.

This system is equipped with a manual glide slope button and can capture the glide slope automatically in APPR mode. When the aircraft couples to the glide slope signal, the ALT light extinguishes. For a back course localizer approach, select the localizer front course inbound heading. Press the REV button on controller.