

THE

*DUPLICATE*

**CHEROKEE** *Arrow II*

**PILOT'S OPERATING MANUAL**



**BY**



**This manual is incomplete without an APPROPRIATE FAA APPROVED AIRPLANE FLIGHT MANUAL and an APPROPRIATE WEIGHT AND BALANCE REPORT.**

**WARNING**

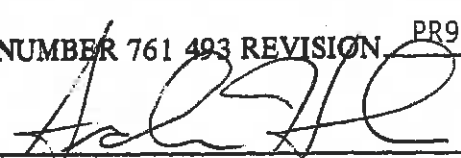
EXTREME CARE MUST BE EXERCISED TO LIMIT THE USE OF THIS MANUAL TO APPLICABLE AIRCRAFT. THIS MANUAL REVISED AS INDICATED BELOW OR SUBSEQUENTLY REVISED IS VALID FOR USE WITH THE AIRPLANE IDENTIFIED BELOW WHEN APPROVED BY PIPER AIRCRAFT CORPORATION. SUBSEQUENT REVISIONS SUPPLIED BY PIPER AIRCRAFT CORPORATION MUST BE PROPERLY INSERTED.

MODEL PA-28R-200

AIRCRAFT SERIAL NO. 28R-7335366 REGISTRATION NO. \_\_\_\_\_

PILOT'S OPERATING MANUAL, PART NUMBER 761 493 REVISION PR900720

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APPROVAL SIGNATURE AND STAMP



Assurance that the airplane is in an airworthy condition is the responsibility of the owner. The pilot in command is responsible for determining that the airplane is safe for flight. The pilot is also responsible for remaining within the operating limitations outlined by the Airplane Flight Manual, instrument markings, and placards.

This Pilot's Operating Manual is not designed as a substitute for adequate and competent flight instruction, knowledge of the current airworthiness directives, applicable federal air regulations, or advisory circulars. It is not intended to be a guide for basic flight instruction or a training manual for transition from single to multi-engine flying.

If an inconsistency of information exists between the Pilot's Operating Manual and the Airplane Flight Manual approved by the FAA, the Airplane Flight Manual shall be the authority.

A complete or partial replacement of this manual, Part No. 761 493, may be obtained only from Piper Customer Services.

Published by  
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761 493  
Issued: November 1971

## APPLICABILITY

This manual is applicable to Piper Model PA-28R-200 aircraft having serial numbers 28R-7235001 through 28-7335446. Contact Piper Customer Services for specific information on the application of this manual.

## REVISIONS

The information compiled in the Pilot's Operating Manual will be kept current by revisions distributed to the airplane owners.

Revision material will consist of information necessary to update the text of the present manual and/or to add information to cover added airplane equipment.

### I. Revisions

Revisions will be distributed whenever necessary as complete page replacements or additions and shall be inserted into the manual in accordance with the instructions given below:

1. Revision pages will replace only pages with the same page number.
2. Insert all additional pages in proper numerical order within each section.
3. Page numbers followed by a small letter shall be inserted in direct sequence with the same common numbered page.

### II. Identification of Revised Material

Revised text and illustrations shall be indicated by a black vertical line along the left hand margin of the page, opposite revised, added or deleted material. A line opposite the page number or section title and printing date, will indicate that the text or illustration was unchanged but material was relocated to a different page or that an entire page was added.

Black lines will indicate only current revisions with changes and additions to or deletions of existing text and illustrations. Changes in capitalization, spelling, punctuation or the physical location of material on a page will not be identified.

### III. Original Pages Issued

The original pages issued for this manual prior to revision are given below:

1-1 through 1-3, 2-1 through 2-22, 3-1 through 3-14, 4-1 through 4-8, 5-1 through 5-32, 6-1 through 6-8, 7-1 through 7-2, 8-1 through 8-9, 9-1 through 9-15.

## REVISIONS ISSUED

Current Permanent and Temporary Revisions to the PA-31 Pilot's Operating Manual issued April, 1971 are as follows:

761 493 (PR720204)	Permanent Revision	Dated February 4, 1972
761 493 (PR720210)	Permanent Revision	Dated February 10, 1972
761 493 (PR720330)	Permanent Revision	Dated March 30, 1972
761 493 (PR720615)	Permanent Revision	Dated June 15, 1972
761 493 (PR720911)	Permanent Revision	Dated September 11, 1972
761 493 (PR720802)	Permanent Revision to W/B	Dated August 2, 1972
761 493 (PR721114)	Permanent Revision to W/B	Dated November 14, 1972
761 493 (PR730115)	Permanent Revision to W/B	Dated January 15, 1973
761 493 (PR730330)	Permanent Revision to F/M & P/O/M	Dated March 30, 1973
761 493 (PR730830)	Permanent Revision to F/M & P/O/M	Dated August 30, 1973
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761 493 (PR751205)	Permanent Revision to F/M, W/B & P/O/M	Dated December 5, 1975
761 493 (PR790410)	Permanent Revision to F/M, W/B & P/O/M	Dated April 10, 1979
761 493 (PR840327)	Permanent Revision to F/M, W/B & P/O/M	Dated March 27, 1984
761 493 (PR851125)	Permanent Revision to F/M & P/O/M	Dated November 25, 1985
761 493 (PR860418)	Permanent Revision to F/M	Dated April 18, 1986
761 493 (PR870131)	Permanent Revision to F/M & P/O/M	Dated January 31, 1987
761 493 (PR900720)	Permanent Revision to P/O/M	Dated July 20, 1990

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## GENERAL SPECIFICATIONS

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**SPECIFICATIONS**
**PERFORMANCE**

Performance figures are for airplanes equipped for cross-country transportation and flown at gross weight under standard conditions at sea level or stated altitude. Any changes in equipment may result in changes in performance.

Take-off Run (maximum effort, 25° flap) (ft)	770
Take-off Over 50-ft Barrier (maximum effort, 25° flap) (ft)	1600
Best Rate of Climb Speed (gear retracted) (mph)	100
Rate of Climb (ft per min)	900
Service Ceiling (ft)	15,000
Absolute Ceiling (ft)	17,000
Top Speed (mph)	175
Optimum Cruising Speed (75% power, optimum altitude) (mph)	165
Cruising Range (75% power, optimum altitude) (mi)	780
Optimum Cruising Range (55% power, optimum altitude) (mi)	900
Stalling Speed (flaps down, gear down) (mph)	64
Stalling Speed (flaps and gear up) (mph)	71
Landing Roll (flaps down) (ft)	780 *
Landing Roll Over 50-ft Barrier (ft)	1380 *

\*This value applies only for the conditions indicated on the landing distance versus density altitude chart.

**WEIGHTS**

Gross Weight (lbs)	2650
Empty Weight (Standard) (lbs)	1499 *
USEFUL LOAD (Standard) (lbs)	1151 *

\*These weights are approximate.

**POWER PLANT**

Engine (Lycoming)	IO-360-C1C
Propeller (Hartzell)	HC-C2YK-1( )/7666A-2 or HC-C2YK-1( )F/7666A-2
Rated Horsepower	200
Rated Speed (rpm)	2700
Bore (in.)	5.125
Stroke (in.)	4.375
Displacement (cu in.)	361.0
Compression Ratio	8.7:1
Dry Weight (lbs)	326

**GENERAL SPECIFICATIONS**

ISSUED: November 15, 1971

REVISED: June 15, 1972

## ARROW II

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### FUEL

#### AVGAS ONLY

Usable Fuel Capacity (U.S. gal.)	48
Fuel, Aviation Grade (min octane)	100/130

### OIL

Oil Capacity (qts)	8
Oil Specification	Refer to latest issue of Lycoming Instruction No. 1014.

Oil Viscosity per Average Ambient Temp. for Starting	MIL-L-6082B Mineral SAE Grade	MIL-L-22851 Ashless Dispersant SAE Grades
All Temperatures	—	15W-50 or 20W-50
Above 80°F	60	60
Above 60°F	50	40 or 50
30°F to 90°F	40	40
0°F to 70°F	30	30, 40 or 20W-40
0°F to 90°F	20W-50	20W-50 or 15W-50
Below 10°F	20	30 or 20W-30

When operating temperatures overlap indicated ranges, use the lighter grade oil.

### BAGGAGE

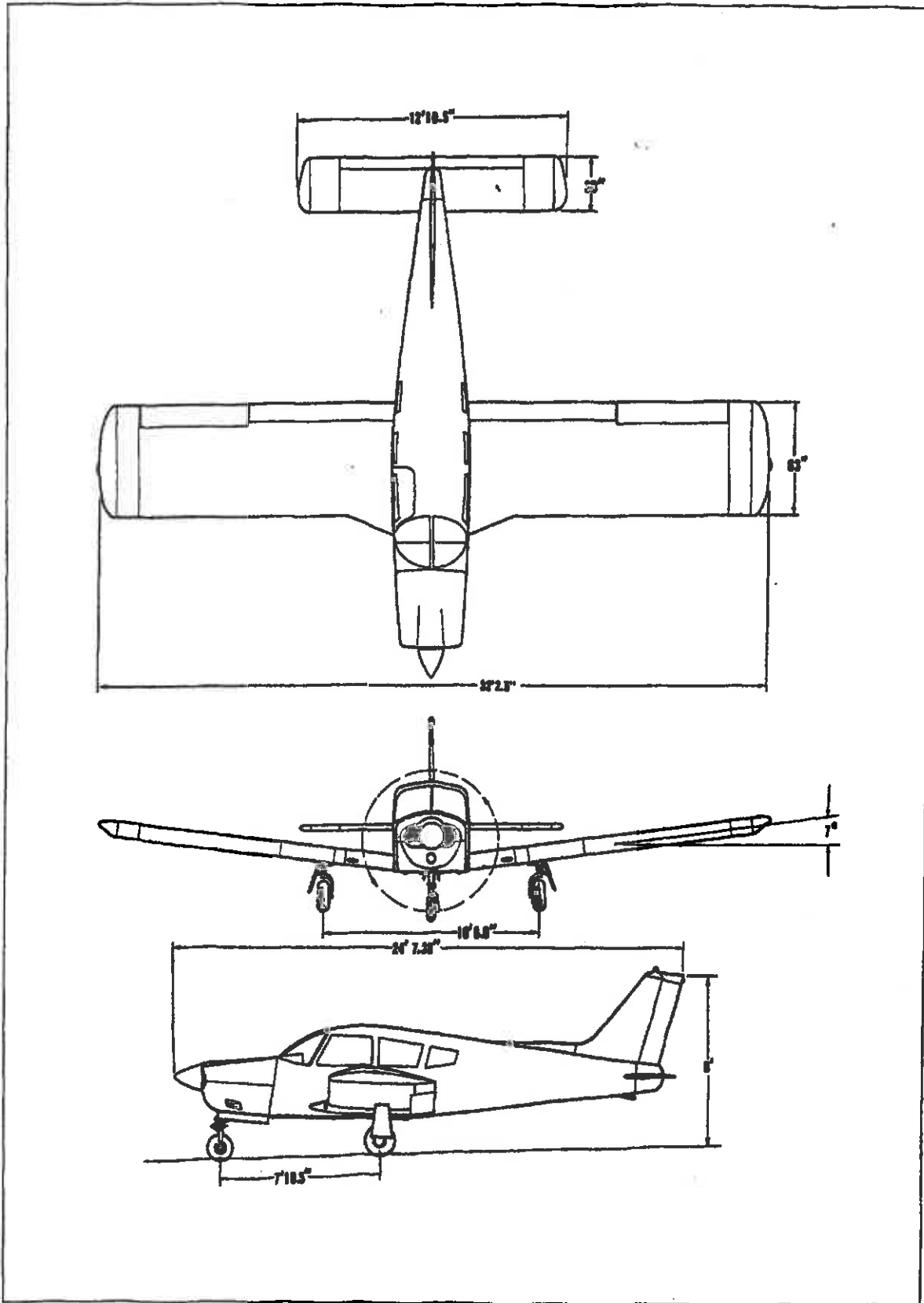
Maximum Baggage (lbs)	200
Baggage Space (cu ft)	22
Baggage Door Size (in)	20 x 22

### DIMENSIONS

Wing Span (ft)	32.2
Wing Area (sq ft)	170
Wing Loading (lbs per sq ft)	15.6
Length (ft)	24.6
Height (ft)	8.0
Power Loading (lbs per hp)	13.25

### LANDING GEAR

Wheel Base (ft)		7.8
Wheel Tread (ft)		10.5
Tire Pressure (psi)	Nose	30
	Main	27
Tire Size	Nose (four-ply rating)	5.00 x 5
	Main (four-ply rating)	6.00 x 6



**GENERAL SPECIFICATIONS**  
**ISSUED: November 15, 1971**  
**REVISED: June 15, 1972**



## DESCRIPTION-AIRPLANE AND SYSTEMS

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**DESCRIPTION****AIRPLANE AND SYSTEMS****THE AIRPLANE**

The Cherokee Arrow II is a single-engine, retractable landing gear, all metal aircraft. Increased fuselage length has enhanced the comfort in the rear seats. A large cabin door allows composed entry and exit of the spacious interior. Four individual seats allow individual comfort for extended cross-country flights. Sound proofing has been built into the aircraft to reduce fatigue and permit restful conversation. Simplicity of operation was designed into the aircraft to allow the aircraft to operate in VFR or IFR conditions with unhurried en route planning.

**AIRFRAME**

Aluminum alloy construction has been used throughout for the primary structure except for the steel tube engine mount, steel landing gear struts and isolated areas. Fiberglass and thermoplastic are used extensively for wing tip, engine cowling and non-structure components. The airframe has been designed to a positive limit load factor of 3.8.

The fuselage is a conventional semi-monocoque structure. External stringers on the bottom of the fuselage extend the length of the cabin area, and are used to maximize cabin room. On the right side of the aircraft are a large cabin door and a large baggage compartment door. Maintenance has been reduced to a minimum with advanced fuselage design.

The wing is of conventional design incorporating a laminar flow NACA 65<sub>2</sub>-415 airfoil section. This allows for locating the main spar 40% aft of the leading edge, an arrangement which benefits the structure in two ways.

1. It provides unobstructed cabin space for the rear passengers.
2. It allows for a lighter wing structure to improve the useful load of the aircraft.

The wing also incorporates a rear spar and front stub spar. The main spar carries the bending loads and the rear and stub spars carry torsional loads. The main spars are bolted into a spar carry through at both sides of the fuselage. The rear and stub spars are bolted to attachments at each side of the fuselage.

The ailerons are of modern metal construction incorporating a balance weight on the outboard end of each aileron, and are controlled by a right or left rotation of the control wheel.

The flaps are also of metal construction. When the flaps are in the retracted position, the right flap acts as a step. The flap control is located between the front seats.

The empennage consists of a vertical stabilizer, a rudder and a horizontal stabilator. The empennage construction is of a modern lightweight design.

## ARROW II

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### ENGINE AND PROPELLER

The Cherokee Arrow II incorporates a Lycoming IO-360-C1C four-cylinder, direct drive, horizontally opposed fuel injected engine rated at 200 horsepower at 2700 RPM. It is furnished with a starter, 60 ampere 12-volt alternator, shielded ignition, vacuum pump drive, fuel pump, propeller governor and a dry automotive type induction air filter. A recommended overhaul period of 1400 hours is based on Lycoming service experience. Operation beyond the recommended time is the decision of the operator. Since Lycoming from time to time revises the recommended overhaul period, the owner should check the latest Lycoming Service Instruction at his Piper dealer for the latest recommended overhaul period and for any additional information.

The aircraft is equipped with a Hartzell constant speed, controllable pitch propeller. The propeller control is located on the power quadrant between the throttle and mixture controls.

The exhaust system is a crossover type, which reduces back pressure and improves performance. It is constructed entirely of stainless steel and is equipped with dual mufflers. Cabin heat and windshield defrosting are provided by a heater shroud around the muffler.

An oil cooler is located on the forward lower right side of the firewall, with the air inlet for the cooler located on the right side of the bottom cowling. A winterization plate is provided to restrict air during winter operation. (See Winterization in Handling and Servicing.)

The induction system incorporates a Bendix RSA-5AD1 type fuel injector. The injector is based on the principle of differential pressure, which balances air pressure against fuel pressure. The regulated fuel pressure established by the servo valve when applied across a fuel control (jetting system) makes the fuel flow proportional to airflow. Fuel pressure regulation by the servo valve causes a minimal drop in fuel pressure throughout the metering system. Metering pressure is maintained above most vapor forming conditions while fuel inlet pressure is low enough to allow use of a diaphragm pump. The servo system feature also checks vapor lock and associated starting problems.

The servo regulation meters fuel flow proportionally with airflow and maintains the mixture as manually set for all engine speeds. The fuel flow divider receives metered fuel and distributes fuel to each cylinder fuel nozzle.

The fuel flow portion of the manifold fuel flow gauge is connected to the flow divider and monitors fuel pressure. This instrument converts fuel pressure to an indication of fuel flow in gallons per hour and percentage of rated horsepower.

The alternate air source of the induction system contains a door that functions automatically or manually. If the primary source is obstructed, the door will open automatically. It may be opened manually by moving the selector on the right side of the quadrant. The primary source should always be used for take-off.

The pilot should read and follow the procedures recommended in the Lycoming Operator's Manual for this engine, in order to obtain maximum engine efficiency and time between engine overhauls.



## LANDING GEAR

The Cherokee Arrow II is equipped with a retractable tricycle landing gear, which is hydraulically actuated by an electrically powered reversible pump. The pump is controlled by a selector switch on the instrument panel to the left of the control quadrant. The landing gear is retracted or extended in about seven seconds.

### WARNING

Avoid ejecting objects out of the pilot storm window which could possibly enter or obstruct the holes in the mast.

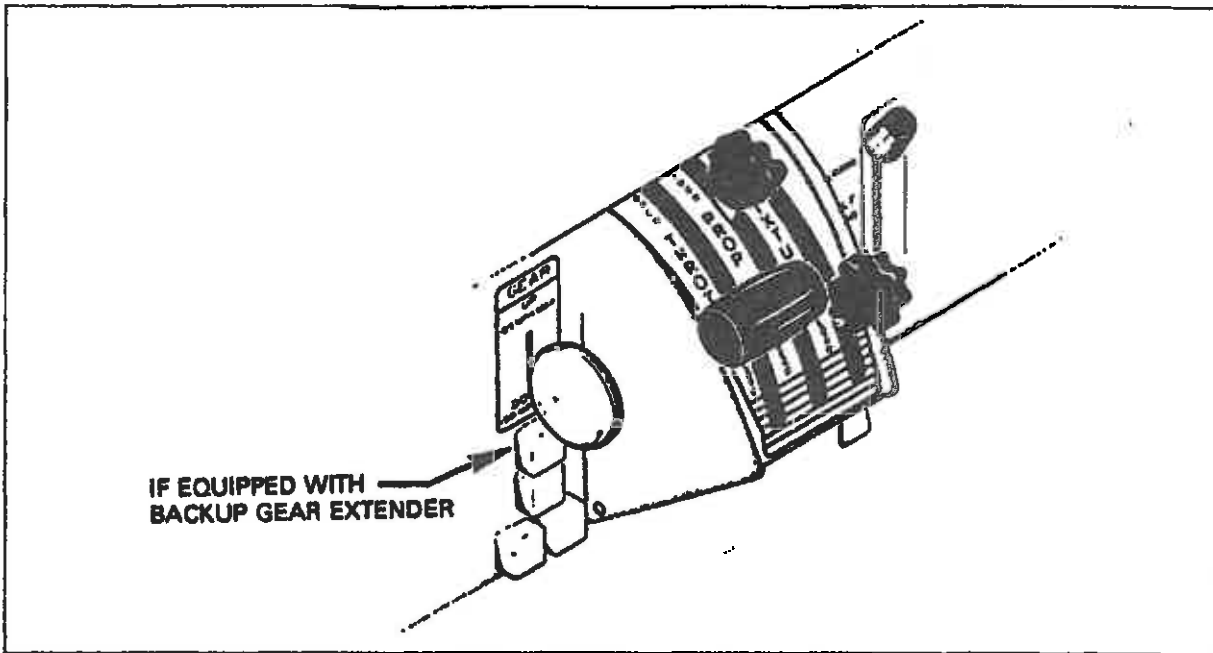
Some aircraft also incorporate a pressure sensing device in the system which lowers the gear regardless of gear selector position, depending upon airspeed and engine power (propeller slipstream). Gear extension is designed to occur, even if the selector is in the up position, at airspeeds below approximately 105 MPH with power off. The extension speeds will vary from approximately 85 MPH to approximately 105 MPH depending on power settings and altitude. The device also prevents the gear from retracting at airspeeds below approximately 85 MPH with full power, though the selector switch may be in the up position. This speed increases with reduced power and/or increased altitude. Manual override of the device is provided by an emergency gear level located between the front seats to the left of the flap handle. The sensing device operation is controlled by differential air pressure across a flexible diaphragm which mechanically linked to a hydraulic valve and an electrical switch which actuates the pump motor. A high pressure and static air source for actuating the diaphragm is provided in a mast mounted on the left side of the fuselage above the wing. Any obstruction of the holes in this mast will cause the gear to extend. An optional heated mast is available to alleviate obstruction in icing conditions. The optional heated mast is turned on whenever the PITOT HEAT is turned on.

The emergency gear lever, when held in the raised position, can be used to override the system, and gear position is then controlled by the selector switch regardless of airspeed/power combinations. The emergency gear lever is provided with a latching device which may be used to lock the override lever in the up position. The latch is located on the left side panel of the console below the level of the manual override lever. To lock the override lever in the up position, raise the override lever to the full up position and push in the latch. A yellow warning light located below the gear selector switch flashes to warn the pilot that the automatic gear lowering system is disabled. The latch is spring loaded to the off position to aid disengagement. To disengage the latch raise the override lever and release. The lever will return to its normal position and the yellow flashing light will extinguish. The lever must also be latched in the raised (up) position when gear-up stalls are practiced.

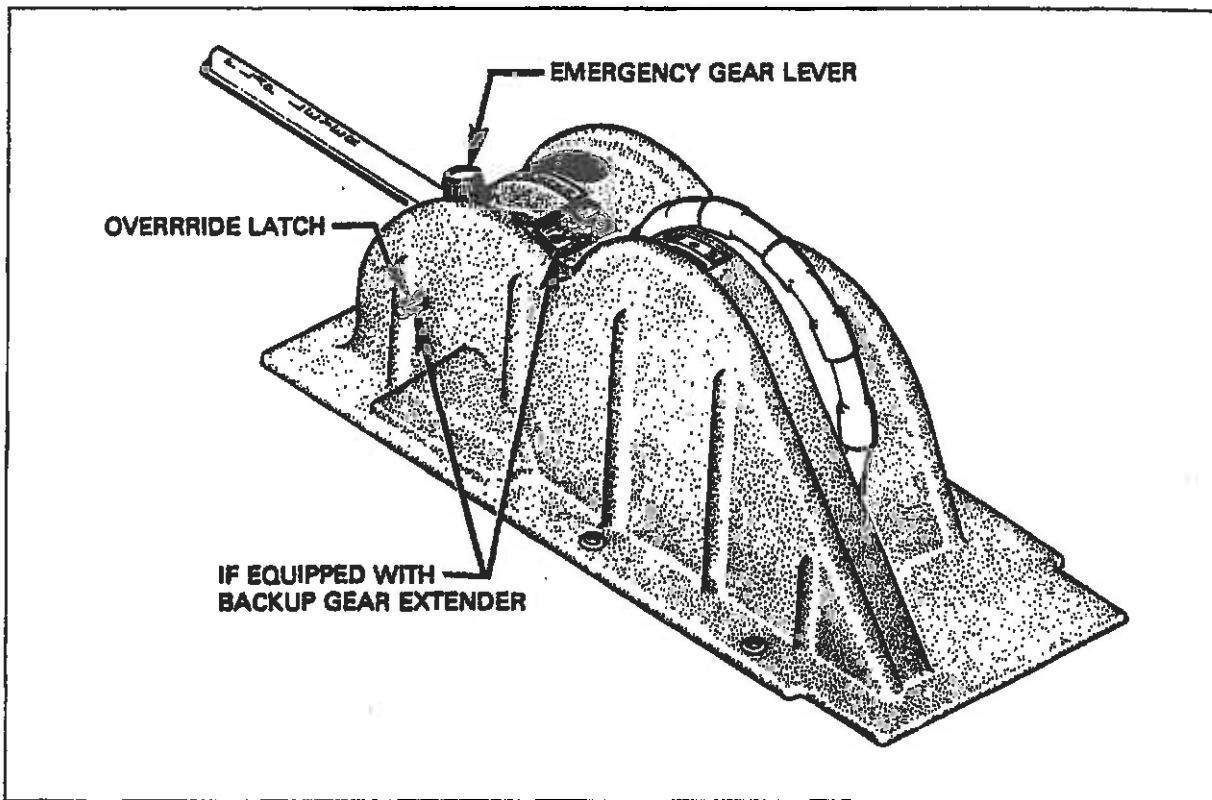
When used for emergency extension of the gear, the emergency gear lever manually releases hydraulic pressure to permit the gear to free-fall with spring assistance on the nose gear. The lever must be held in the downward position for emergency extension.

Gear down and locked positions are indicated by three green lights below the selector, and a yellow light for in-transit positions is located at the top of the panel. An all lights out condition indicates the gear is up. The landing gear should not be retracted above a speed of 125 MPH and should not be extended above a speed of 150 MPH.

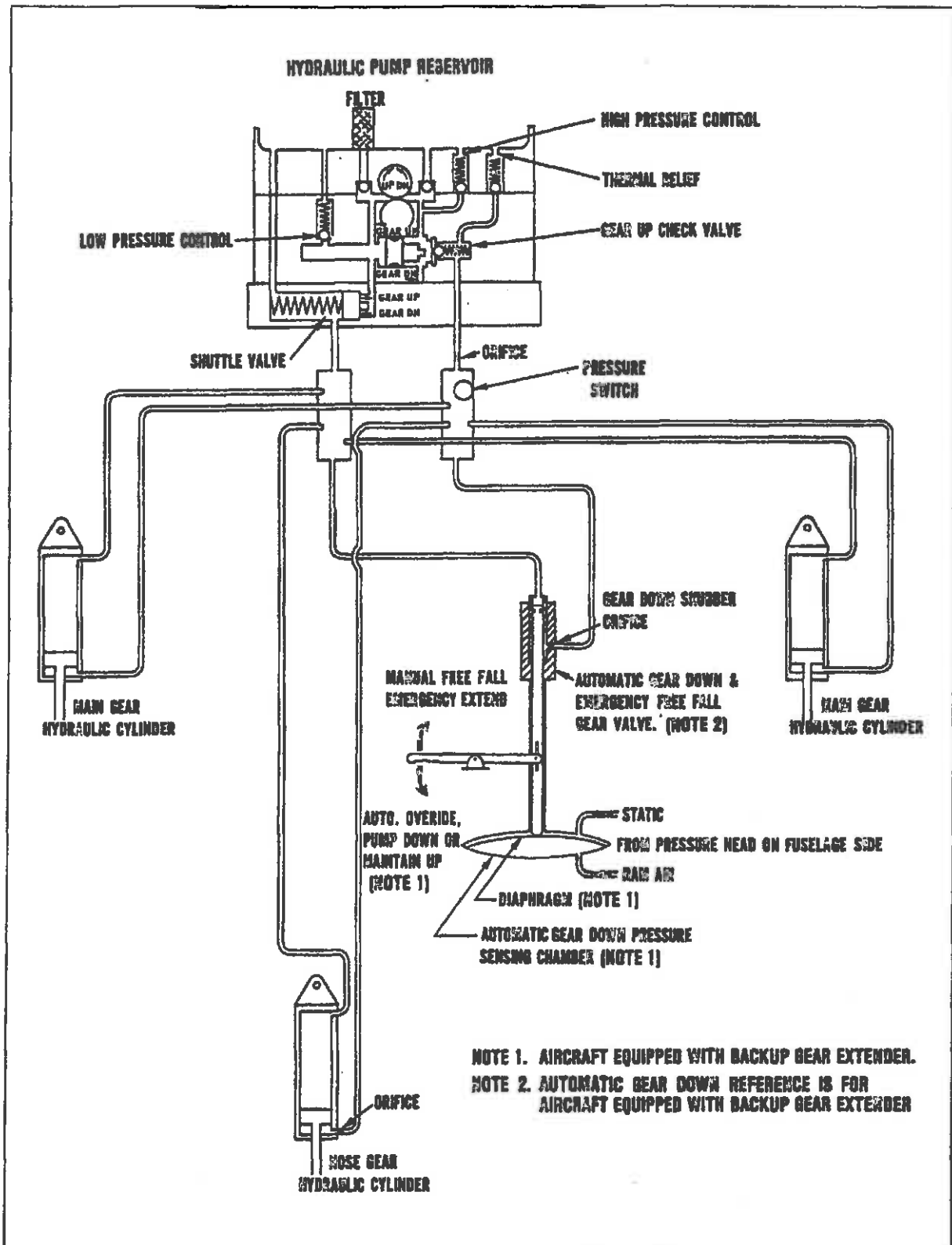
**ARROW II**



**Throttle Quadrant**



**Console**



Landing Gear Hydraulic Schematic

## ARROW II

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Two micro-switches in the throttle quadrant activate a warning horn and a red "Warning Gear Up" light under the following conditions:

1. Gear up and power reduced below approximately 14 inches of manifold pressure.
2. On aircraft equipped with the backup gear extender, if the system has extended the landing gear and the gear selector is UP, except at full throttle.
3. Gear selector switch "UP" while on the ground.

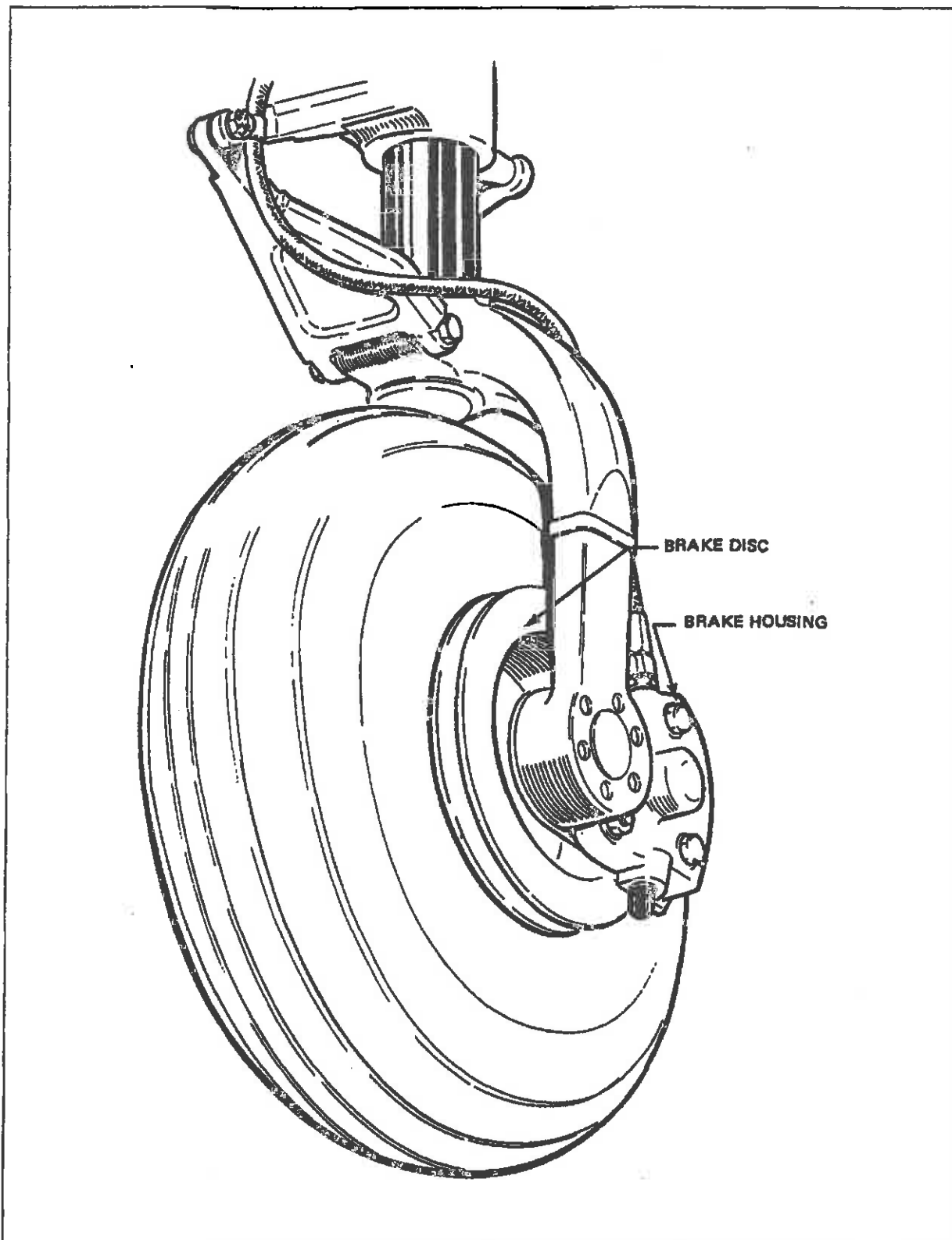
On aircraft NOT equipped with the backup gear extender an additional switch is installed which activates the warning horn and light whenever the flaps are extended beyond the approach position (10°) and the gear are not down and locked.

The nose gear is steerable through a 60-degree arc through use of the rudder pedals. As the nose gear retracts, the steering linkage disengages to reduce rudder pedal loads in flight. The nose wheel is equipped with a hydraulic shimmy dampener to reduce nose wheel shimmy.

The oleo struts are of the air-oil type, with normal extension being 2.75 inches for the nose gear and 2.0 inches for the main gear under normal static load (empty weight of airplane plus full fuel and oil).

The standard brake system includes toe brakes on the left set of rudder pedals and a hand brake located below and near the center of the instrument panel. Toe brakes on the right rudder pedal are optional. The toe brakes and the hand brake have individual brake cylinders, but all cylinders use a common reservoir. The parking brake is incorporated in the lever brake and is operated by pulling back on the lever and depressing the knob attached to the top of the handle. To release the parking brake, pull back on the brake lever; then allow the handle to swing forward.

A single disc, single puck brake is mounted on the main gears. A brake disc is mounted on the inboard side of the wheels and the brake housing which incorporates the pucks is mounted to the inboard side of the wheel axle.



Main Wheel Assembly

## ARROW II

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### FLIGHT CONTROLS

Dual flight controls are provided as standard equipment. A cable system provides actuation of the control surfaces when the flight controls are moved in their respective directions.

The horizontal surface (stabilator) is of the flying tail design with a trim tab/servo mounted on the trailing edge. This tab series the dual function of providing trim control and pitch control forces. The trim function is controlled by a trim control wheel located on the control console between the two front seats. Rotating the wheel forward gives nose down trim and rotation aft gives nose up trim. The stabilator provides extra stability and controllability with less area, drag and weight than conventional tail surfaces.

The rudder is conventional in design and incorporates a rudder trim. The trim mechanism is a spring-loaded recentering device. The trim control is located on the right side of the pedestal below the throttle quadrant. Turning the trim control clockwise gives nose right trim and counterclockwise rotation gives nose left trim.

Ailerons are provided with differential deflection. This feature reduces adverse yaw in turning maneuvers, and thus reducing the amount of coordination required.

Manually controlled flaps are provided. They are extended by a control cable and are spring-loaded to the retracted (up) position. The control is located between the two front seats on the control console. To extend the flaps pull the handle up to the desired flap setting of 10, 25 or 40 degrees. To retract, depress the button on the end of the handle and lower the control. A balanced control system is used for light operating forces.

When extending or retracting flaps, there is a pitch change in the aircraft. This pitch change can be corrected either by stabilator trim or increased control wheel force. When the flaps are in the retracted position the right flap, provided with a over-center lock mechanism, acts as a step.

#### NOTE

The right flap will support a load only in the fully retracted (up) position. When loading and unloading passengers make sure the flaps are in the retracted (up) position.

## FUEL SYSTEM

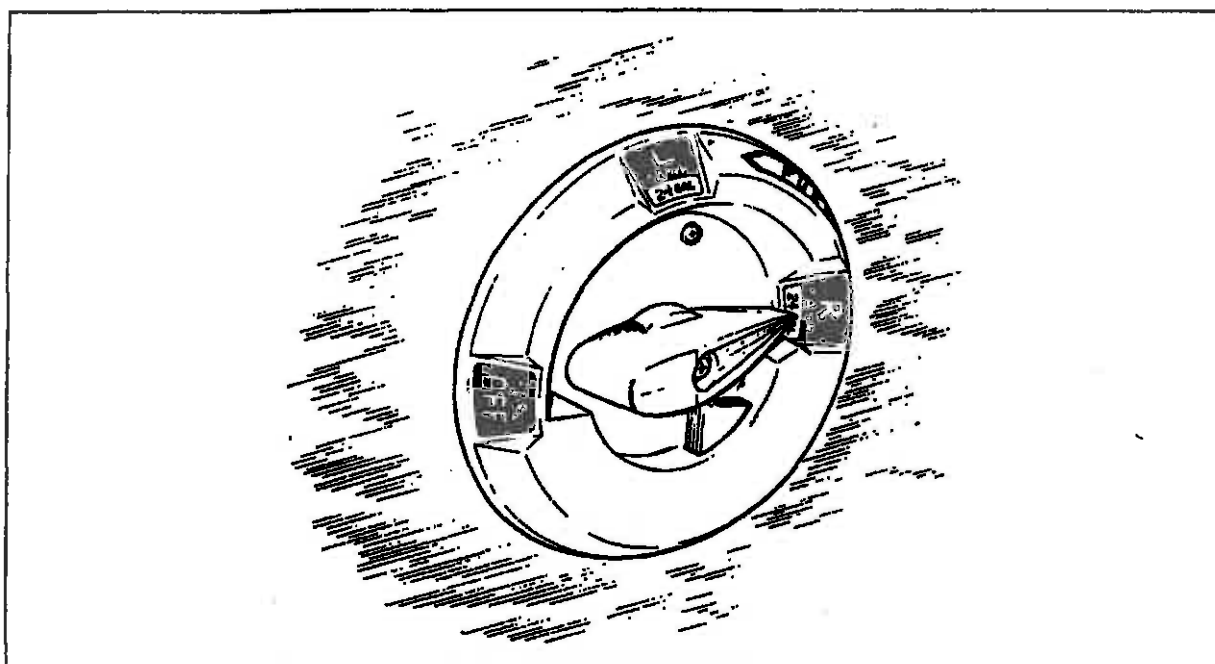
The fuel system was designed with simplicity in mind. It incorporates two fuel tanks, one in each wing containing twenty-five (25) U.S. gallons, giving a total of 48 usable gallons. The tanks are attached to the leading edge of the wing with screws and are an integral part of the wing structure. This allows for easy removal for service. An auxiliary electric fuel pump is provided in case of a failure of the engine driven pump. A rocker type switch for controlling the electric pump is located on the switch panel above the throttle quadrant. The electric pump should be on for take-off, switching tanks and during landing.

The fuel tank selector, which allows the pilot to control the flow of fuel to the engine, is located on the left side wall below the instrument panel. It has three positions: OFF, LEFT TANK and RIGHT TANK. The arrow on the handle of the selector points to the tank which is supplying fuel to the engine. The valve also incorporates a safety latch which prevents inadvertently selecting the "OFF" position.

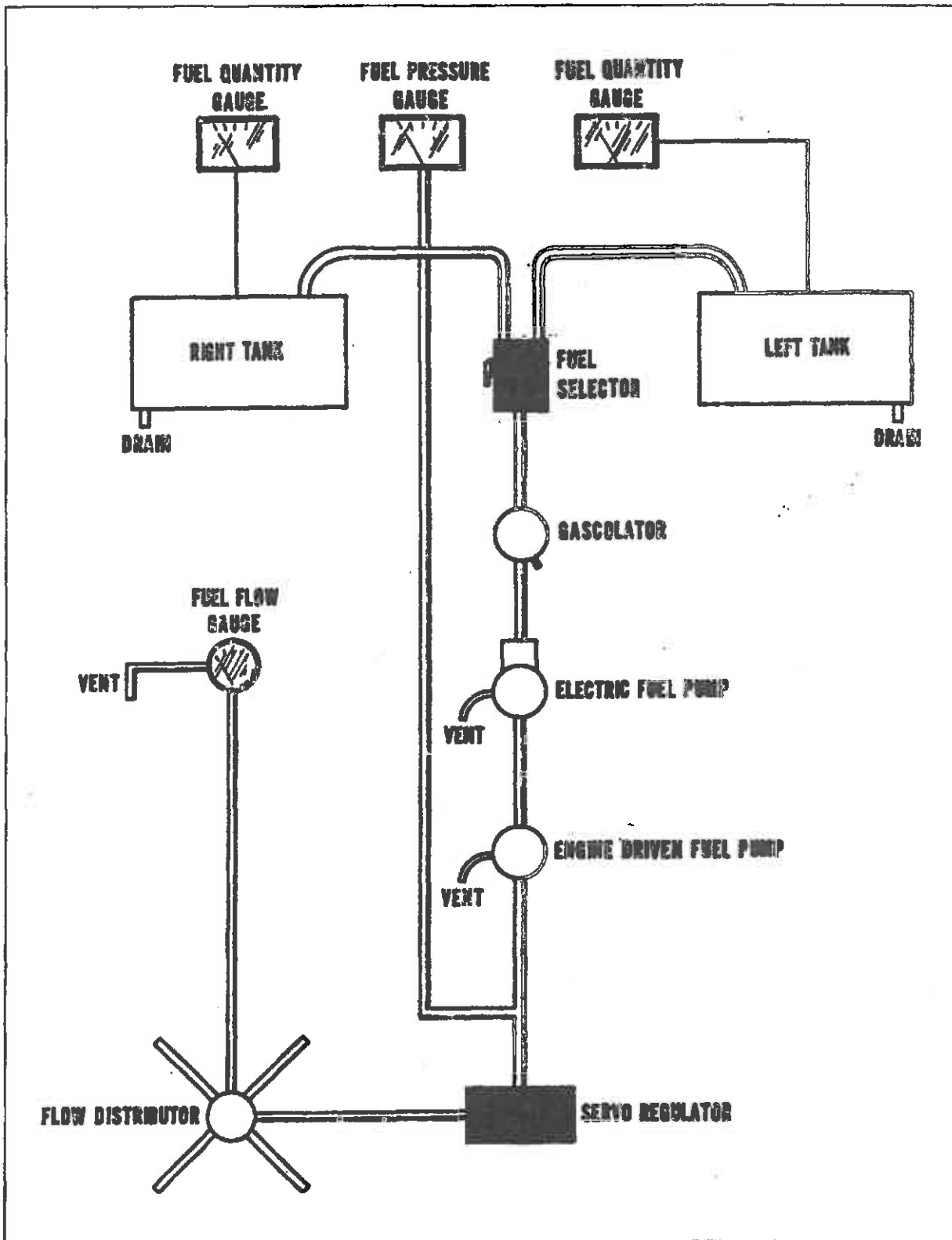
Each tank has an individual quick drain located at the bottom inboard rear corner. The fuel strainer also incorporates a quick drain which is located in the left front corner of the firewall. The quick drain protrudes from the cowling to allow easy draining of the fuel strainer. All three drains should be drained before every flight and checked for contamination.

The fuel tanks are vented individually by a vent tube which protrudes below the bottom of the wing at the rear outboard corner of each fuel tank. The vent should be checked periodically to ascertain that the vent is not obstructed and allows free passage of air.

Fuel quantity and pressure are indicated on gauges located in the instrument cluster to the left of the switch panel.



Fuel Selector



Fuel Schematic



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## ELECTRICAL SYSTEM

The electrical system is very simple and functional. All switches are grouped in a switch panel above the power quadrant. On the lower right side of the instrument panel is the circuit breaker panel, with each breaker clearly marked to show what circuit it protects. Also, circuit provisions are made to handle a complete complement of communication and navigational equipment.

Standard electrical accessories include alternator, starter, electric fuel pump, stall warning indicator, and ammeter.

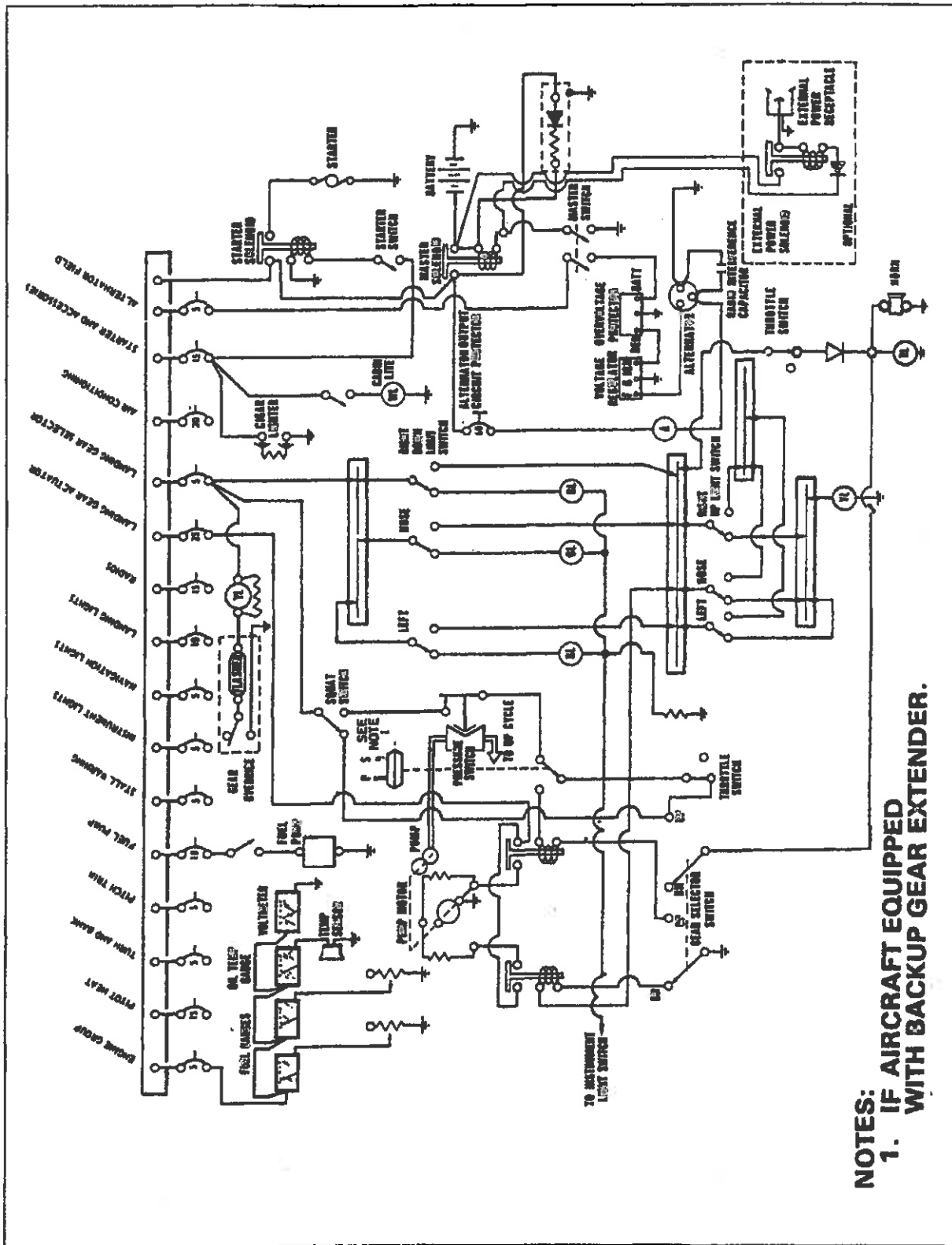
Navigation anti-collision, landing, instrument and cabin dome lights are offered as optional equipment. Navigation and dome lights are controlled by a rheostat switch on the left side of the switch panel. The rheostat controls the intensity of the dome light only. The instrument panel lights are controlled by a rheostat switch on the right side of the switch panel. The anti-collision and landing lights are controlled by rocker switches on the switch panel.

### WARNING

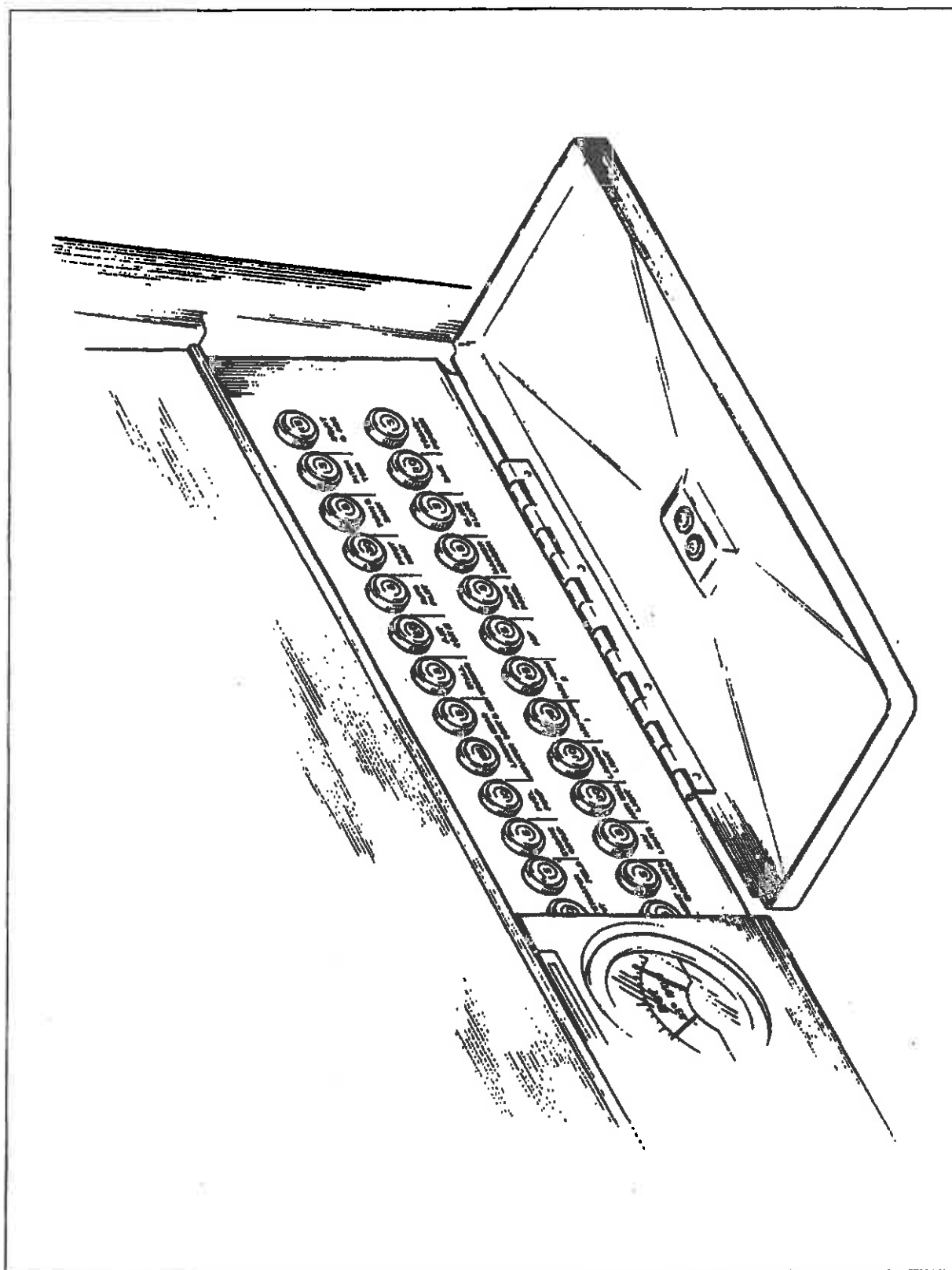
Anti-collision lights should not be operating when flying through clouds, fog or haze, since the reflected light can produce spatial disorientation. Strobe lights should not be used in close proximity to the ground, such as during taxiing, takeoff or landing.

The master switch, also located in the switch panel, is a split rocker switch. One side of the switch is the battery side ("BAT") and the other is the alternator side ("ALT"). Henceforth, "master switch," used in this manual, shall mean both "BAT" and "ALT" switches. The "ALT" switch is provided for an emergency and its function is covered under "Alternator Failure" in the Emergency section of the handbook.

The primary electrical power source is a 12-volt, 60-amp alternator, which is protected by a voltage regulator and an overvoltage relay. The alternator provides full electrical power output even at low engine RPM. This provides improved radio and electrical equipment operation and increases battery life by reducing battery load.



Electrical Schematic



Circuit Breaker Panel

## ARROW II

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Secondary power is provided by a 12-volt, 25-ampere hour battery.

The ammeter as installed does not show battery discharge; rather it shows the electrical load placed on the system. With all the electrical equipment off, and the master switch on, the ammeter will indicate the charging rate of the battery. As each electrical unit is switched on, the ammeter will indicate the total ampere draw of all the units including the battery. For example, the maximum continuous load for night flying with radios on is about 30 amperes. The 30 ampere value plus 2 amperes for charging the battery will then show on the ammeter, indicating the alternator is functioning properly.

Solenoids, provided in the battery and starter circuits, are used to control high current drain functions remotely from the cabin.

## VACUUM SYSTEM

The vacuum system is designed to operate the air driven gyro instruments. This includes the directional and attitude gyros when installed. The system consists of an engine driven vacuum pump, a vacuum regulator, a filter and the necessary plumbing.

The vacuum pump is a dry type pump which eliminates the need for an air/oil separator and its plumbing. A shear drive protects the pump from damage. If the drive shears the gyros will become inoperative.

The vacuum gauge, mounted on the right instrument panel to the right of the radios, provides valuable information to the pilot about the operation of the vacuum system. A decrease in pressure in a system that has remained constant over an extended period, may indicate a dirty filter, dirty screens, possibly a sticking vacuum regulator or leak in system. Zero pressure would indicate a sheared pump drive, defective pump, possibly a defective gauge or collapsed line. In the event of any gauge variation from the norm, the pilot should have a mechanic check the system to prevent possible damage to the system components or eventual failure of the system.

A vacuum regulator is provided in the system to protect the gyros. The valve is set so the normal vacuum reads  $5.0 \pm .1$  inches of mercury, a setting which provides sufficient vacuum to operate all the gyros at their rated RPM. Higher settings will damage the gyros and with a low setting the gyros will be unreliable. The regulator is located behind the instrument panel.

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## INSTRUMENT PANEL

The instrument panel is designed to be functional and professional, accommodating complete instruments and avionics equipment for VFR and IFR flights. A wide range of optional instruments and avionics permits an equipment selection uniquely suited to individual needs.

**Flight instruments** are grouped in a standard "T" directly in front of the pilot. Radio navigational indicators are to the right of the flight instruments and are located to correspond to the respective radio control heads. Fuel gauges are located to the right of the pilot control wheel and engine instruments are located to the left of the control wheel. The tachometer and manifold pressure instruments are located to the left of the power quadrant and are positioned respective of the throttle and propeller controls.

The circuit breakers are protected by a cover door.

The climatic controls, when the air conditioning system is installed, are located in the right instrument panel above the circuit breakers.

## PITOT-STATIC SYSTEM

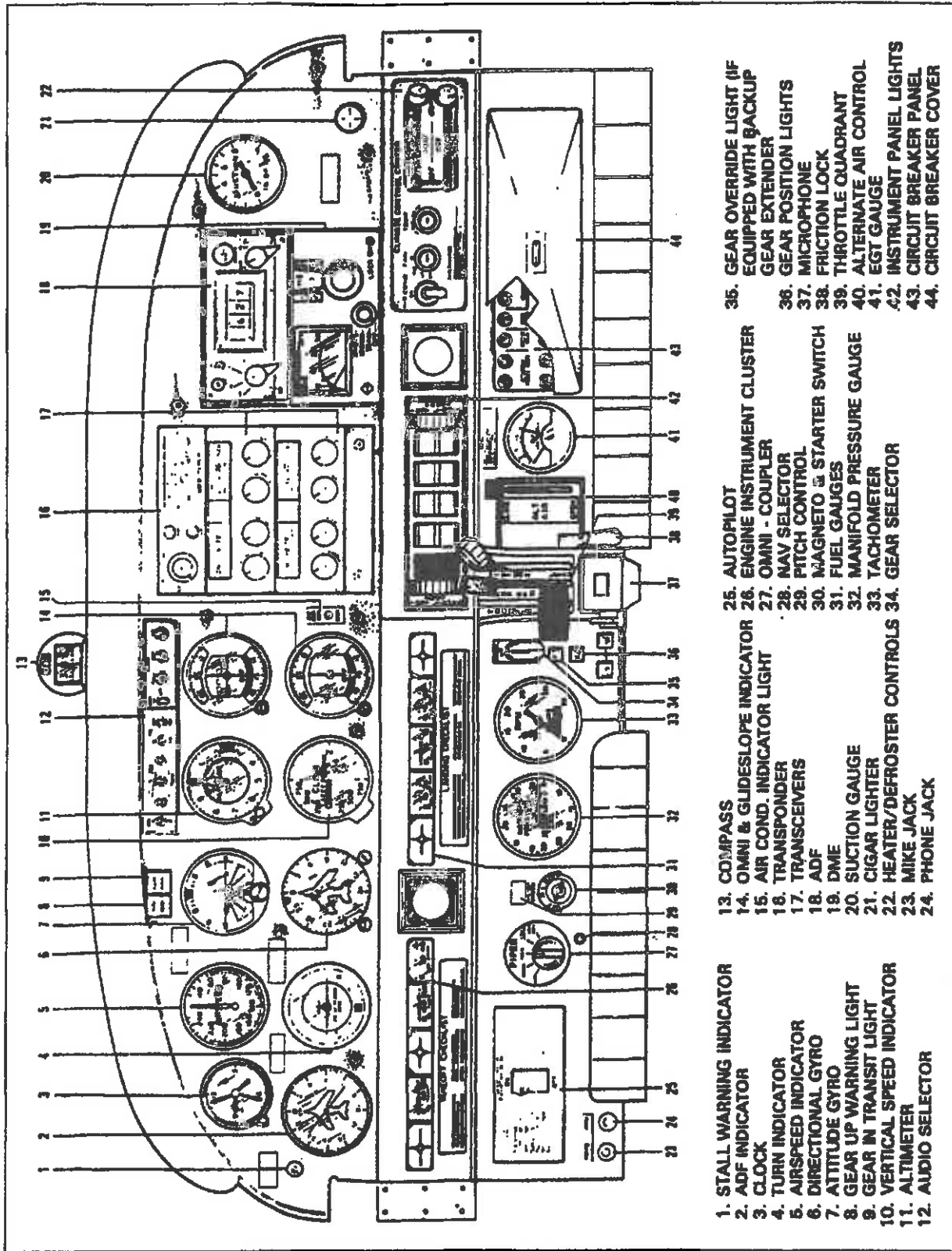
The system supplies both pitot and static pressure for the airspeed indicator, altimeter and vertical speed indicator (when installed).

**Pitot and static pressure** are picked up by the pitot head on the bottom of the left wing. An optional heated pitot head, which alleviates problems with icing or heavy rain, is available. The switch for pitot heat is located on the lower left instrument panel.

To prevent bugs and water from entering the pitot and static pressure holes, a cover should be placed over the pitot head. A partially or completely blocked pitot head will give erratic or zero readings on the instruments.

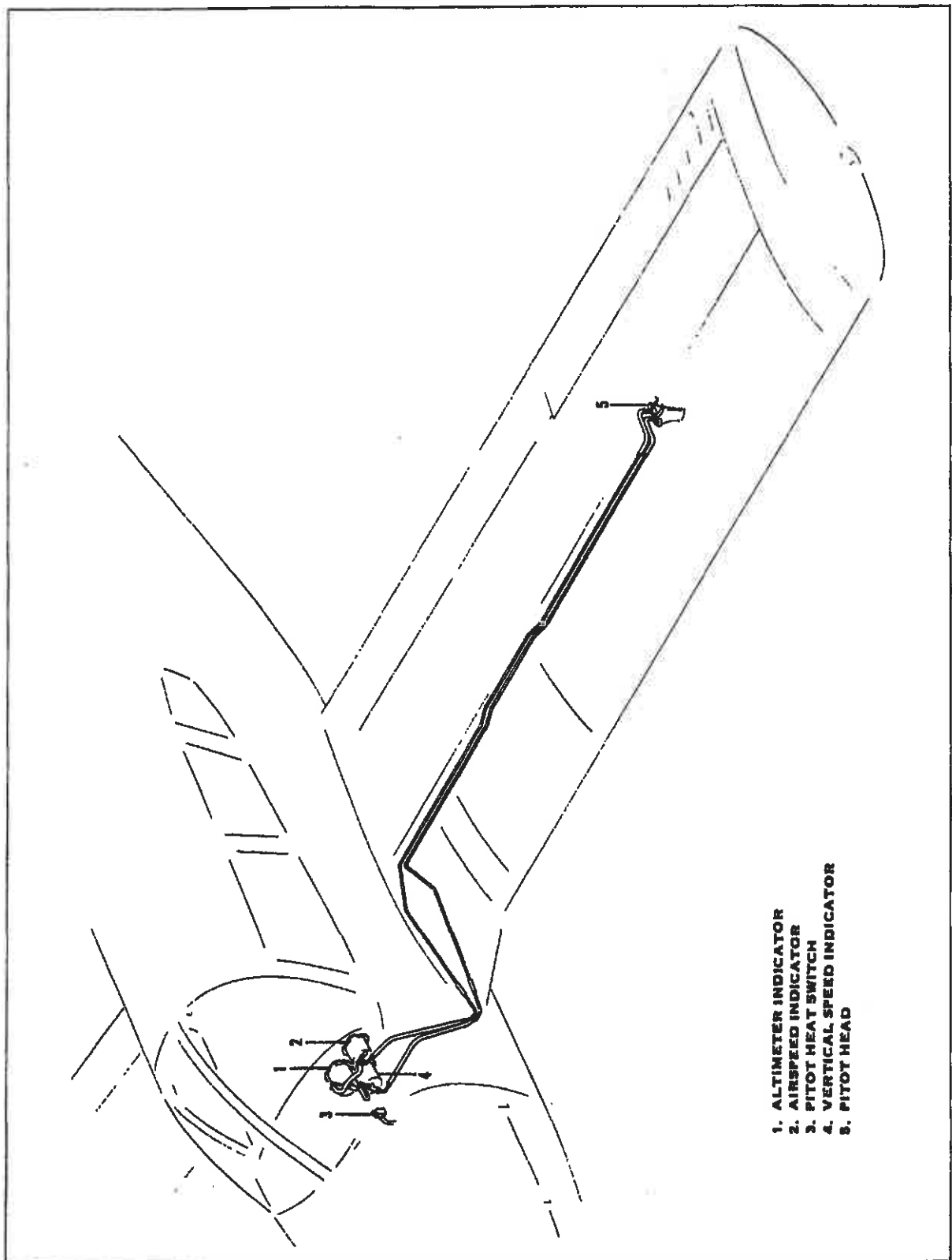
### NOTE

During the preflight, check to make sure the pitot cover is removed.



Instrument Panel

- |                              |                                 |                               |   |
|------------------------------|---------------------------------|-------------------------------|---|
| 1. STALL WARNING INDICATOR   | 13. COMPASS                     | 25. AUTOPILOT                 | 35. GEAR OVERRIDE LIGHT (IF EQUIPPED WITH BACKUP GEAR EXTENDER) |
| 2. ADF INDICATOR             | 14. OMNI & GLIDESLOPE INDICATOR | 26. ENGINE INSTRUMENT CLUSTER | 36. GEAR POSITION LIGHTS  |
| 3. CLOCK                     | 15. AIR COND. INDICATOR LIGHT   | 27. OMNI - COUPLER            | 37. MICROPHONE  |
| 4. TURN INDICATOR            | 16. TRANSPONDER                 | 28. NAV SELECTOR              | 38. THROTTLE LOCK   |
| 5. AIRSPEED INDICATOR        | 17. TRANSCEIVERS                | 29. PITCH CONTROL             | 39. THROTTLE QUADRANT   |
| 6. DIRECTIONAL GYRO          | 18. ADF                         | 30. MAGNETO & STARTER SWITCH  | 40. ALTERNATE AIR CONTROL                                       |
| 7. ATTITUDE GYRO             | 19. DME                         | 31. FUEL GAUGES               | 41. EGT GAUGE   |
| 8. GEAR UP WARNING LIGHT     | 20. SUCTION GAUGE               | 32. MANIFOLD PRESSURE GAUGE   | 42. INSTRUMENT PANEL LIGHTS                                     |
| 9. GEAR IN TRANSIT LIGHT     | 21. CIGAR LIGHTER               | 33. TACHOMETER                | 43. CIRCUIT BREAKER PANEL                                       |
| 10. VERTICAL SPEED INDICATOR | 22. HEATER/DEFROSTER CONTROLS   | 34. GEAR SELECTOR             | 44. CIRCUIT BREAKER COVER                                       |
| 11. ALTIMETER                | 23. MIKE JACK                   |                               |   |
| 12. AUDIO SELECTOR           | 24. PHONE JACK                  |                               |   |



- 1. ALTIMETER INDICATOR
- 2. AIRSPEED INDICATOR
- 3. PITOT HEAT SWITCH
- 4. VERTICAL SPEED INDICATOR
- 5. PITOT HEAD

Static System

## ARROW II

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### HEATING, VENTILATING AND DEFROSTING SYSTEM

The heating system is designed to provide maximum comfort for the occupants during winter and cool weather flights. The system includes a heat shroud, heat ducts, defroster outlets, heat and defroster controls.

An opening in the front of the lower cowl admits ram air to the heater shroud and then the air is ducted to the heater shut-offs on the right and left side of the firewall. When the shut-offs are opened the heated air then enters the heat ducts located along each side of the center console. Outlets in the heat duct are located at each seat location. Air flow to the rear seats can be regulated by controls in the heat ducts located between the front seats. The temperature of the cabin is regulated by the heater control located on the right side of the instrument panel.

#### CAUTION

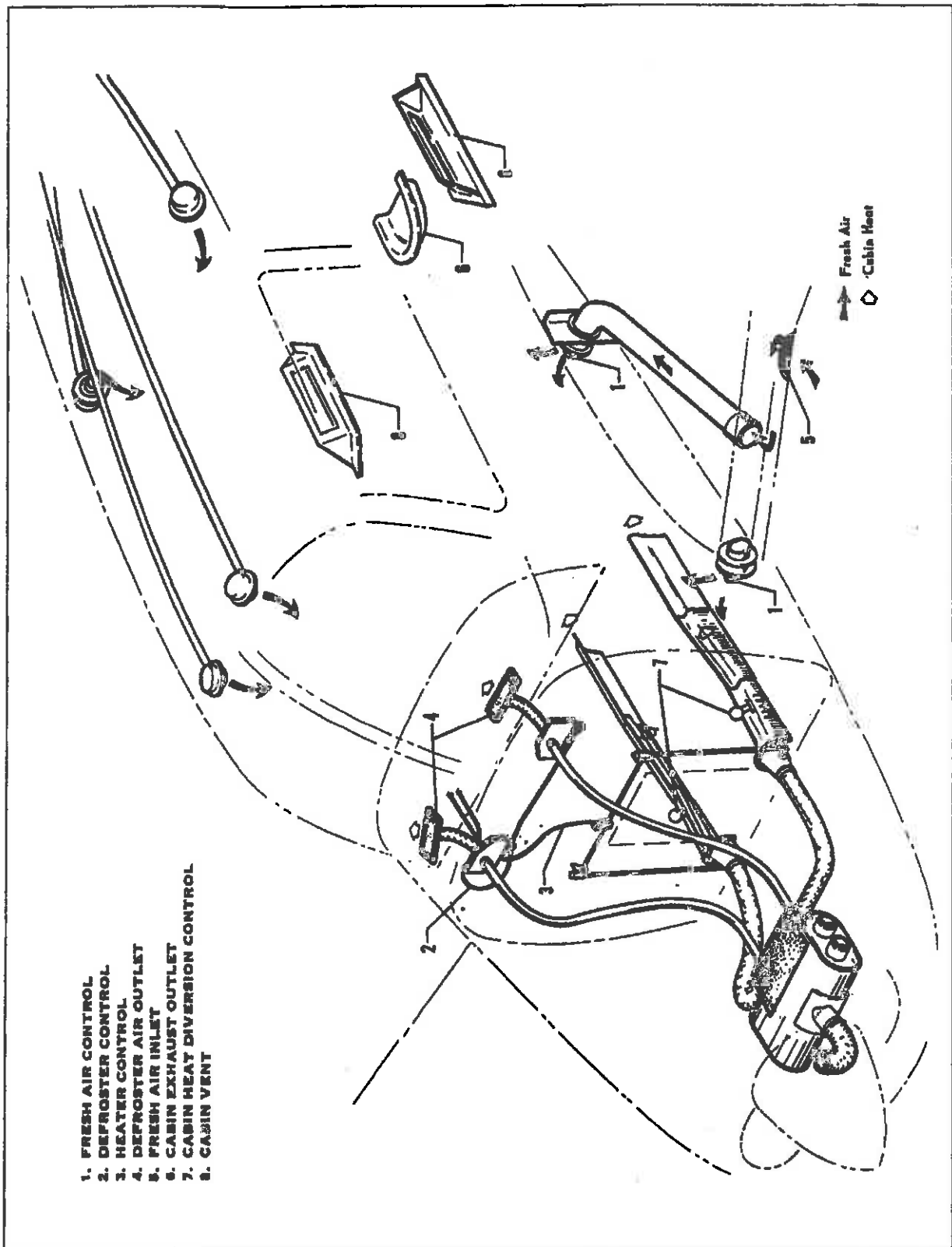
When cabin heat is operated, heat duct surface becomes hot. This could result in burns if arms or legs are placed too close to heat duct outlets or surface.

**Defrosting** is accomplished by heat outlets located on the right and left side of the cowl cover. Heated air is ducted directly to defroster shut-off valves at the firewall, then to the defroster outlets. The air flow is regulated by a defroster control located below the heat control.

To aid air distribution, the cabin air is exhausted overboard by an outlet located on the bottom of the fuselage. Cabin exhaust outlets are located below and outboard of the rear seats. The above features are removed when air conditioning is installed.

Optional individual overhead fresh air outlets supply fresh air from an air inlet located on the tip of the vertical fin. The air is directed to a plenum chamber at the base of the fin, then ducted to the individual outlets. For individual comfort, the amount and direction of air can be regulated by rotating the rim of the outlet (clockwise to decrease the amount of air, counterclockwise to increase flow) to control the amount of air and moving the outlet in the direction of desired air flow.





Heat, Defrost and Ventilating System

## ARROW II

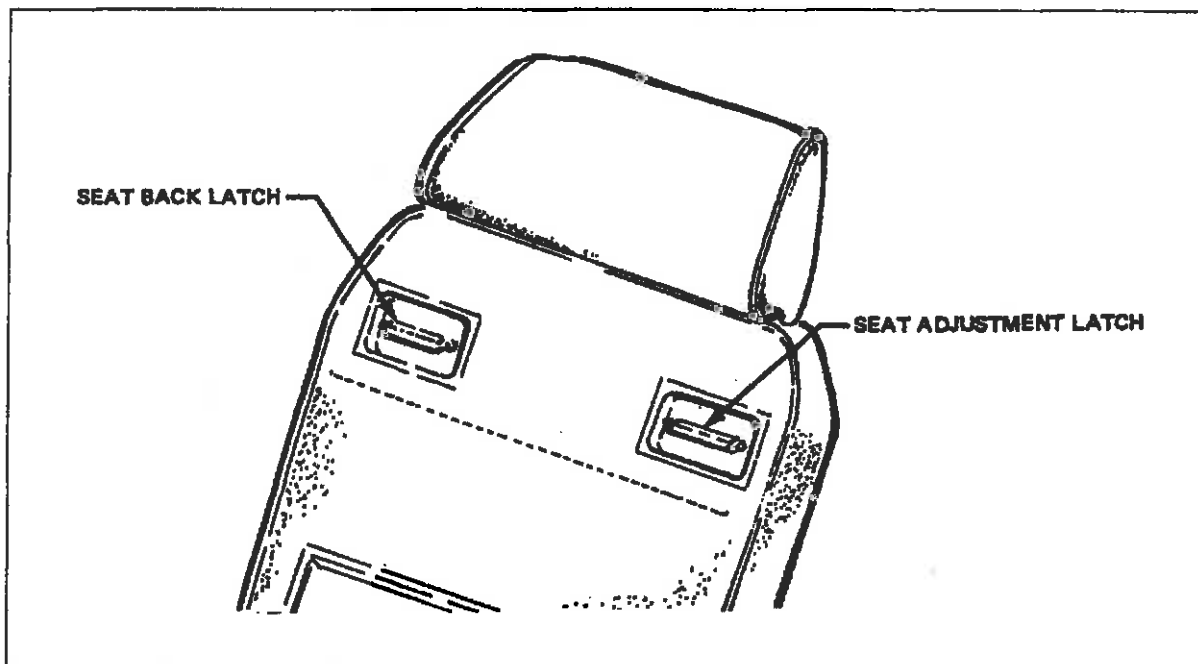
### CABIN FEATURES

The interior has been designed for passenger comfort and safety. All seat backs have three positions: normal, intermediate and recline. The adjustment lever is located at the base of the seat back on the outboard side of the seat. The front seats adjust fore and aft for ease of entry and occupant comfort. The back of the right front seat contains two latches, an outboard latch which allows the seat to be moved forward to allow easy entry to the rear seats, and an inboard latch which allows the seat back to be tilted in a forward direction. The rear seats are easily removed to provide room for bulky items. Optional headrests are available.

A single strap shoulder harness controlled by an inertia reel, located above the side window, protects each front seat occupant. Optional shoulder straps for the rear occupants are available. The shoulder strap is routed over the shoulder adjacent to the window and attached to the lap belt in the general area of the occupant's inboard hip. A check of the inertia reel mechanism can be made by pulling sharply on the strap and checking that the reel will lock in place under sudden stress; this locking feature prevents the strap from extending and holds the occupant in place. Under normal movement the strap will extend and retract as required. Shoulder harnesses should be routinely worn during take-off, landing and whenever an inflight emergency situation occurs.

Additional features include pilot storm window, two sun visors, ashtrays for each occupant, two map pockets located on the side panels below the instrument panel, miscellaneous pockets on the rear of the front seat backs, armrests for the front occupants, cabin or baggage door locks and ignition lock.

The interior is tastefully finished in soft vinyls and matching Scotchguard fabrics. The blend of vinyls and fabric gives long wear, comfort and easy care.



Right Seat Latches

## **BAGGAGE AREA**

A large baggage area, located behind the rear seats, is accessible either from the cabin or through a large outside baggage door on the right side of the aircraft. Maximum capacity is 200 lbs. Tie-down straps are provided and should be used at all times.

### **NOTE**

It is the pilot's responsibility to be sure when the baggage is loaded that the aircraft C.G. falls within the allowable C.G. Range. (See Weight and Balance Section.)

## **STALL WARNING**

An approaching stall is indicated by a stall warning light activated by a vane installed on the leading edge of the left wing. The warning light is located to the left of the clock. Mild airframe buffeting and gentle pitching may also precede the stall. Stall speeds vs Angle of Bank, for a gross weight of 2650 pounds, are shown on a graph in the Performance Chart section. During preflight, the stall warning system should be checked to make sure the light is working. This is accomplished by turning the master switch "ON," lifting the vane on the left wing and checking to see if the stall warning light comes on. Since the vane is spring-loaded to the "OFF" position, this procedure will require two people. If another person is not available ascertain that vane has free movement.

## **FINISH**

The exterior of the aircraft is finished with a durable acrylic lacquer in a variety of tasteful colors to suit individual owners.

**ARROW II**

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**AIR CONDITIONING\***

The air conditioning system is a recirculating air system. The major items include; evaporator, condenser, compressor, blower, switches and temperature controls.

The evaporator is located behind the left rear side of the baggage compartment. This cools the air that is used for air conditioning.

The condenser is mounted on a retractable scoop located on the bottom of the fuselage and to the rear of the baggage compartment area. The scoop extends when the air conditioner is "ON" and retracts to a flush position when the system is "OFF."

The compressor is mounted on the forward right underside of the engine. It has an electric clutch which automatically engages or disengages the compressor to the belt drive system of the compressor.

An electrical blower is mounted on the aft side of the rear cabin panel. Air from the baggage area is drawn through the evaporator by the blower and distributed through an overhead duct to individual outlets located adjacent to each occupant.

The switches and temperature control are located on the lower right side of the instrument panel in the climate control center panel. The temperature control regulates the desired temperature of the cabin. Turn the control clockwise for increased cooling, counterclockwise for decreased cooling.

Located inboard of the temperature control is the fan speed switch and the air conditioning "ON-OFF" switch. The fan can be operated independently of the air conditioning. However, it must be on for air conditioner operation. Turning either switch off will disengage the compressor clutch and retract the condenser door. Cooling air should be felt within one minute after the air conditioner is turned on.

**NOTE**

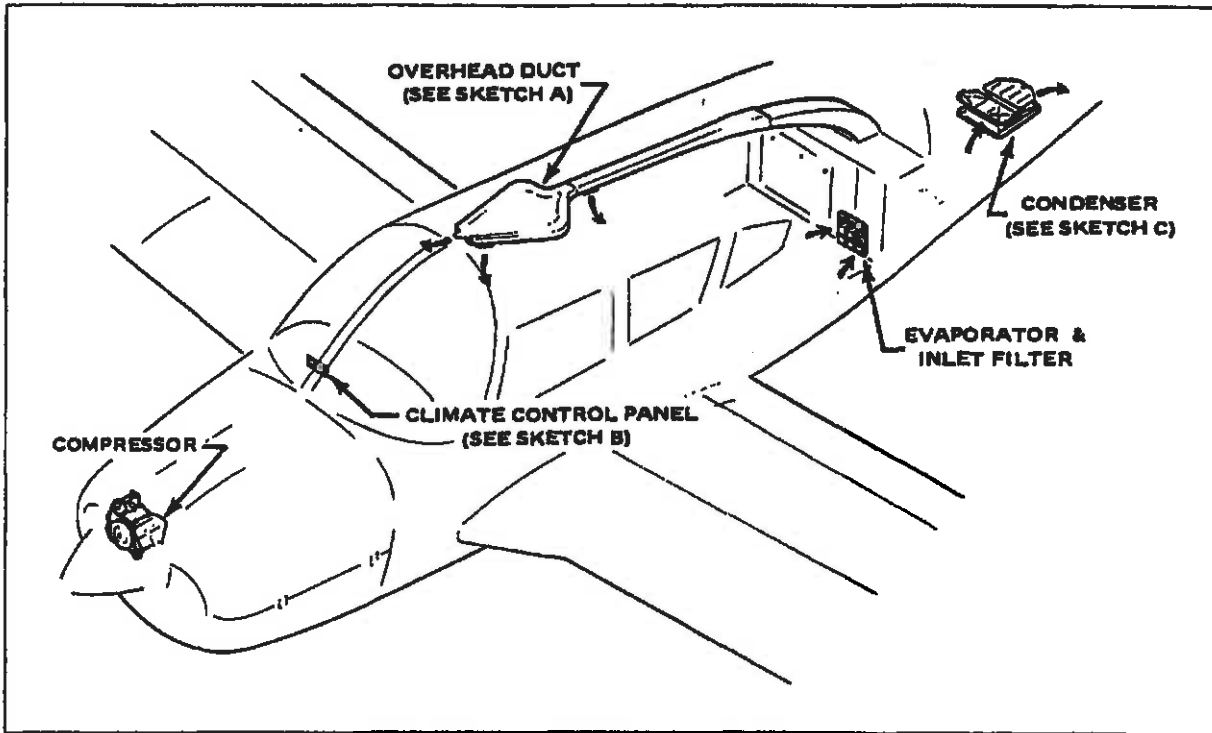
If the system is not operating in 5 minutes turn the system "OFF," until the fault is corrected.

The "FAN" switch allows operation of the fan with the air conditioner turned "OFF" to aid cabin air circulation if desired. A "LOW," "MED" or "HIGH" flow of air can be selected to the air conditioner outlets located in the overhead duct. The outlets can be adjusted or turned off by each occupant to obtain individual cooling effect.

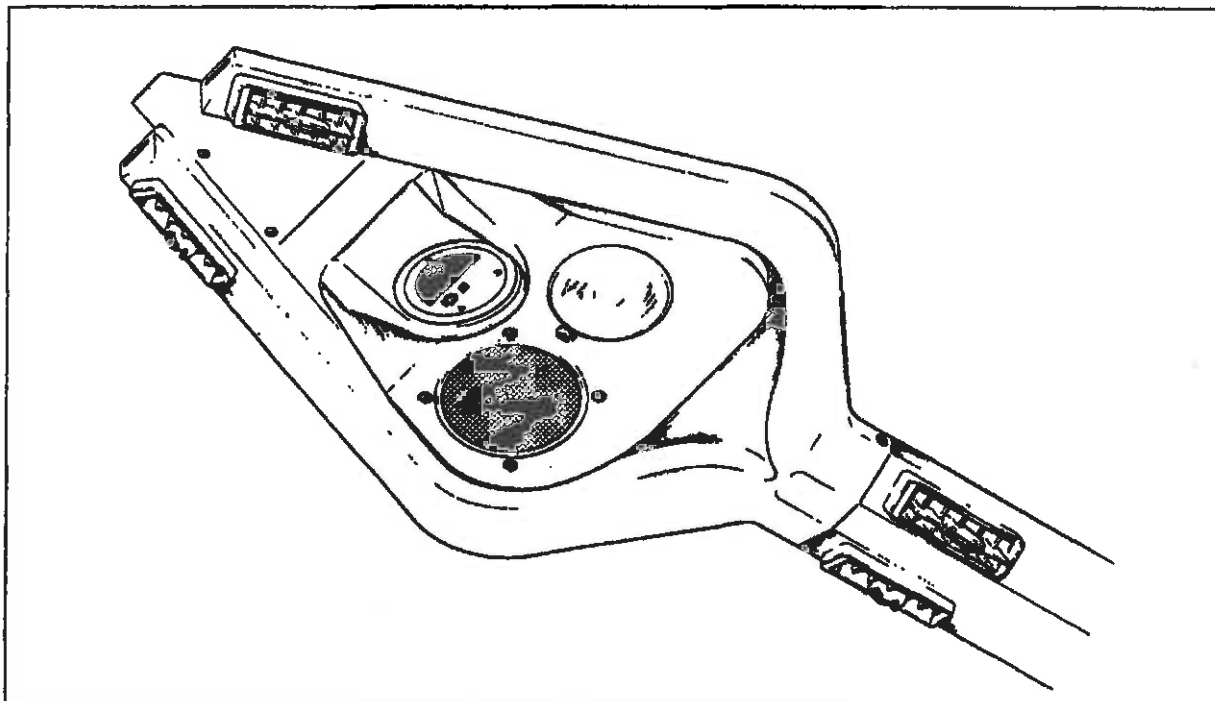
The condenser door light is located to the left of the radio stack in front of the pilot. The door light illuminates and remains on when the door is open or extended. The light is off when the door is retracted.

\*Optional Equipment

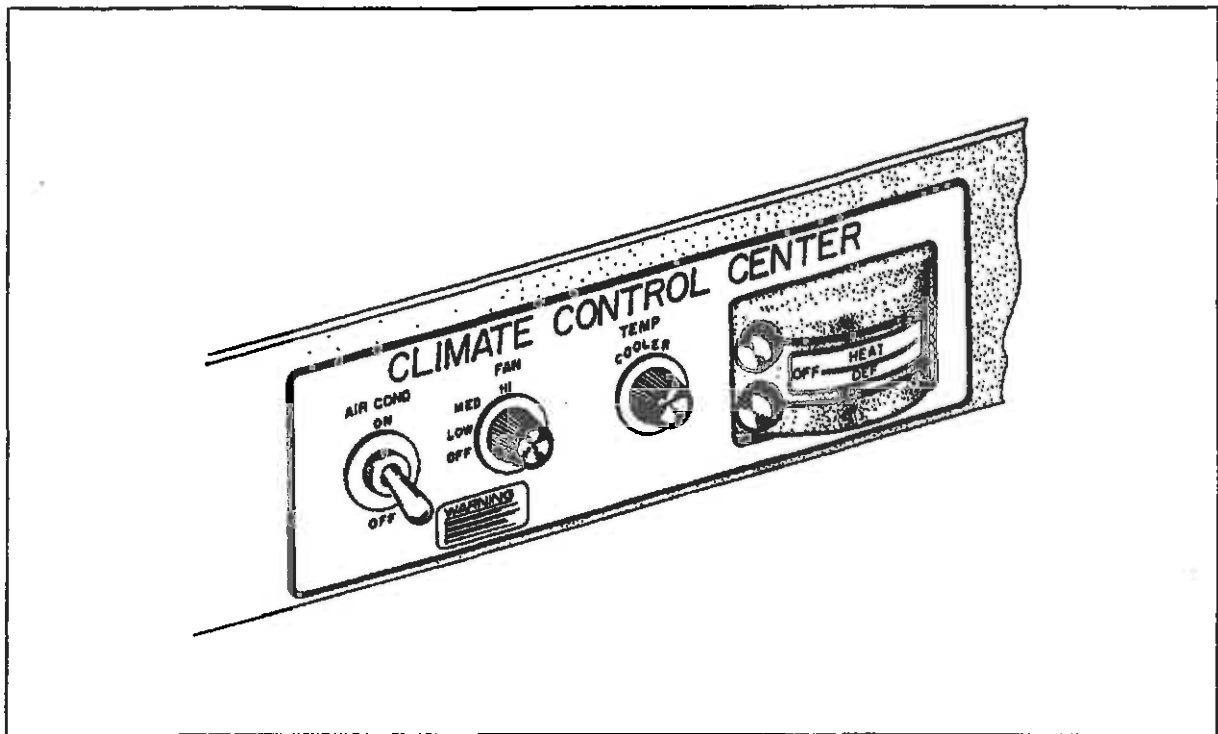
ARROW II



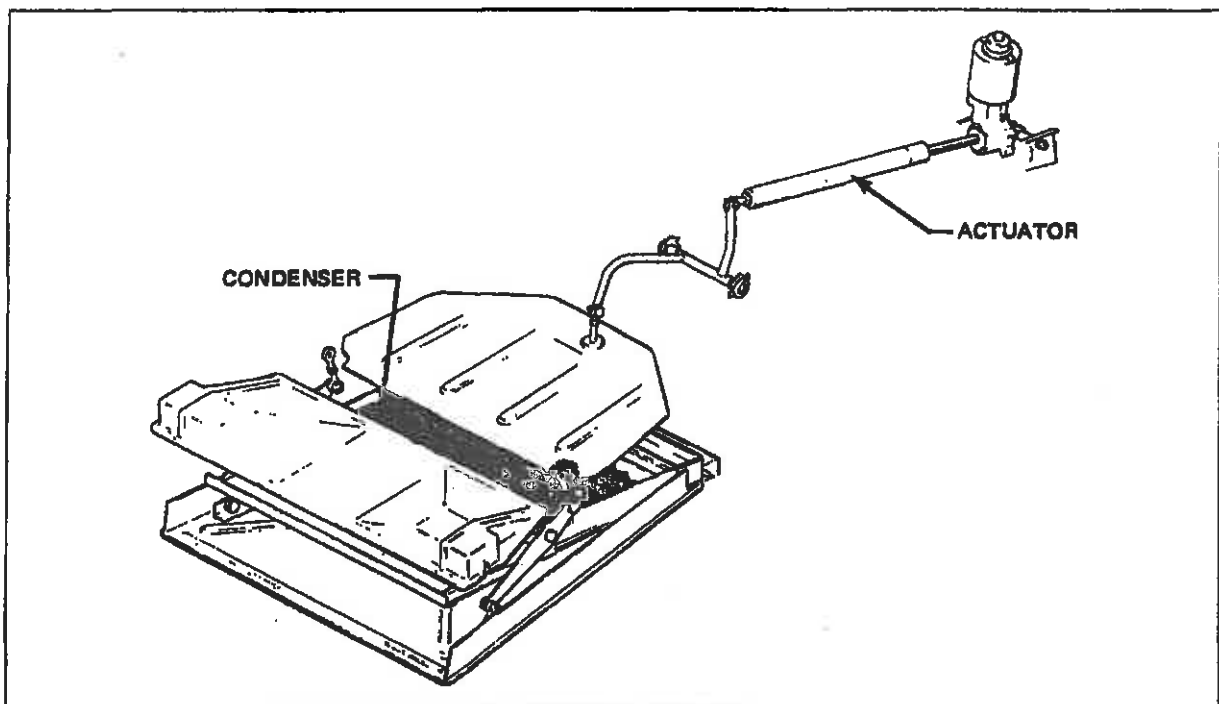
Air Conditioning System



SKETCH A. Overhead Duct



SKETCH B. Climate Control Panel



SKETCH C. Condenser

## ARROW II

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A circuit breaker located on the circuit breaker panel protects the air conditioning electrical system.

Whenever the throttle is in the full throttle position, it actuates a micro switch which disengages the compressor and retracts the scoop. This is done to obtain maximum power and maximum rate of climb. The fan continues to operate and the air will remain cool for approximately one minute. When the throttle is retarded approximately 1/4 inch, the clutch will engage and the scoop will extend, again supplying cool, dry air.



# AIRPLANE FLIGHT MANUAL

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# AIRPLANE FLIGHT MANUAL

FOR

## CHEROKEE ARROW

APPLICABLE TO AIRPLANE S/N 28R-7235001 THRU 28R-7335446

### WARNING

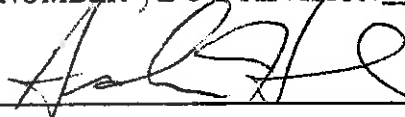

EXTREME CARE MUST BE EXERCISED TO LIMIT THE USE OF THIS REPORT TO APPLICABLE AIRCRAFT. THIS MANUAL REVISED AS INDICATED BELOW OR SUBSEQUENTLY REVISED IS VALID FOR USE WITH THE AIRPLANE IDENTIFIED BELOW WHEN APPROVED BY PIPER AIRCRAFT CORPORATION. SUBSEQUENT REVISIONS SUPPLIED BY PIPER AIRCRAFT CORPORATION MUST BE PROPERLY INSERTED.

MODEL PA-28R-200

AIRCRAFT SERIAL NO. \_\_\_\_\_ REGISTRATION NO. \_\_\_\_\_

AIRPLANE FLIGHT MANUAL, REPORT NUMBER YB-343 REVISION 12


PIPER AIRCRAFT CORPORATION  
APPROVAL SIGNATURE AND STAMP

### NOTE

THIS MANUAL MUST BE KEPT IN THE AIRPLANE AT ALL TIMES

FAA APPROVED BY:

  
GLENN C. STEPHEN  
PIPER AIRCRAFT CORPORATION  
D. O. A. No. SO-1  
VERO BEACH, FLORIDA

DATE OF APPROVAL: OCTOBER 14, 1971

APPROVAL BASIS: CAR 3 AND FAR PART 21, SUBPART J.

REPORT: VB-343 PA-28R-200

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## LOG OF REVISIONS

Revision	Revised Pages	Description and Revision	FAA Approved Date
1	3-15 3-16 3-17 3-18	Added Page 3-15 Added Page 3-16 Added Page 3-17 Added Page 3-18	Dec. 29, 1971 <i>[Signature]</i> G. C. Stephen
2	3-2	Revised Item E.	Jan. 21, 1972 <i>[Signature]</i> G. C. Stephen
3	3-3 3-4 3-5 3-15 3-19	Added Placards, Retyped Page Added Placards, Retyped Page Added Placards, Retyped Page Added Air Conditioner Installation Added Page 3-19	Feb. 10, 1972 <i>[Signature]</i> H. W. Barnhouse
4	3-19	Revise item 2. b. procedures and add serial number restrictions.	March 29, 1973 <i>[Signature]</i> H. W. Barnhouse
5	Title 3-11	Added serial number accountability. Revised B.-1. item (g) and B.-2. item (a).	August 30, 1973 <i>[Signature]</i> H. W. Barnhouse
6	Title	Added PAC Approval Form. (NOTE: AIRCRAFT DELIVERED WITH MANUALS PRIOR TO THIS REVISION DO NOT REQUIRE THIS REVISION.)	Oct. 18, 1974 <i>Ward Evans</i> Ward Evans
7	3-1	Added figure to Oil Pressure Red Line (Minimum) Limitation.	Dec. 5, 1975 <i>Ward Evans</i> Ward Evans
8	3-11	Revised item B.1.	April 10, 1979 <i>Ward Evans</i> Ward Evans

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LOG OF REVISIONS (cont)

Revision	Revised Pages	Description and Revision	FAA Approved Date
9	3-i 3-1	Revised Page No's. Revised Item B.	March 27, 1984 Ward Evans <i>Ward Evans</i>
10	3-11	Revised Item 2	<i>D.H. Trompler</i> D.H. Trompler Dec. 4, 1985
11	3-11	Revised Item 2	<i>D.H. Trompler</i> D.H. Trompler April 2, 1986
12	3-4 3-7, 3-8 3-11	Added placard note. Revised landing gear system operation. Revised emergency landing gear extention procedure.	<i>D.H. Trompler</i> D.H. Trompler May 14, 1987



**SECTION I**  
**LIMITATIONS**

The following limitations must be observed in the operation of this airplane:

**A. ENGINE**

Lycoming IO-360-C1C

**ENGINE LIMITS**

For all operations 2700 RPM, 200 HP

**B. FUEL (AVGAS ONLY)**

100/130 Octane Aviation Gasoline (Minimum)

**C. PROPELLER**

Hartzell HC-C2YK-1( )/7666A-2 or Hartzell HC-C2YK-1( )/F7666A-2

Pitch Settings at 30 in. Station:

High  $29.0^{\circ} \pm 2^{\circ}$ , Low  $14^{\circ} \pm 0.2^{\circ}$

Diameter: Maximum 74 inches

Minimum 72.5 inches

(Avoid continuous operation 2100 - 2350 RPM)

**D. INSTRUMENT MARKINGS (Power Plant)**

**OIL TEMPERATURE**

Green Arc (Normal Operating Range)

75°F to 245°F

Red Line (Maximum)

245°F

**OIL PRESSURE**

Green Arc (Normal Operating Range)

60 PSI to 90 PSI

Yellow Arc (Caution Range)

25 PSI to 60 PSI

Red Line (Minimum)

25 PSI if installed or 60 PSI if installed

Red Line (Maximum)

90 PSI

**FUEL PRESSURE**

Green Arc (Normal Operating Range)

14 PSI to 45 PSI

Red Line (Minimum)

14 PSI

Red Line (Maximum)

45 PSI

**TACHOMETER**

Green Arc (Normal Operating Range)

500 to 2100 and 2350 to 2700 RPM

Red Arc

2100 to 2350 RPM

Red Line (Maximum Continuous Power)

2700 RPM

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**E. AIRSPEED LIMITATIONS AND INSTRUMENT MARKINGS (Calibrated Airspeed)**

NEVER EXCEED SPEED	214 MPH
MAXIMUM STRUCTURAL CRUISE SPEED	170 MPH
MANEUVERING SPEED	131 MPH
FLAPS EXTENDED SPEED	125 MPH
MAXIMUM GEAR EXTENSION SPEED	150 MPH
MAXIMUM GEAR RETRACTION SPEED	125 MPH

**AIRSPEED INSTRUMENT MARKINGS**

Red Radial Line (Never Exceed)	214 MPH (186 KT)
Yellow Arc (Caution Range) (Smooth Air Only)	170 MPH to 214 MPH (148 KT to 186 KT)
Green Arc (Normal Operating Range)	71 MPH to 170 MPH (62 KT to 148 KT)
White Arc (Flap Down Range)	64 MPH to 125 MPH (56 KT to 109 KT)

**F. FLIGHT LOAD FACTORS**

Positive Load Factor (Maximum)	3.8 G
Negative Load Factor (Maximum)	No inverted maneuvers approved

**G. MAXIMUM WEIGHT**

2650 LBS

**H. BAGGAGE CAPACITY**

200 LBS

**I. C. G. RANGE**

Weight Pounds	Forward Limit Inches Aft of Datum	Rearward Limit Inches After of Datum
2650	87.3	93.0
2300	82.0	93.0
1800	80.0	93.0

**NOTES**

1. Straight line variation between points given.
2. The datum used is 78.4 inches ahead of the wing leading edge at the intersection of the straight and tapered section.
3. It is the responsibility of the airplane owner and the pilot to insure that the airplane is properly loaded. See "Weight and Balance Section" for proper loading instructions.

**J. MANEUVERS**

All acrobatic maneuvers including spins prohibited.

**K. PLACARDS**

In full view of the pilot:

“THIS AIRCRAFT APPROVED FOR NIGHT IFR NON—ICING FLIGHT WHEN EQUIPPED IN ACCORDANCE WITH FAR 91 OR FAR 135.”

“THIS AIRCRAFT MUST BE OPERATED AS A NORMAL CATEGORY AIRPLANE IN COMPLIANCE WITH THE OPERATING LIMITATIONS STATED IN THE FORM OF PLACARDS, MARKINGS AND MANUALS.”

In full view of the pilot, the following takeoff and landing check lists will be installed:

**TAKEOFF CHECK LIST**

Fuel on Proper Tank	Mixture - Set	Flaps - Set
Electric Fuel Pump - On	Propeller - Set	Trim Tab - Set
Engine Gauges - Checked	Fasten Belts/Harness	Controls - Free
Alternate Air - Closed		Door - Latched
Seat Backs Erect		Air Conditioner - Off

**LANDING CHECK LIST**

Fuel on Proper Tank	Electric Fuel Pump - On	Gear Down (150 MPH Max)
Seat Back Erect	Mixture - Rich	Flaps - Set (125 MPH)
Fasten Belts/Harness	Propeller - Set	Air Conditioner - Off

The “AIR CONDITIONER OFF” item in the above takeoff and landing check lists is mandatory for air conditioned aircraft only.

In full view of the pilot:

“NO ACROBATIC MANEUVERS INCLUDING SPINS APPROVED.”

On the instrument panel in full view of the pilot:

“MANEUVERING SPEED – 131 MPH.”

On the instrument panel in full view of the pilot:

“DEMONSTRATED CROSSWIND COMPONENT – 20 MPH.”

## ARROW

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Adjacent to upper door latch:

**"ENGAGE LATCH BEFORE FLIGHT"**

On the inside of the baggage compartment door:

**"BAGGAGE MAXIMUM 200 LBS. SEE WEIGHT AND  
BALANCE DATA FOR BAGGAGE LANDINGS BETWEEN  
150 LBS AND 200 LBS."**

Near emergency gear lever:

**"EMERGENCY DOWN"**

Near emergency gear lever (aircraft equipped with backup gear extender):

**"OVERRIDE ENGAGED AUTO-EXT-OFF  
LOCK PIN ON SIDE  
TO ENGAGE OVERRIDE:  
PULL LEVER FULL UP, PUSH LOCK PIN  
TO RELEASE OVERRIDE:  
PULL LEVER FULL UP & RELEASE"**

Near landing gear selector switch:

<b>"GEAR UP</b>	<b>125 MPH MAX"</b>
<b>"DOWN</b>	<b>150 MPH MAX"</b>

In full view of the pilot when AutoFlite is installed:

**"FOR HEADING CHANGES: PRESS DISENGAGE SWITCH  
ON CONTROL WHEEL. CHANGE HEADING, RELEASE  
DISENGAGE SWITCH."**

On the instrument panel in full view of the pilot when the oil cooler winterization kit is installed:

**"OIL COOLER WINTERIZATION PLATE TO BE  
REMOVED WHEN AMBIENT TEMPERATURE EXCEEDS  
50° F."**

On the instrument panel in full view of the pilot when the supplementary white strobe lights are installed:

**"WARNING - TURN OFF STROBE LIGHTS WHEN  
TAXIING IN VICINITY OF OTHER AIRCRAFT, OR  
DURING FLIGHT THROUGH CLOUD, FOG OR HAZE."**

In full view of the pilot in the area of the air conditioner controls when the air conditioner is installed:

**“WARNING - AIR CONDITIONER MUST BE OFF TO INSURE  
NORMAL TAKEOFF CLIMB PERFORMANCE.”**

**ARROW**

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**SECTION II**  
**PROCEDURES**

**A. SYSTEM OPERATIONS**

1. The stall-warning system is inoperative with the master switch off.
2. The electric fuel pump must be on for both landing and takeoff.
3. Some aircraft are equipped with an airspeed - power sensing system (back-up gear extender) which extends the landing gear under low airspeed - power conditions\* even though the pilot may not have selected gear down. This system will also prevent retraction of the landing gear by normal means when the airspeed - power values are below a predetermined minimum. (See Item 5, Procedures Section.) To override this system or to hold the emergency gear lever in the override up position without maintaining manual pressure on the emergency gear lever, pull the lever full up and push the latch pin in. To release the override, pull lever up to disengage latch pin, then release lever. For normal operation, the pilot should extend and retract the gear with the gear selector switch located on the instrument panel, just as he would if the back-up gear extender system were not installed.

\*Approximately 105 mph IAS at any altitude, power off.

4. Landing gear position indication and warning lights:
  - (a) The red gear warning light on the instrument panel and the horn operate simultaneously when:
    - (1) In flight, when the throttle is reduced to where the manifold pressure is approximately 14 inches of mercury or below, and the gear selector switch is not in the down position.
    - (2) On aircraft equipped with the backup gear extender, when the system has lowered the landing gear and the gear selector switch is not in the down position and the throttle is not full open.
    - (3) On the ground, when the master switch is on and the gear selector switch is in the up position.

**NOTE**

On aircraft which are not equipped with the backup gear extender an additional switch is installed which activates the warning horn and light whenever the flaps are extended beyond the approach position (10°) and the landing gear are not down and locked.

- (b) The three green lights on the instrument panel operate individually as each associated gear is locked in the extended position.
- (c) The yellow "In Transit" light on the instrument panel operates whenever any of the three gears is not in either the fully retracted position or the fully extended and locked position.
- (d) On aircraft equipped with the backup gear extender the yellow "Auto Ext. Off" light immediately below the gear selector switch flashes whenever the emergency gear lever is in the full up position.

## ARROW

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### 5. Takeoff considerations:

After takeoff on aircraft equipped with the backup gear extender, if the gear selector switch is placed in the gear up position before reaching the airspeed at which the system no longer commands gear down,\* the gear will not retract. For obstacle clearance on takeoff and for takeoffs from high altitude airports, the landing gear can be retracted at the pilot's discretion by placing the gear selector switch in the up position and then latching the emergency gear lever in the override up position. If desired, the override up position can be selected and latched before takeoff, and the gear will then retract as soon as the gear selector switch is placed in the up position. In this case care should be taken not to retract the gear prematurely, or the aircraft could settle back onto the runway. If the override lock is used for takeoff, it should be disengaged as soon as sufficient airspeed and terrain clearance are obtained, to return the gear system to normal operation. For normal operation, the pilot should extend and retract the gear with the gear selector switch located on the instrument panel, as if the backup gear extender system were not installed.

\*Approximately 85 mph IAS at sea level to approximately 100 mph IAS at 10,000 ft, with a straight line variation between.



**ARROW**

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**FAA APPROVED October 14, 1971**

**REPORT: VB-343 PAGE 3-9  
MODEL: PA-28R-200**

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**B. EMERGENCY PROCEDURES****1. Emergency landing gear extension instructions:**

Accomplish the following checks prior to initiation of the emergency extension procedures.

- (a) Master Switch - Check on
- (b) Circuit Breakers - Check
- (c) Panel Lights - Off (in daytime)
- (d) Gear Indicator Bulbs - Check

When the Emergency Landing Gear Extension Procedure is performed for training purposes, the following changes must be made to the procedure in order to prevent the hydraulic pump from activating during the procedure. On aircraft equipped with the backup gear extender the landing gear selector must be left in the UP position until all gear position indicators are green. On aircraft which do NOT have the backup gear extender a pull type LANDING GEAR PUMP circuit breaker is installed and must be pulled prior to executing the emergency extension procedure. The circuit breaker must be reset after the completion of the procedure to allow normal gear system operation.

If landing gear does not check down and locked:

- (e) Reduce airspeed below 100 mph.
- (f) Move landing gear selector switch to gear down position.
- (g) If gear has failed to lock down on aircraft equipped with the backup gear extender, raise emergency gear lever to "Override Engaged" position.
- (h) If gear has still failed to lock down, move emergency gear lever to "Emergency Down" position.
- (i) If gear has still failed to lock down, yaw the airplane abruptly from side to side with the rudder.

If the nose gear will not lock down using the above procedure, slow the aircraft to the lowest safe speed attainable using the lowest power setting required for safe operation and accomplish the following:

- (j) On aircraft equipped with the backup gear extender raise emergency gear lever to "Override Engaged" position.
- (k) Move landing gear selector switch to gear down position.

If landing gear does not check down, recycle gear through up position, and repeat (k).

**2. Gear up emergency landing:**

- (a) On aircraft equipped with the backup gear extender lock emergency gear lever in "Override Engaged" position before airspeed drops to 115 mph to prevent landing gear from inadvertently free falling.
- (b) Flaps as desired.
- (c) Close throttle and shut off the master and ignition switches.
- (d) Turn the fuel selector valve to off.
- (e) Mixture - Idle cut off.
- (f) Tighten seat belt (and shoulder harness, if available).
- (g) Contact surface at minimum possible airspeed.

**NOTE**

With the master switch off, the landing gear cannot be retracted.

**ARROW**

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**SECTION III****PERFORMANCE****A. STALLS**

The following performance figures were obtained during FAA type tests and may be realized under conditions indicated with the airplane and engine in good condition and with average piloting technique. All performance is given for 2650 pounds.

Loss of altitude during stalls varied from 100 to 300 feet, depending on configuration and power.

Stalling speeds, in mph, power off, versus angle of bank (Calibrated airspeed):

Angle of bank	0°	20°	40°	50°	60°
Flaps up (gear down)	71	73	81	88	100
Flaps down (gear down)	64	66	73	80	90

**ARROW**

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SECTION IV  
SUPPLEMENTS

NOTE

A FLIGHT MANUAL SUPPLEMENT IS REQUIRED TO BE IN THE AIRPLANE FLIGHT MANUAL ONLY IF THE EQUIPMENT WHICH IS THE SUBJECT OF THE SUPPLEMENT IS INSTALLED.

- A. Electric Pitch Trim Installation
- B. AutoControl III Installation
- C. AutoFlite II Installation
- D. Air Conditioner Installation

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**A. ELECTRIC PITCH TRIM INSTALLATION****1. LIMITATIONS**

There are no limitations for this installation.

**2. PROCEDURES****a. Preflight**

- (1) Circuit breaker - Set
- (2) Operate rocker switch - Trim fore and aft
- (3) Manually override electric trim
- (4) Check manual trim operation
- (5) If trim fails preflight, disengage electric trim by operating push button trim switch on instrument panel until repaired. If trim does not disengage have unit repaired before further flight.

**(b) Inflight**

- (1) Activate rocker fore-aft trim.

**3. EMERGENCY OPERATION**

- (a) In case of malfunction, disengage electric pitch trim by pushing pitch trim switch on instrument panel to off position.
- (b) In an emergency, electric pitch trim may be overpowered using manual pitch trim.
- (c) In cruise configuration, a malfunction can result in a 10° pitch change and 200 ft. altitude variation.
- (d) In approach configuration, a malfunction can result in a 5° pitch change and 50 ft. altitude loss.

## ARROW

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### B. AUTOCONTROL III INSTALLATION

#### 1. LIMITATIONS

- (a) Autopilot use is prohibited above 200 MPH-CAS
- (b) Autopilot "OFF" for takeoff and landing

#### 2. PROCEDURES

##### a. Normal Operation

Refer to the current AutoControl III Owner's Handbook.

##### b. Emergency Operation

- (1) In an emergency, the AutoControl III can be disconnected by
  - (a) Pushing the roll "ON-OFF" switch to "OFF".
  - (b) Turning aircraft Master Switch "OFF."
- (2) The AutoControl III can be overpowered at either control wheel.
- (3) An autopilot runaway, with a 3 second delay in the initiation of recovery, while operating in a climb, cruise or descending flight could result in a 50° bank and a 190 foot altitude loss.
- (4) An autopilot runaway, with a 1 second delay in the initiation of recovery, during an approach operation, coupled or uncoupled, could result in a 15° bank and a 40 foot altitude loss.

#### 3. PERFORMANCE

The airplane performance remains unchanged.

**C. AUTOFLITE II INSTALLATION**

**1. LIMITATIONS**

- (a) Autopilot use is prohibited above 200 MPH-CAS
- (b) Autopilot "OFF" for takeoff and landing

**2. PROCEDURES**

**a. Normal Operation**

Refer to the current AutoFlite II Owner's Handbook

**b. Emergency Operation**

- (1) In an emergency, the AutoFlite II can be disconnected by
  - (a) Pressing disconnect switch on pilot's control wheel.
  - (b) Rocker switch on instrument panel - OFF.
- (2) Unit may be overpowered manually at either control wheel.
- (3) An autopilot runaway, with a 3 second delay in the initiation of recovery, while operating in a climb, cruise or descending flight could result in a 50° bank and a 190 foot altitude loss.
- (4) An autopilot runaway, with a 1 second delay in the initiation of recovery, during an approach operation, coupled or uncoupled, could result in a 15° bank and a 40 foot altitude loss.

**2. PERFORMANCE**

The airplane performance remains unchanged.

**D. AIR CONDITIONER INSTALLATION**

**1. LIMITATIONS**

Air Conditioner "OFF" for takeoff and landing

**2. PROCEDURES**

Prior to takeoff, the air conditioner should be checked for proper operation as follows:

(a) Check aircraft master switch on

(b) (For aircraft serial numbers 7235001 through 7335057.)  
Turn the air conditioner control switch to "AIR COND" - the "AIR COND DOOR OPEN" warning light will turn on, thereby indicating proper air conditioner condenser door actuation.

(For aircraft serial numbers 7335058 and up.)

Turn the air conditioner control switch to "ON" and the fan switch to one of the operating positions - the "AIR COND DOOR OPEN" warning light will turn on, thereby indicating proper air conditioner condenser door actuation.

(c) Turn the air conditioner control switch to OFF - the "AIR COND DOOR OPEN" warning light will go out, thereby indicating the air conditioner condenser door is in the up position.

(d) If the "AIR COND DOOR OPEN" light does not respond as specified above, an air conditioner system or indicator bulb malfunction is indicated and further investigation should be conducted prior to flight.

The above operational check may be performed during flight if an inflight failure is suspected.

**3. PERFORMANCE**

(a) When the full throttle position is not used or in the event of a malfunction which causes the compressor to operate and the condenser door to remain extended, a decrease in rate of climb of as much as 100 fpm can be expected at all altitudes.

(b) Warning - The air conditioner must be off to insure normal takeoff performance.

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## EMERGENCY PROCEDURE

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## EMERGENCY PROCEDURES

### INTRODUCTION

This section contains procedures that are recommended if an emergency condition should occur during ground operation, take-off, or in-flight. These procedures are suggested as the best course of action for coping with the particular condition described, but are not a substitute for sound judgment and common sense. Since emergencies rarely happen in modern aircraft, their occurrence is usually unexpected, and the best corrective action may not always be obvious. Pilots should familiarize themselves with the procedures given in this section and be prepared to take appropriate action should an emergency arise.

Most basic emergency procedures, such as power off landings, are a part of normal pilot training. Although these emergencies are discussed here, this information is not intended to replace such training, but only to provide a source of reference and review, and to provide information on procedures which are not the same for all aircraft. It is suggested that the pilot review standard emergency procedures periodically to remain proficient in them.

In the procedures that follow, critical actions with respect to time are indicated by use of bold print; these actions should be performed immediately if the emergency condition is not to be aggravated. The remaining procedures are non-critical in the sense that time is usually available for consulting the check list.

### ENGINE FIRE DURING START

Refer to FIRE emergency procedures.

## ARROW II

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### ENGINE POWER LOSS DURING TAKE-OFF

The proper action to be taken if loss of power occurs during take-off will depend on circumstances.

1. If sufficient runway remains for a normal landing, leave the gear down and land straight ahead.
2. If the area ahead is rough, or if it is necessary to clear obstructions, put gear selector switch in the UP position, and on aircraft equipped with the backup gear extender latch the gear lever in the override position.
3. If you have gained sufficient altitude to attempt a restart, proceed as follows:
  - (a) MAINTAIN SAFE AIRSPEED
  - (b) FUEL SELECTOR - SWITCH TO ANOTHER TANK CONTAINING FUEL
  - (c) ELECTRIC FUEL PUMP - CHECK ON
  - (d) MIXTURE - CHECK RICH
  - (e) ALTERNATE AIR - ON
  - (f) EMERGENCY GEAR LEVER - AS REQUIRED

#### NOTE

On aircraft equipped with the backup gear extender the landing gear will extend automatically when engine power fails at speeds below approximately 105 MPH IAS. Glide distance with the gear extended is roughly halved; if conditions dictate, the gear can be retained in the retracted position by latching the lever in the override up position.

#### NOTE

If engine failure was caused by fuel exhaustion, power will not be regained after tanks are switched until empty fuel lines are filled, which may require up to ten seconds.

If power is not regained, proceed with the POWER OFF LANDING procedure.



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## ENGINE POWER LOSS IN FLIGHT

Complete engine power loss is usually caused by fuel flow interruption, and power will be restored shortly after fuel flow is restored. If power loss occurs at low altitude, the first step is to prepare for an emergency landing (See POWER OFF LANDING). Maintain an airspeed of at least 105 MPH IAS, gear and flaps up and if altitude permits proceed as follows:

1. Fuel Selector - Switch to another tank containing fuel.
2. Electric Fuel Pump - On
3. Mixture - Rich
4. Alternate Air - On
5. Engine Gauges - Check for indication of the cause of power loss.
6. If no fuel pressure is indicated, check tank selector position to be sure it is on a tank containing fuel.

When power is restored:

7. Alternate Air - Off
8. Electric Fuel Pump - Off

If the above steps do not restore power, prepare for an emergency landing. If time permits:

1. Ignition switch - "L" then "R" then back to "BOTH."
2. Throttle and Mixture - Different settings. (This may restore power if problem is too rich or too lean a mixture, or partial fuel system restriction.)
3. Try another fuel tank. (Water in the fuel could take some time to be used up, and allowing the engine to windmill may restore power. If power loss is due to water, fuel pressure indications will be normal).

### NOTE

If engine failure was caused by fuel exhaustion, power will not be restored after tanks are switched until empty fuel lines are filled, which may require up to ten seconds.

If power is not restored, proceed with POWER OFF LANDING procedures.

## POWER OFF LANDING

If loss of power occurs at altitude in aircraft equipped with the backup gear extender, lock Emergency Gear Lever in "Override Engaged" position before airspeed drops to 115 MPH IAS to prevent landing gear from inadvertently free falling. Then trim the aircraft for best gliding angle (105 MPH IAS) (Air Cond. off) and look for a suitable field. (See Note) If measures taken to restore power are not effective, and if time permits, check your charts for airports in the immediate vicinity; it may be possible to land at one if you have sufficient altitude. At best gliding angle, with the engine windmilling, and the propeller control in full "decrease RPM," the aircraft will travel approximately 1.6 miles for each thousand feet of altitude. If possible, notify the FAA by radio of your difficulty and intentions. If another pilot or passenger is aboard, let him help.

## ARROW II

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When you have located a suitable field, establish a spiral pattern around this field. Try to be at 1000 feet above the field at the downwind position, to make a normal landing approach. When the field can easily be reached, slow to 90 MPH IAS for the shortest landing.

### CAUTION

This will increase your rate of descent, so be sure you have adequate altitude. Excess altitude may be lost by widening your pattern, using flaps or slipping, or a combination of these.

Whether to attempt a landing with gear up or down depends on many factors. If the field chosen is obviously smooth and firm, and long enough to bring the plane to a stop, the gear should be down. If there are stumps or rocks or other large obstacles in the field, the gear in the down position will better protect the occupants of the aircraft. If, however, the field is suspected to be excessively soft or short, or when landing in water of any depth, a wheels-up landing will normally be safer and do less damage to the airplane.

Touchdown should normally be made at the lowest possible airspeed.

### GEAR DOWN LANDING

For a gear down landing, proceed as follows when committed to landing:

1. Gear down.
2. Close throttle and shut off the master and ignition switches.
3. Flaps as desired.
4. Turn the fuel selector valve to off.
5. Mixture - Idle cut-off.
6. Tighten seat belt (and shoulder harness, if available).
7. Touchdown at lowest possible airspeed.

### GEAR UP LANDING

#### — NOTE —

On aircraft equipped with the automatic gear extender the mechanism will extend the gear below approximately 105 MPH IAS with power off. Be prepared to latch the emergency override lever UP before airspeed drops to 115 mph to prevent landing gear from inadvertently free falling, unless gear extension is desired.

#### NOTE

With the master switch off, the landing gear cannot be retracted.

In the event a gear up landing is required, proceed as follows when committed to landing:

1. On aircraft equipped with the backup gear extender: Lock emergency gear lever in "Override Engaged" position.
2. Flaps as desired.
3. Close throttle and shut off the master and ignition switches.
4. Turn the fuel selector valve to off.
5. Mixture - Idle cut-off.
6. Tighten seat belt (and shoulder harness, if available).
7. Contact surface at minimum possible airspeed.

#### NOTE

With the master switch off, the landing gear cannot be retracted.

#### PROPELLER OVERSPEED

Propeller overspeed is caused by a malfunction in the propeller governor, or low oil pressure, which allows the propeller blades to rotate to full low pitch. If this should occur, proceed as follows:

1. THROTTLE - RETARD
2. OIL PRESSURE - CHECK
3. PROPELLER CONTROL - FULL DECREASE RPM, THEN SET IF ANY CONTROL AVAILABLE
4. REDUCE AIRSPEED
5. THROTTLE - AS REQUIRED TO REMAIN BELOW 2700 RPM

#### EMERGENCY LANDING GEAR EXTENSION

Accomplish the following checks prior to initiation of the emergency extension procedure:

1. Master Switch - Check On
2. Circuit Breakers - Check
3. Panel Lights - Off (in daytime)
4. Gear Indicator Bulbs - Check

If landing gear does not check down and locked:

5. Reduce airspeed below 100 mph
6. Move landing gear selector switch to gear down position
7. If gear has failed to lock down on aircraft equipped with the backup gear extender, raise emergency gear lever to "Override Engaged" position
8. If gear has still failed to lock down, move emergency gear lever to "Emergency Down" position
9. If gear has still failed to lock down, yaw the airplane abruptly from side to side with the rudder.

#### NOTE

If all electrical power has been lost, the landing gear must be extended using the above emergency procedures. The landing gear position indicator lights will not be operative.

## ARROW II

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### NOTE

Refer to page 3-11 for differences when emergency extension procedure is performed for training purposes.

### SPINS

Intentional spins are prohibited in this aircraft. If a spin is inadvertently entered, immediately use the following recovery procedures:

1. THROTTLE - IDLE
2. RUDDER - FULL OPPOSITE TO DIRECTION OF ROTATION
3. CONTROL WHEEL - FULL FORWARD
4. RUDDER - NEUTRAL (WHEN ROTATION STOPS)
5. CONTROL WHEEL - AS REQUIRED TO SMOOTHLY REGAIN LEVEL FLIGHT ATTITUDE

### NOTE

On aircraft equipped with the backup gear extender the landing gear will extend in this flight condition, but will retract during recovery, and has no adverse affect on the spin characteristics.

### OPEN DOOR

The cabin door on the Cherokee Arrow II is latched at four points so the chances of its opening in flight are remote. However, should you forget to completely close or latch the door, it may open partially. This will usually happen soon after take-off. An open door will not affect the normal flight characteristics, and a normal landing can be made with it open. If the door opens it will trail in a slightly open position, and the airspeed will be reduced slightly.

To close the door in flight, proceed as follows:

1. Slow aircraft to 100 MPH IAS.
2. Cabin Vents - Close
3. Storm Window - Open
4. If upper latch is open - latch. If lower latch is open - open top latch, push door further open, and then close rapidly. Latch top latch.

A slip in the direction of the open door will assist in latching procedure.

## FIRE

The presence of fire is noted through smoke, smell, and heat in the cabin. It is essential that the source of the fire be promptly identified through instrument readings, character of the smoke, or other indications, since the action to be taken differs somewhat in each case.

1. Source of Fire - Check
  - a. Electrical Fire (Smoke in Cabin):
    - (1) Master Switch - Off
    - (2) Vents - Open
    - (3) Cabin Heat - Off
    - (4) Land as soon as practicable.
  - b. Engine Fire:
    - (1) In case of engine fire in flight
      - (a) Fuel Selector - OFF
      - (b) Throttle - CLOSE
      - (c) Mixture - IDLE CUT OFF
      - (d) Heater - Off (In all cases of fire)
      - (e) Defroster - OFF (In all cases of fire)
      - (f) If terrain permits - Land Immediately

The possibility of an engine fire in flight is extremely remote. The procedure given above is general and pilot judgement should be the deciding factor for action in such an emergency.

- (2) In case of engine fire on the ground
  - (a) If engine has not started
    1. Mixture - IDLE CUT OFF
    2. Throttle - OPEN
    3. Turn engine with starter (This is an attempt to pull the fire into the engine.)
  - (b) If engine has already started and is running, continue operating to try pulling the fire into the engine.
  - (c) In either case stated in (a) and (b), if the fire continues longer than a few seconds, the fire should be extinguished by the best available external means.
  - (d) If external fire extinguishing is to be applied
    1. Fuel Selector Valves - OFF
    2. Mixture - IDLE CUT OFF

## LOSS OF OIL PRESSURE

Loss of oil pressure may be either partial or complete. A partial loss of oil pressure usually indicates a malfunction in the oil pressure regulating system, and a landing should be made as soon as possible to investigate the cause and prevent engine damage.

A complete loss of oil pressure indication may signify oil exhaustion or may be the result of a faulty gauge. In either case, proceed toward the nearest airport, and be prepared for a forced landing. If the problem is not a pressure gauge malfunction, the engine may stop suddenly. Maintain altitude until such time as a dead stick landing can be accomplished. Don't

## ARROW II

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change power settings unnecessarily, as this may hasten complete power loss.

Depending on the circumstances, it may be advisable to make an off airport landing while power is still available, particularly if other indications of actual oil pressure loss, such as sudden increase in temperatures, or oil smoke, are apparent, and an airport is not close.

If engine stoppage occurs, proceed to POWER OFF LANDING.

### LOSS OF FUEL PRESSURE

1. Electric Boost Pump - On.
2. Mixture Control Forward.
3. Fuel Selector - Check on full tank.

If problem is not an empty fuel tank, land as soon as practicable and have the fuel system checked.

### HIGH OIL TEMPERATURE

An abnormally high oil temperature indication may be caused by a low oil level, an obstruction in the oil cooler, damaged or improper baffle seals, a defective gauge, or other causes. Land as soon as practicable at an appropriate airport, and have the cause investigated.

A steady, rapid rise in oil temperature is a sign of trouble. Land at the nearest airport and let a mechanic investigate the problem. Watch the oil pressure gauge for an accompanying loss of pressure.

### ALTERNATOR FAILURE

Loss of alternator output is detected through a zero reading on the ammeter. Before executing the following procedure, insure that the reading is zero and not merely low by actuating an electrically powered device, such as the landing light. If no increase in the ammeter reading is noted, alternator failure can be assumed.

1. Reduce electrical load.
2. Alternator Circuit Breakers - Check.
3. "Alt" Switch - Off (for 1 second), then On.

If the ammeter continues to indicate no output, or alternator will not stay reset, turn off "Alt" switch, maintain minimum electrical load, and land as soon as practical. All electrical power is being supplied by the battery.

### NOTE

If the battery is fully discharged, the gear will have to be lowered using the "EMERGENCY LANDING GEAR EXTENSION" procedure, and the position lights will of course not be operating.

# WEIGHT AND BALANCE

FOR

# CHEROKEE ARROW

APPLICABLE TO AIRPLANE SERIAL NUMBERS 28R-7235001 THRU 28R-7335446.

## WARNING

EXTREME CARE MUST BE EXERCISED TO LIMIT THE USE OF THIS REPORT TO APPLICABLE AIRCRAFT. THIS REPORT REVISED AS INDICATED BELOW OR SUBSEQUENTLY REVISED IS VALID FOR USE WITH THE AIRPLANE IDENTIFIED BELOW WHEN APPROVED BY PIPER AIRCRAFT CORPORATION. SUBSEQUENT REVISIONS SUPPLIED BY PIPER AIRCRAFT CORPORATION MUST BE PROPERLY INSERTED.

MODEL PA-28R-200

AIRCRAFT SERIAL NO. \_\_\_\_\_ REGISTRATION NO. \_\_\_\_\_

WEIGHT AND BALANCE, REPORT NUMBER VB-334 REVISION \_\_\_\_\_

PIPER AIRCRAFT CORPORATION  
APPROVAL SIGNATURE AND STAMP \_\_\_\_\_

ISSUED: August 2, 1972  
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MODEL: PA-28R-200





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## LOG OF REVISIONS

Revision	Revised Pages	Description and Revision	Approved Date
1	5-23 5-26 5-27 5-29	Add: AutoControl III Omni Coupler AutoFlite II Add: Genave Alpha 360 Genave Theta 100 King KR-85 Add: IFD Skyline 300 Transponder Piper Automatic Locator For Turn & Bank, Cert. Basis was TSO C2A Type II	Dec. 29, 1971    <i>N. Tennant</i>
2	5-31	Add: Air Conditioner	Feb. 10, 1972 <i>N. Tennant</i>
3	5-15 5-22 5-26 5-29	Add: Airspeed Indicator PS 50049-5 Heated Pitot 67477-0 was 96392-0 Add: KX-175 (2 places) & changed Moment on Loop Antenna Add: Tru-Speed Indicator	June 15, 1972    <i>N. Tennant</i>
	5-15 5-29	Correct Instrument Specification Numbers. Change from Turn and Bank - Piper 99005 to Turn and Slip Indicator - Piper PS50030-2 or -3; Delete Turn Coordinators.	July 10, 1972  <i>N. Tennant</i>
5	Title 5-27 5-28	Add: Page Add: King KT76/78 Transponder Add: King KMA-20 Audio Panel	Aug. 2, 1972  <i>N. Tennant</i>
6	5-25 5-27 5-29	Correct: Comm Antenna Cable Arms and Moments, Add Anti Static Kit. Remove: Duplicate entry of Piper Automatic Locator. Correct: Vacuum Regulator Vendor's name.	Nov. 14, 1972   <i>N. Tennant</i>
7	5-26 5-28	Changed from Narco Comm 10 and Comm 11 to Narco Comm 10A and Comm 11A. Add: King KX-175, KN-73, KN-77 and KNI-520 Installations.	Jan. 15, 1973  <i>N. Tennant</i>

## LOG OF REVISIONS (cont)

Revision	Revised Pages	Description and Revision	Approved Date
8	Title	Added PAC Approval Form. (NOTE: AIRCRAFT DELIVERED WITH MANUALS PRIOR TO THIS REVISION DO NOT REQUIRE THIS REVISION.)	<i>DM</i> Oct. 18, 1974
9	Title 5-29	Added Applicable Ser. Nos. Revised Item, Weight, and Moment of Vacuum Regulator.	Dec. 5, 1975 <i>James H. Haggerty</i>
10	5-1 5-3 5-4	Revised Weight and Balance info. Added Caution; relocated para. 2.b. to pg. 5-4. Added para. 2.b. from page 5-3.	April 10, 1979 <i>James H. Haggerty</i>
11	5-i 5-1 5-3  5-7 5-11 5-25 5-27	Revised Index. Revised Weight and Balance info. Revised Weight and Balance Data — Weighing Procedure. Revised Airplane Empty Weight info. Revised Equipment List info. Revised Moment. Revised Weight and Moment.	March 27, 1984 <i>Word Trans.</i>

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## WEIGHT AND BALANCE

In order to achieve the performance and flying characteristics which are designed into the aircraft, the Arrow must be flown with the weight and center of gravity (C.G.) position within the approved envelope. Although, the aircraft offers flexibility of loading, it cannot be flown with four adults, full fuel tanks and maximum baggage. With the flexibility comes responsibility. The pilot must insure that the airplane is loaded within the loading envelope before he makes a takeoff.

Misloading carries consequences for any aircraft. An overloaded airplane will not take off, climb or cruise as well as when it is properly loaded. The heavier the airplane is loaded the less climb performance it will have.

Center of gravity is a determining factor in flight characteristics. If the C.G. is too far forward in any airplane, it may be difficult to rotate for take-off or landing. If the C.G. is too far aft, the airplane may rotate prematurely on take-off or try to pitch up during climb. Longitudinal stability will be reduced. This can lead to inadvertent stalls and even spins; and spin recovery becomes more difficult as the center of gravity moves aft of the approved limit.

A properly loaded aircraft, however, will perform as intended. Before the aircraft is delivered, the Arrow is weighed and a licensed empty weight and C.G. location computed. (Licensed empty weight consists of the empty weight of the aircraft plus the unusable fuel and full oil capacity.) Using the licensed empty weight and C.G. location, the pilot can easily determine the weight and C.G. position for the loaded airplane by computing the total weight and moment and then determining whether they are within the approved envelope.

The licensed empty weight and C.G. location for a particular airplane are recorded in the weight and balance section of the Airplane Flight Manual. The current values should always be used. Whenever new equipment is added or any modification work is done, the mechanic responsible for the work is required to compute a new licensed empty weight and C.G. position and to write these in the aircraft log book. The owner should make sure that it is done.

A weight and balance calculation is necessary in determining how much fuel or baggage can be boarded so as to keep the C.G. position within allowable limits. Check calculations prior to adding fuel to insure against improper loading.

The following pages are forms used in weighing an airplane in production and in computing licensed empty weight, C.G. position, and useful load. Note that the useful load includes fuel, oil, baggage, cargo and passengers. Following this is the method for computing takeoff weight and C.G.

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**WEIGHT AND BALANCE DATA****WEIGHING PROCEDURE**

At the time of licensing, Piper Aircraft Corporation provides each airplane with the licensed empty weight and center of gravity location. This data is on Page 5-7 of this Flight Manual.

The removal or addition of an excessive amount of equipment or excessive airplane modifications can affect the licensed empty weight and center of gravity. The following is a weighing procedure to determine this licensed empty weight and center of gravity location:

**1. PREPARATION**

- a. Be certain that all items checked in the airplane equipment list are installed in the proper location in the airplane.
- b. Remove excessive dirt, grease, moisture, foreign items such as rags and tools from the airplane before weighing.
- c. Defuel airplane. Then open all fuel drains until all remaining fuel is drained. Operate engine on each tank until all undrainable fuel is used and engine stops.

**CAUTION**

Whenever the fuel system is completely drained and fuel is replenished it will be necessary to run the engine for a minimum of 3 minutes at 1000 RPM on each tank to insure no air exists in the fuel supply lines.

- d. Drain all oil from the engine, by means of the oil drain, with the airplane in ground attitude. This will leave the undrainable oil still in the system. Engine oil temperature should be in the normal operating range before draining.
- e. Place pilot and copilot seats in fourth (4th) notch, aft of forward position. Put flaps in the fully retracted position and all control surfaces in the neutral position. Tow bar should be in the proper location and all entrance and baggage doors closed.
- f. Weigh the airplane inside a closed building to prevent errors in scale readings due to wind.

**2. LEVELING**

- a. With airplane on scales, block main gear oleo pistons in the fully extended position.

**ARROW**

- b. Level airplane (see diagram) deflating nose wheel tire, to center bubble on level.

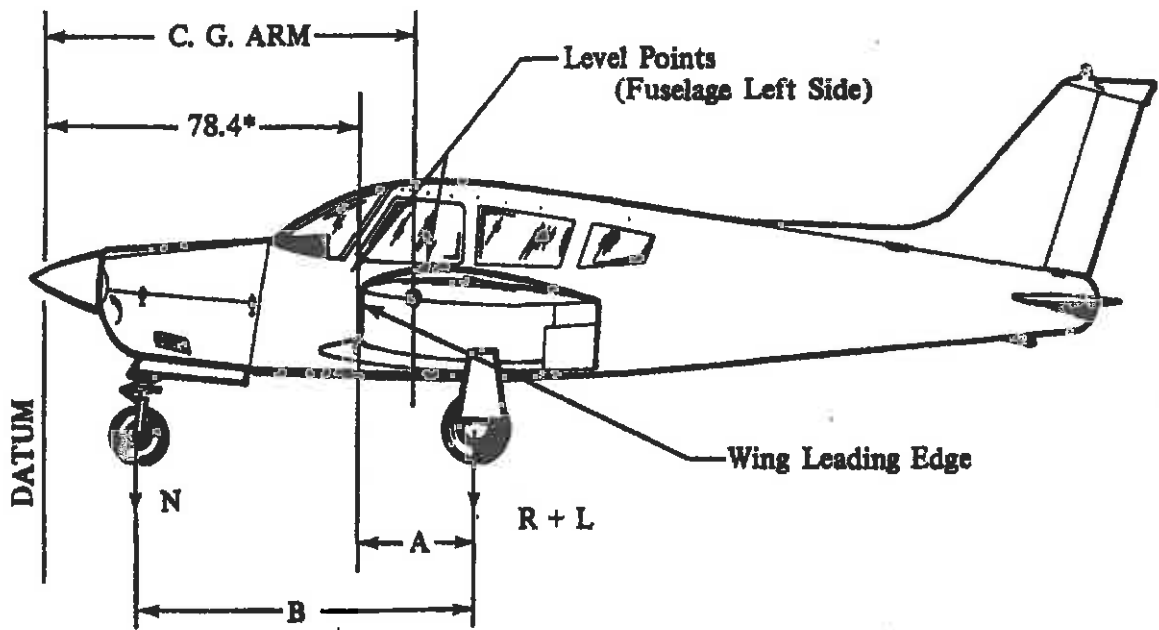
**3. WEIGHING - AIRPLANE EMPTY WEIGHT**

- a. With the airplane level and brakes released, record the weight shown on each scale. Deduct the tare, if any, from each reading.

Scale Position and Symbol	Scale Reading	Tare	Weight
Nose Wheel (N)			
Right Main Wheel (R)			
Left Main Wheel (L)			
Airplane Empty Weight, as Weighed (T)			

**4. EMPTY WEIGHT CENTER OF GRAVITY**

- a. The following geometry applies to the PA-28R-200 airplane when airplane is level (See Item 2).



A =

B =

\* The datum is 78.4 inches ahead of the wing leading edge at the intersection of the straight and tapered section.

- b. Obtain measurement "A" by measuring from a plumb bob dropped from the wing leading edge, at the intersection of the straight and tapered section, horizontally and parallel to the airplane centerline, to the main wheel centerline.
- c. Obtain measurement "B" by measuring the distance from the main wheel centerline, horizontally and parallel to the airplane centerline, to each side of the nose wheel axle. Then average the measurements.
- d. The empty weight center of gravity (as weighed including optional equipment and undrainable oil) can be determined by the following formula:

$$\text{C.G. Arm} = 78.4 + A - \frac{B(N)}{T}$$

$$\text{C. G. Arm} = 78.4 + ( \quad ) - \frac{( \quad )( \quad )}{( \quad )} = \quad \text{inches}$$

#### 5. LICENSED EMPTY WEIGHT AND EMPTY WEIGHT CENTER OF GRAVITY

	Weight	Arm	Moment
Empty Weight (as weighed)			
Unusable Fuel (13 1/3 Pints)	+10.0	103.0	+1030
Licensed Empty Weight			

**ARROW**

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**WEIGHT AND BALANCE DATA**  
**MODEL PA-28R-200 CHEROKEE**

Airplane Serial Number

Registration Number

Date

**AIRPLANE EMPTY WEIGHT**

Item	Weight (Lbs)	x	C. G. Arm (Inches Aft of Datum)	=	Moment (In-Lbs)
Standard Empty Weights*	Actual Computed				
Optional Equipment					
Unusable Fuel (13 1/3 Pints)	10.0		103.0		1030
Licensed Empty Weight = Total of above items					
*Standard Empty Weight includes paint, hydraulic fluid and undrainable engine oil.					

**AIRPLANE USEFUL LOAD - NORMAL CATEGORY OPERATION**

(Gross Weight) - (Licensed Empty Weight) = Useful Load

(2650 lbs) - (        lbs) =        lbs

THIS LICENSED EMPTY WEIGHT, C.G. AND USEFUL LOAD ARE FOR THE AIRPLANE AS LICENSED AT THE FACTORY. REFER TO APPROPRIATE AIRCRAFT RECORD WHEN ALTERATIONS HAVE BEEN MADE.

### C. G. RANGE AND WEIGHT INSTRUCTIONS

1. Add the weight of all items to be loaded to the licensed empty weight.
2. Use the loading graph to determine the moment of all items to be carried in the airplane.
3. Add the moment of all items to be loaded to the licensed empty weight moment.
4. Divide the total moment by the total weight to determine the C.G. location.
5. By using the figures of Item 1 and Item 4, locate a point on the C.G. range and weight graph. If the point falls within the C.G. envelope, the loading meets the weight and balance requirements.

#### SAMPLE LOADING PROBLEM (Normal Category)

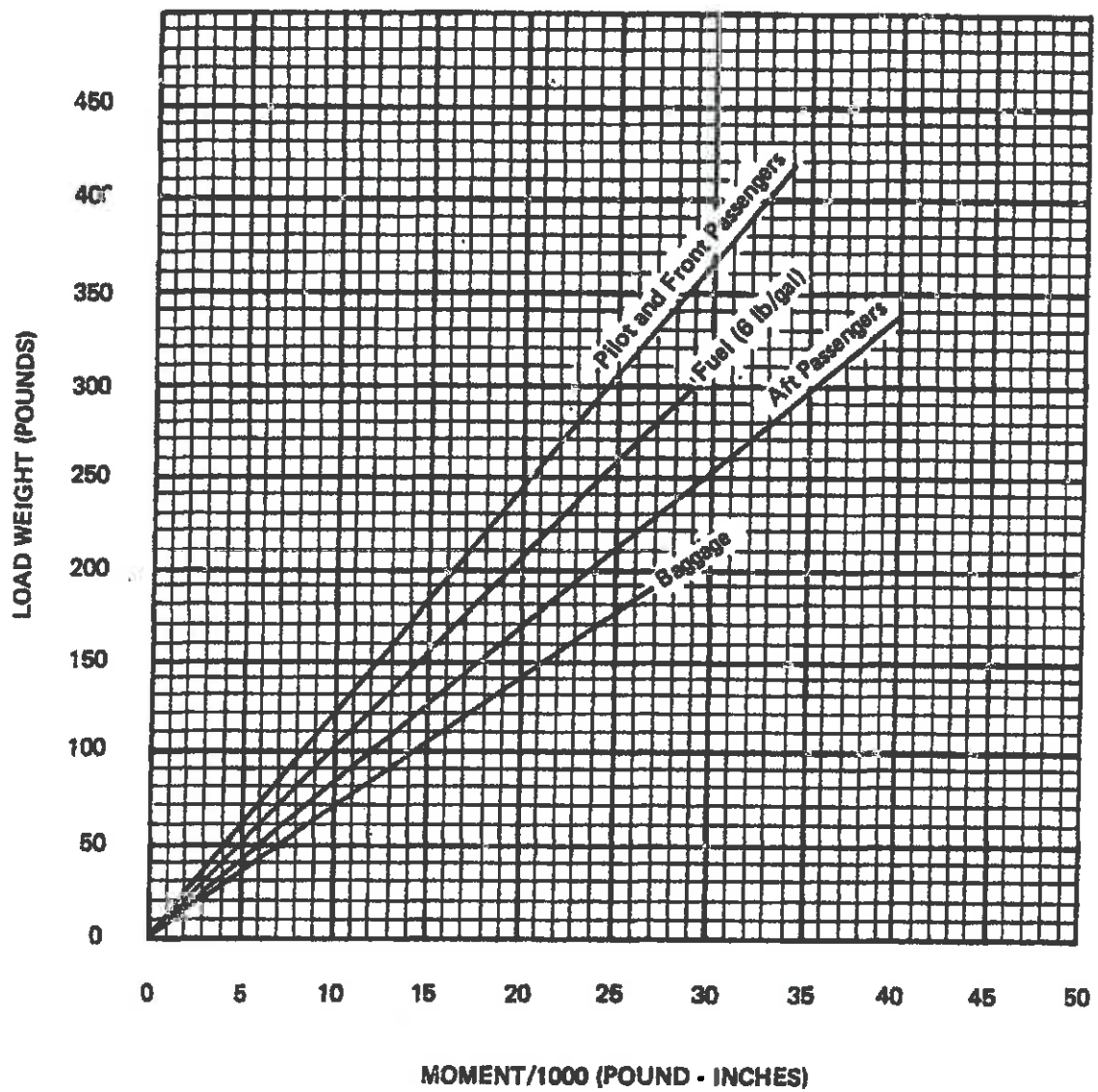
	Weight (Lbs)	Arm Aft Datum (Inches)	Moment (In-Lbs)
Licensed Empty Weight			
Oil (8 quarts)	15	24.5	368
Pilot and Front Passenger	340	80.5	27370
Passengers, Aft (Rear Seat)	340	118.1	40154
Fuel (50 Gal. Maximum)		95.0	
*Baggage		142.8	
Moment due to Retracting of Landing Gear			819
Total Loaded Airplane			

The center of gravity (C.G.) of this sample loading problem is at \_\_\_\_\_ inches aft of the datum line. Locate this point ( ) on the C.G. range and weight graph. Since this point falls within the weight-C.G. envelope, this loading meets the weight and balance requirements.

**IT IS THE RESPONSIBILITY OF THE PILOT AND AIRCRAFT OWNER TO INSURE THAT THE AIRPLANE IS LOADED PROPERLY.**

\*Check Aft C.G. between 150 lbs and 200 lbs.

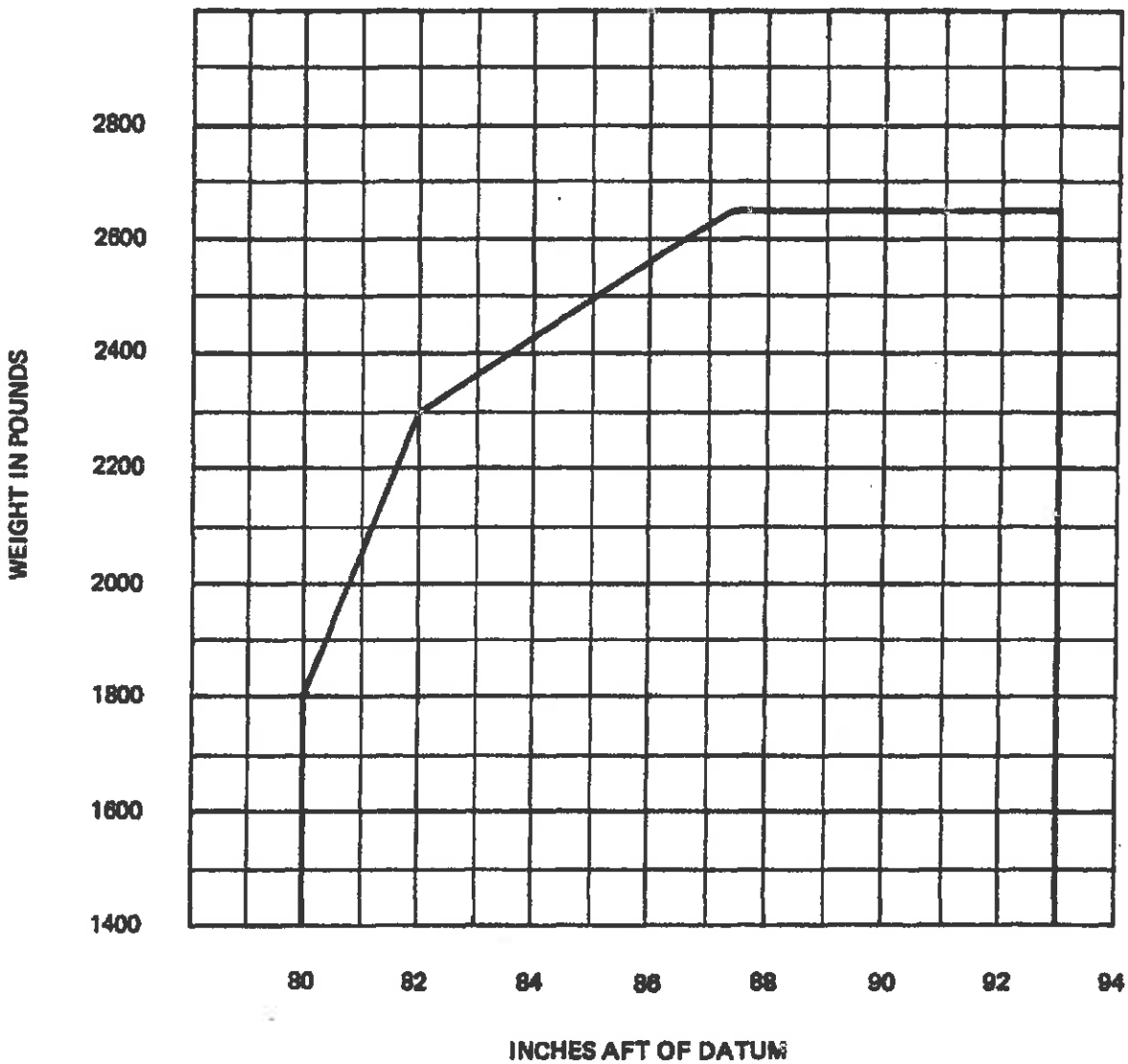
## LOADING GRAPH



# ARROW

IT IS THE RESPONSIBILITY OF THE OWNER AND PILOT TO ASCERTAIN THAT THE AIRPLANE ALWAYS REMAINS WITHIN THE ALLOWABLE WEIGHT VS. CENTER OF GRAVITY ENVELOPE WHILE IN FLIGHT.

## C. G. RANGE AND WEIGHT



MOMENT DUE TO RETRACTING LANDING GEAR = +819 IN - LBS



## EQUIPMENT LIST

The following is a list of equipment which may be installed in the PA-28R-200. Items marked with an "X" are items installed when the airplane was licensed by the manufacturer.

Item	Item	Weight Lbs.	Arm Aft Datum	Moment	Cert. Basis
A. Propellers and Propeller Accessories					
_____	Propeller - Hartzell Model				
_____	HC-C2YK-1( )/7666A-2 or				
_____	HC-C2YK-1( )F/7666A-2	55.0	-1.9	-105	TC P920
_____	Spinner and Attachment Plate				
_____	Installation PAC Dwg. 99374	5.0	-2.2	-11	TC 2A13
_____	Hydraulic Governor				
_____	Hartzell Model F-2-7 ( )	5.5	34.1	188	TC P920

**ARROW**

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Item	Item	Weight Lbs.	Arm Aft Datum	Moment	Cert. Basis
	<b>B. Engine and Engine Accessories - Fuel and Oil Systems</b>				
_____	Engine - Lycoming Model IO-360-C1C	326	18.7	6096	TC 1E10
_____	Fuel Pump - Electric Auxiliary Weldon #8120-AB	2.8	42.9	120	TC 2A13
_____	Induction Air Filter Fram Model CA-144PL	.5	37.2	19	TC 2A13
_____	Fuel Pump - Engine Driven Lycoming 75247	1.6	32.0	51	TC 1E10
_____	Alternator 12V 60 Amp Chrysler 2642997	12.5	9.6	120	TC 2A13
_____	Starter - 12V Prestolite Model MZ-4206 Lycoming 76211	18.0	10.5	189	TC 1E10
_____	Oil Cooler, PAC 67848	2.6	39.7	103	TC 2A13

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Item	Item	Weight Lbs.	Arm Aft Datum	Moment	Cert. Basis
	<b>C. Landing Gear and Brakes</b>				
	Two Main Wheel - Brake Assemblies 40-86 Wheel Assembly (Cleveland) 30-55 Brake Assembly (Cleveland) Two Main 4 Ply Rating Tires 6.00-6 with Regular Tubes	34.4	109.8	3777	TC 2A13
	One Nose Wheel Assembly 40-77 Wheel Assembly (Cleveland) (less brake drum) One 4 Ply Rating Tire 5.00-5 Regular Tube	8.1	15.5	126	TC 2A13

**ARROW**

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Item	Item	Weight Lbs.	Arm Aft Datum	Moment	Cert. Basis
D.	Electrical Equipment				
_____	One Battery 12V, 25 Amp Hour Rebat S-25	21.5	168.0	3612	TC 2A13
_____	Battery Contactor, Piper 63880-0	1.2	168.0	202	TC 2A13
_____	Stall Warning Detector, Safe Flight Inst. Corp. No. C52207-4	.2	80.2	16	TC 2A13
_____	Switch - Landing Gear Selector Cutler Hammer 8906-K 1736	.2	62.8	13	TC 2A13
_____	Voltage Regulator Wico Electric No. X-16300B	.5	59.4	30	TC 2A13
_____	Overvoltage Relay Wico Electric No. X-16799B	.5	55.4	28	TC 2A13
_____	Starter Relay Piper Dwg. 99130-2	1.0	47.0	47	TC 2A13
_____	Landing Gear Motor Contactor Cole-Helsee #24059 (2) .8 lbs. each	1.6	162.0	259	TC 2A13

Item	Item	Weight Lbs.	Arm Aft Datum	Moment	Cert. Basis
E.	Instruments				
_____	Compass - Piper 67462	.9	59.9	54	TSO C7c
_____	Airspeed Indicator - Piper 67434-2 or - 3	.6	61.8	37	TSO C2b
_____	Tachometer - Piper 62177-6	.7	61.2	43	TC 2A13
_____	Engine Cluster - Piper 95241-2	.8	62.4	50	TC 2A13
_____	Engine Cluster - Piper 95241-3	.8	62.4	50	TC 2A13
_____	Altimeter - Piper PS50008-2, -3, -4 or -5	1.0	60.9	61	TSO C10b
_____	Manifold Pressure and Fuel Flow - Piper PS50031-6	1.7	60.8	103	TSO C45
_____	Airspeed Indicator - Piper PS 50049-5	.6	61.8	37	TSO C2b

**ARROW**

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Item	Item	Weight Lbs.	Arm Aft Datum	Moment	Cert. Basis
F.	Hydraulic Equipment				
_____	Cylinder Hydraulic Nose Gear Piper 67504	.9	45.0	41	TC 2A13
_____	Cylinder Hydraulic (2) Main Gear Piper 67505 (0.9 lbs. each)	1.8	108.4	195	TC 2A13
_____	Pump Assembly - Piper 67500-2	9.0	159.0	1431	TC 2A13
_____	Switch, Pressure Consolidated Controls #211C243-3	.2	116.7	23	TC 2A13
_____	Valve - Free Fall Piper 67522-2	.3	114.0	34	TC 2A13

## ARROW

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Item	Item	Weight Lbs.	Arm Aft Datum	Moment	Cert. Basis
	G. Miscellaneous				
_____	Forward Seat Belts (2) PS50039-4-2 (.75 lbs. each)	1.5	81.9	123	TSO C22
_____	Rear Seat Belts (2) PS50039-4-3 (.70 lbs. each)	1.4	123.0	172	TSO C22
_____	Inertia Safety Belts, Front Seats (2) PS50039-4-9 (0.9 lbs. each)	1.8	120.1	216	TC 2A13
_____	Toe Brakes (Left) Piper Dwg. 63475-3	5.0	49.6	248	TC 2A13
_____	Right Front Seat Piper Dwg. 76171-1	13.7	88.0	1206	TC 2A13
_____	Individual Rear Seats (2) Piper Dwg. 99730-0 and -1 (13.5 lbs. each)	27.0	124.1	3351	TC 2A13
_____	Flight Manual and Logs	2.6	95.1	247	TC 2A13
_____	Tow Bar, Piper Dwg. 67336-0	2.3	155.2	357	TC 2A13



**ARROW**

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Item	Item	Weight Lbs.	ArmAft Datum	Moment	Cert. Basis
H.	Engine and Engine Accessories - Fuel and Oil System (Optional Equipment)				
	Vacuum Pump Airborne Manufacturing Co. Model 200CC	5.0	29.6	148	TC 2A13
	Oil Filter with Adapter AC 0F5578770 (3.3 lbs. each) (Lycoming #75528)	3.3	33.1	109	TC 2A13

Item	Item	Weight Lbs.	Arm Aft Datum	Moment	Cert. Basis
I.	Electrical Equipment (Optional Equipment)				
_____	Landing Light G.E. Model 4509	.5	13.1	7	TC 2A13
_____	Navigation Light (Rear) Grimes A2064	.2	281.0	56	TSO C30b
_____	Navigation Light (Wing) (2) Grimes A1285-G-12 A1285-R-12 (0.2 lbs. each)	.4	106.6	43	TSO C30b
_____	Auxiliary Power Receptacle Piper 65647	2.7	178.5	482	TC 2A13
_____	External Power Cable Piper 62355-2	4.6	142.8	657	TC 2A13
_____	Cabin Speaker Quincy Spkr. Co. 8B-15052 or Oaktron Ind. GEV 1937	.8	99.0	79	TC 2A13
_____	Cabin Light	.3	99.0	30	TC 2A13
_____	Rotating Beacon, Grimes #40-0101-15-12	1.5	263.4	395	TC 2A13
_____	Battery 12V, 35 A.H. Reading R-35 (Weight 27.0 lbs.)	5.5 *	168.0	924	TC 2A13

\*Weight and moment difference between standard and optional equipment.

**ARROW**

Item	Item	Weight Lbs.	Arm Aft Datum	Moment	Cert. Basis
I.	Electrical Equipment (Optional Equipment) (cont)				
_____	Heated Pitot Head - Piper 67477-0	.4	100.0	40	TC 2A13
_____	Anti-Collision Lights Whelen Engineering Co. Piper Dwg. 99030-2 or -5				
_____	Power Supply, Model HS, No. A412A-14 (with fin light only)	2.3	198.0	455	TC 2A13
_____	Power Supply, Model HD, T3 No. A413 (with fin and wing lights)	3.0	198.0	594	TC 2A13
_____	Light, Fin Tip, A408	.4	263.4	105	TC 2A13
_____	Cable, Fin Light, A417-1/300	.4	230.7	92	TC 2A13
_____	Lights, Wing Tip (2) (0.15 lbs. each) No. A429	.3	106.6	32	TC 2A13
_____	Cable, Wing Lights A417-1/298 & A417-1/252	2.0	115.6	231	TC 2A13
_____	Electric Trim System	4.3	155.3	668	TC 2A13

Item	Item	Weight Lbs.	Arm Aft Datum	Moment	Cert. Basis
J. Autopilots (Optional Equipment)					
Autocontrol III					
_____	Roll Servo #1C363-1-183R	2.5	122.2	306	STC SA1406SW
_____	Console #1C338	1.2	60.1	72	STC SA1406SW
_____	Cables	.7	95.5	67	STC SA1406SW
_____	Attitude Gyro #52D66	2.3	59.4	137	STC SA1406SW
_____	Directional Gyro #52D54	3.2	59.0	189	STC SA1406SW
_____	Omni Coupler #1C388	.9	59.3	53	STC SA1406SW
AutoFlite II					
_____	Roll Servo #1C363-1-183R	2.5	122.2	306	STC SA1157SW
_____	Cable	.7	93.4	65	STC SA1157SW
_____	Panel Unit #52D75-3 or -4	2.4	59.4	143	STC SA1157SW

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Item	Item	Weight Lbs.	Arm Aft Datum	Moment	Cert. Basis
K.	Radio Equipment (Optional Equipment)				
_____	Narco Mark 16 Transceiver, Single	7.5	56.9	427	TC 2A13
_____	Narco Mark 16 Transceiver, Dual	15.0	56.9	854	TC 2A13
_____	Narco VOA-50M Omni Converter	2.1	59.9	126	TC 2A13
_____	Narco VOA-40M Omni Converter	1.9	59.9	114	TC 2A13
_____	Narco VOA-40 Omni Converter	1.9	59.9	114	TC 2A13
_____	Nav. Receiving Antenna	.5	265.0	133	TC 2A13
_____	Cable, Nav. Antenna	.9	157.0	141	TC 2A13
_____	#1 VHF Comm. Antenna	.3	157.8	47	TC 2A13
_____	Cable, #1 VHF Comm. Antenna	.4	103.4	41	TC 2A13
_____	#2 VHF Comm. Antenna	.3	192.8	58	TC 2A13
_____	Cable, #2 VHF Comm. Antenna	.5	147.5	74	TC 2A13
	Anti Static Kit				
_____	#1 VHF Comm. Antenna	1.0	160.8	161	TC 2A13
_____	Cable, #1 VHF Comm. Antenna	.4	103.4	41	TC 2A13
_____	#2 VHF Comm. Antenna	1.0	195.8	196	TC 2A13
_____	Cable, #2 VHF Comm. Antenna	.5	120.9	60	TC 2A13
_____	Low Frequency Antenna	.5	147.5	74	TC 2A13
_____	Static Wicks	—	—	—	TC 2A13
	Bendix ADF-T-12C or D				
_____	Receiver Model 201F	3.9	59.4	232	TC 2A13
_____	Receiver Model 201 C or D	3.5	59.4	208	TC 2A13
_____	Audio Amplifier 102A	.8	52.4	42	TC 2A13
_____	Servo Indicator 551A	1.7	60.9	104	TC 2A13
_____	Loop Antenna 2321E	1.3	160.8	209	TC 2A13
_____	Cable, Interconnecting	2.3	108.0	248	TC 2A13
_____	Sense Antenna and Cable	.4	150.0	60	TC 2A13

**ARROW**

Item	Item	Weight Lbs.	Arm Aft Datum	Moment	Cert. Basis
<b>K. Radio Equipment (Optional Equipment) (cont)</b>					
_____	Narco Comm 10A	3.9	57.4	224	TC 2A13
_____	Narco Comm 11A	3.6	57.4	207	TC 2A13
_____	Dual Comm 11A	7.1	57.4	408	TC 2A13
_____	Narco Nav 10	1.9	58.6	111	TC 2A13
_____	Narco Nav 11	2.8	58.6	164	TC 2A13
_____	Narco Nav 12	3.4	58.6	199	TC 2A13
_____	Dual Nav 11	5.6	58.6	328	TC 2A13
_____	King KX-170 or KX-175	7.5	56.6	425	TC 2A13
_____	Dual KX-170 or KX-175	15.0	56.6	849	TC 2A13
_____	King KI-201 ( )	2.5	59.9	150	TC 2A13
_____	King KI-211 ( )	3.3	59.9	198	TC 2A13
_____	Dual KI-201 ( )	5.0	59.9	300	TC 2A13
_____	Genave 200 A (VHF Comm/Nav)	5.9	57.7	340	TC 2A13
_____	Genave 300 (VHF Comm/Nav)	5.9	57.7	340	TC 2A13
_____	Genave Alpha 360	5.0	56.9	285	TC 2A13
_____	Genave Theta 100	1.6	59.6	95	TC 2A13
_____	Narco ADF-31				
_____	Panel Unit	5.0	58.5	293	TC 2A13
_____	Sensor Unit	2.5	162.7	407	TC 2A13
_____	Sensor Cable	2.3	105.6	243	TC 2A13
_____	Sense Antenna and Cable	.4	150.0	60	TC 2A13
_____	King KR-85				
_____	Receiver	4.3	59.4	255	TC 2A13
_____	Servo Indicator	1.2	61.3	74	TC 2A13
_____	Loop Antenna	1.3	161.5	210	TC 2A13
_____	Loop Cable	1.8	105.5	190	TC 2A13
_____	Audio Amplifier	.8	51.0	41	TC 2A13
_____	Sense Antenna and Cable	.4	147.5	59	TC 2A13



Item	Item	Weight Lbs.	Arm Aft Datum	Moment	Cert. Basis
K.	Radio Equipment (Optional Equipment) (cont)				
	PM-1 Marker Beacon				
	Receiver	1.1	121.3	133	TC 2A13
	Remote Unit	.3	128.4	39	TC 2A13
	Cable	.3	85.0	26	TC 2A13
	UGR-2 Glide Slope				
	Receiver	2.4	173.8	417	TC 2A13
	Cable	1.8	128.0	230	TC 2A13
	Antenna	.4	92.4	37	TC 2A13
	Cable, Antenna	.5	145.0	73	TC 2A13
	King KN60C DME				
	Receiver	6.8	56.7	386	TC 2A13
	Antenna	.2	112.1	22	TC 2A13
	Cable, Antenna	.3	83.1	25	TC 2A13
	IFD Starlight Transponder				
	Panel Unit	2.3	59.4	137	TC 2A13
	Antenna	.1	47.2	5	TC 2A13
	Cable	.3	46.5	14	TC 2A13
	IFD Skyline 300 Transponder				
	Panel Unit	1.7	60.4	103	TC 2A13
	Remote Unit	1.8	53.1	96	TC 2A13
	Antenna	.1	47.5	5	TC 2A13
	Cable	.1	52.1	5	TC 2A13
	Piper Automatic Locator				
	Transmitter	1.7	236.2	402	TC 2A13
	Antenna & Coax	.2	224.4	45	TC 2A13
	Shelf & Access Hole	.3	235.4	71	TC 2A13
	King KT76/78 Transponder				
	Panel Unit	3.1	58.1	180	TC 2A13
	Antenna & Cable	—	—	—	TC 2A13

**ARROW**

Item	Item	Weight Lbs.	Arm Aft Datum	Moment	Cert. Basis
K.	Radio equipment (Optional Equipment) (cont)				
_____	Narco AT6-A Transponder Panel Unit	2.0	59.4	119	TC 2A13
_____	Remote Unit	5.7	203.0	1157	TC 2A13
_____	Cable, Interconnecting	.4	133.7	53	TC 2A13
_____	Antenna and Cable	.3	197.0	59	TC 2A13
_____	Narco AT-50 Transponder (Includes Antenna & Cable)	3.0	57.3	172	TC 2A13
_____	King KMA-20 Audio Panel	2.8	60.2	169	TC 2A13
_____	Antenna	.5	116.3	58	TC 2A13
_____	Cable	.4	87.5	35	TC 2A13
_____	Audio Selector Panel - Piper 99395-0, -2, or -3	.7	61.3	43	TC 2A13
_____	Microphone	.5	70.0	35	TC 2A13
_____	Headset	.5	60.0	30	TC 2A13
_____	King KX-175 VHF Transceiver	9.4	56.6	532	TC 2A13
_____	King KN-73 Glide Slope Receiver	3.2	184.3	590	TC 2A13
_____	King KN-77 VOR/LOC Conv.	3.6	183.6	661	TC 2A13
_____	King KNI-520 VOR/ILS Indicator	1.7	60.5	103	TC 2A13
_____	King KX-175 VHF Transceiver (2nd)	8.6	56.6	487	TC 2A13
_____	King KN-77 VOR/LOC Conv.	4.2	183.6	771	TC 2A13
_____	King KNI-520 VOR/ILS Indicator	1.7	60.5	103	TC 2A13

Item	Item	Weight Lbs.	Arm Aft Datum	Moment	Cert. Basis
L.	Instruments (Optional Equipment)				
_____	Suction Gauge - Piper 99480-0 or -2	.5	62.2	31	TC 2A13
_____	Vacuum Regulator, Airborne Mech. 133A4	.6	52.0	31	TC 2A13
_____	Vacuum Filter, Piper 66673	.3	52.0	16	TC 2A13
_____	Indicator - Rate of Climb - Piper 99010-2, -4, or -5	1.0	60.9	61	TSO C8b
_____	Indicator - Rate of Climb - Piper 99010-3	.5	62.2	31	TSO C8b
_____	Attitude Gyro - Piper 99002-2, -3, -4, or -5	2.2	59.4	131	TSO C4c
_____	Directional Gyro - Piper 99003-2, -3, -4, or -5	2.6	59.7	155	TSO C5c
_____	Air Temperature Gauge - Piper 99479-0 or -2	.2	72.6	15	TC 2A13
_____	Clock - Piper 99478	.4	62.4	25	TC 2A13
_____	Turn ant Slip Indicator - Piper PS50030-2 or -3	2.6	59.7	155	TSO C3B Type II
_____	Exhaust Gas Temperature Gauge Piper 99026	.7	55.4	39	TC 2A13
_____	Tru-Speed Indicator Piper 67433-2 or -3 or PS50049-4	(same as Standard Equipment)			

**ARROW**

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Item	Item	Weight Lbs.	Arm Aft Datum	Moment	Cert. Basis
M.	Miscellaneous (Optional Equipment)				
_____	Assist Step Piper 65384-0	1.8	156.0	281	TC 2A13
_____	Toe Brakes (Right) Piper 63476-3	5.0	49.6	248	TC 2A13
_____	Assist Straps and Coat Hooks (2) Piper 62353-5	.2	109.5	22	TC 2A13
_____	Inertia Safety Belts, Rear Seats (2) PS50039-4-6	1.4	133.9	187	TC 2A13
_____	Lighter 200462 (12V Universal)	.2	62.9	13	TC 2A13
_____	Fire Extinguisher, Kiddie Compact VI (with brackets) Piper Dwg. 76167	5.3	71.0	376	TC 2A13
_____	Headrests, Front (2) 99255-3 (1.0 lbs. each)	2.0	94.5	189	TC 2A13
_____	Headrests, Rear (2) 99255-3 (1.0 lbs. each)	2.0	132.1	264	TC 2A13
_____	Overhead Vent System Piper	1.2	130.0	156	TC 2A13
_____	Alternate Static Source	.4	61.0	24	TC 2A13
_____	Zinc Chromate Finish	5.0	158.0	790	TC 2A13
_____	Air Conditioner Instl.	68.9	105.0	7235	TC 2A13

Calibrated Alternate Static Source

Placard Required: Yes No

TOTAL OPTIONAL EQUIPMENT

**ARROW**

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**EXTERIOR FINISH**

Base Color \_\_\_\_\_ Registration No. Color \_\_\_\_\_

Trim Color \_\_\_\_\_ Type Finish \_\_\_\_\_

Accent Color \_\_\_\_\_

## OPERATING INSTRUCTIONS

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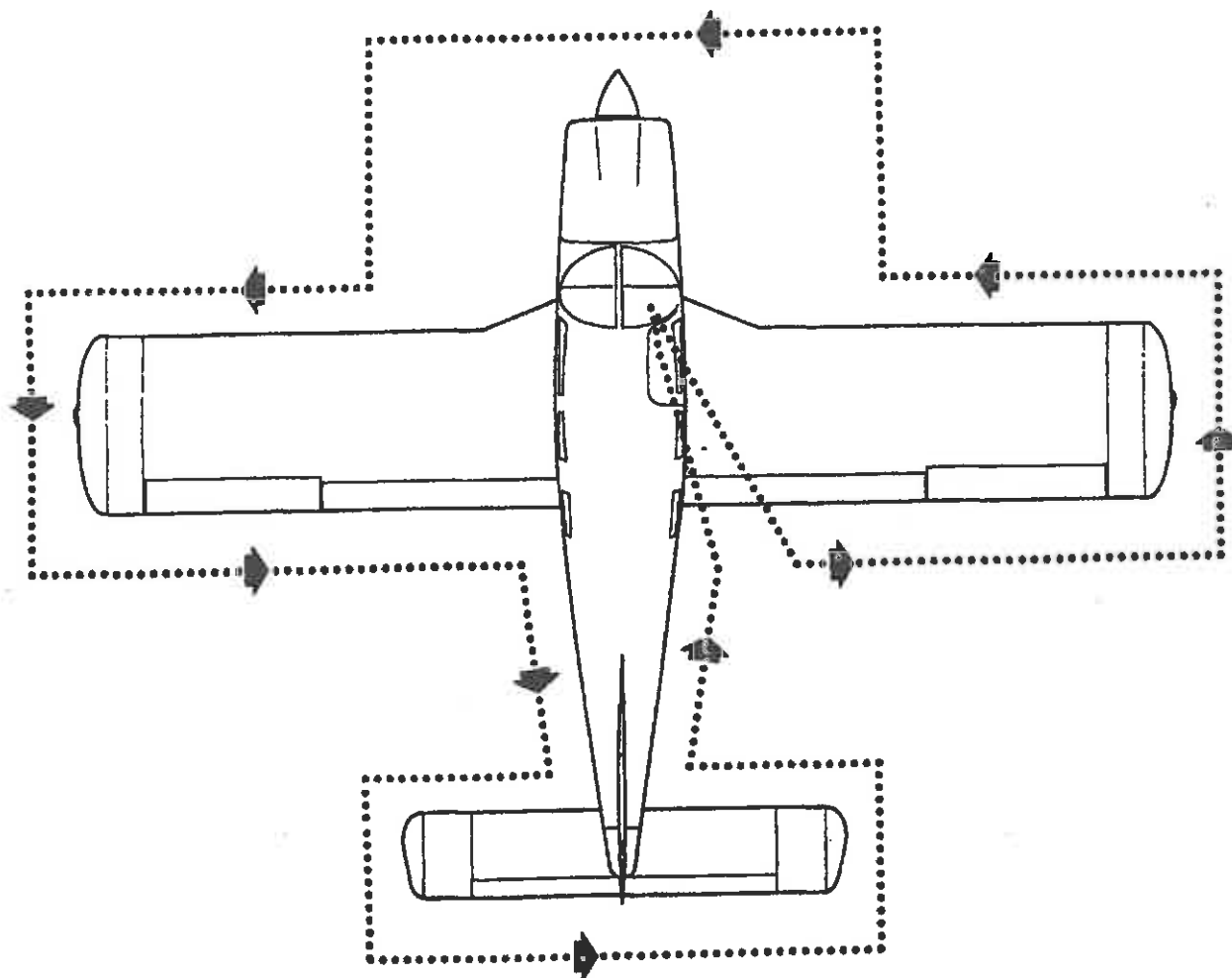


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**OPERATING INSTRUCTIONS****PREFLIGHT**

The airplane should be given a thorough visual inspection prior to each flight. Particular attention should be given to the following items:

1. Master switch and ignition OFF; landing gear switch DOWN; remove seat belt securing control wheel or wheel control lock.
2. a. Check for external damage and operational interference of control surfaces or hinges.  
b. Insure that wings and control surfaces are free of snow, ice or frost.
3. a. Visually check fuel supply; secure caps.  
b. Drain and check all fuel system sumps and lines for water, sediment and proper fuel.  
c. Check that fuel system vents are open.  
d. Check landing gear shock struts for proper inflation (approximately 2 inches showing).



## ARROW II

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- e. Check hydraulic lines and landing gear cylinders for leaks.
- f. Check tires for cuts, wear and proper inflation.
- g. Check brake blocks and discs for wear and damage.
4.
  - a. Check windshield for cleanliness.
  - b. Check propeller and spinner for defects or nicks.
  - c. Check for obvious fuel or oil leaks.
  - d. Check oil level. (Insure dipstick is properly seated.)
  - e. Check cowling and inspection covers for security.
  - f. Check cowl scoop for obstructions.
  - g. Check nose wheel tire for inflation or wear.
  - h. Check nose gear shock strut for proper inflation (approximately 2-3/4 inches showing).
  - i. Check hydraulic lines and landing gear cylinder for excessive leaks.
  - j. Check for foreign matter in air inlet.
5.
  - a. Stow tow bar and control locks if used.
  - b. Check baggage for proper storage and security.
  - c. Close and secure the baggage compartment door.
6.
  - a. Upon entering airplane check that all primary flight controls operate properly, and that aircraft is properly loaded.
  - b. Close and secure cabin door.
  - c. Check that required papers are in order and in the airplane.

### STARTING ENGINE

After completion of the preflight inspection:

1. Set parking brakes ON.
2. Set the propeller control in full INCREASE RPM (control forward).
3. Select the desired tank with fuel selector valve.

### STARTING ENGINE WHEN COLD

1. Open the throttle approximately 1/2 inch.
2. Turn the master switch ON.
3. Turn the electric fuel pump ON.
4. Move the mixture control to FULL RICH until an indication on the fuel flow meter is noted. (Engine is primed.)
5. Move the mixture control to IDLE CUT-OFF.
6. Engage the starter by rotating magneto switch clockwise and pressing in.
7. When the engine fires, advance mixture control to FULL RICH and move throttle to the desired setting.
8. If the engine does not fire within five to ten seconds, disengage starter and reprime.

### STARTING ENGINE WHEN HOT

1. Open the throttle approximately 1/2 inch.
2. Turn the master switch ON.
3. Turn the electric fuel pump ON.
4. Put mixture control in IDLE CUT-OFF.
5. Engage the starter by rotating magneto switch clockwise and pressing in. When the engine fires, advance the mixture control and move the throttle to desired setting.

---

### STARTING ENGINE WHEN FLOODED

1. Open the throttle full.
2. Turn the master switch ON.
3. Turn the electric fuel pump OFF.
4. Put mixture control in IDLE CUT-OFF.
5. Engage the starter by rotating the magneto switch clockwise and pressing in. When the engine fires, advance the mixture control and retard the throttle.

### STARTING ENGINE WITH EXTERNAL POWER

An optional feature known as Piper External Power (PEP) allows the operator to use an external battery to crank the engine without having to gain access to the aircraft battery.

The procedure is as follows:

1. Turn aircraft MASTER SWITCH to OFF.
2. Connect RED lead of PEP kit jumper cable to POSITIVE (+) terminal of external 12 volt battery and BLACK lead to NEGATIVE (-) terminal.
3. Insert plug of jumper cable into socket located on aircraft fuselage.
4. Turn aircraft MASTER SWITCH to ON and proceed with NORMAL engine starting technique.
5. After engine has been started, turn MASTER SWITCH to OFF and remove jumper cable plug from aircraft.
6. Turn aircraft MASTER SWITCH to ON and check alternator ammeter for indication of output. DO NOT ATTEMPT FLIGHT IF THERE IS NO INDICATION OF ALTERNATOR OUTPUT.

When the engine is firing evenly, advance the throttle to 800 RPM. If oil pressure is not indicated within 30 seconds, stop the engine and determine the trouble. In cold weather it will take a few seconds longer to get an oil pressure indication. If the engine has failed to start, refer to the "Engine Troubles and Their Remedies" section of the Lycoming Operating Handbook.

Starter manufacturers recommend that cranking periods be limited to 30 seconds with a two minute rest between cranking periods. Longer cranking periods will shorten the life of the starter.

### WARM-UP AND GROUND CHECK

Warm-up the engine at 1400 to 1500 RPM for not more than two minutes in warm weather, four minutes in cold weather. Avoid prolonged idling at low RPM as this practice may result in fouled spark plugs. If necessary to hold before take-off, it is recommended that engine be operated at 1400-1500 RPM.

The magnetos should be checked at 2000 RPM with the propeller set at increase RPM. Drop off on either magneto should not exceed 175 RPM and the differential should be not more than 50 RPM. Prolonged operation on one magneto should be avoided.

## ARROW II

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Check vacuum gauge. Indicator should read 5" Hg  $\pm$  .1" Hg at 2000 RPM. Check both the oil temperature and pressure. The temperature may be low for some time if the engine is being run for the first time of the day, but as long as the pressure is within limits the engine is ready for take-off. For air conditioner ground check, refer to page 6-11.

The propeller control should be moved through its complete range to check for proper operation and then placed to full increase RPM for take-off. To obtain maximum RPM, push the pedestal-mounted control fully toward the instrument panel. In cold weather the propeller control should be cycled at least three times to ensure that warm engine oil has circulated through the system.

The electric fuel pump should be turned off momentarily during ground check to make sure that the engine driven pump is operating. The electric fuel pump should be on during take-off to prevent loss of power should the engine driven pump fail. The engine is warm enough for take-off when the throttle can be opened without the engine faltering.

### TAKE-OFF

Just before take-off the following items should be checked:

1. Fuel - on proper tank
2. Electric fuel pump - ON
3. Engine gauges - checked
4. Flight instruments - checked and set as required
5. Master Switch - ON
6. Alternate air - closed
7. Prop - set
8. Mixture - set
9. Seat backs - erect
10. Fasten belts/harness
11. Empty seats - seat belts snugly fastened
12. Flaps - exercised and set
13. Trim tab - set
14. Controls - free
15. Door - latched
16. Air conditioner - OFF

The take-off technique is conventional for the Cherokee Arrow II. The tab should be set slightly aft of neutral, with the exact setting determined by the loading of the aircraft. Allow the airplane to accelerate to 60 to 70 MPH. Then ease back on the wheel enough to let the airplane fly from the ground.

#### Short Field, Obstacle Clearance:

Lower flaps to 25° (second notch), accelerate aircraft to 60-65 MPH and ease back on the wheel to rotate. After breaking ground, accelerate to best angle of climb speed, 85 MPH, select gear "up"\* and continue climb while accelerating to best rate of climb speed, 100 MPH, and slowly retract the flaps while climbing out.

#### Soft Field, Obstacle Clearance:

Lower flaps to 25° (second notch), accelerate aircraft, pull nose gear off as soon as possible and lift off at lowest possible airspeed. Accelerate just above the ground to best angle of climb speed, 85 MPH, select gear "up"\* and climb past obstacle clearance height. Continue climb while accelerating to best rate of climb speed, 100 MPH, and slowly retract the flaps.

**OPERATING INSTRUCTIONS**  
**ISSUED: November 15, 1971**  
**REVISED: December 5, 1975**

**Soft Field, No Obstacle:**

Proceed as above after gear retraction, continue climb at best rate of climb speed, 100 MPH, and slowly retract the flaps.

\*If desired on the aircraft equipped with the backup gear extender, the override up position can be selected and latched before take-off, and the gear will then retract as soon as the gear selector switch is placed in the up position. In this case care should be taken not to retract the gear prematurely, or the aircraft could settle back onto the runway. If the override lock is used for take-off, it should be disengaged as soon as sufficient terrain clearance is obtained, to return the gear system to normal operation.

**CLIMB**

The best rate of climb at gross weight will be obtained at 95 MPH with gear down and 100 MPH with gear up. The best angle of climb may be obtained at 85 MPH with gear down and 96 MPH with gear up. For climbing en route a speed of 110 MPH is recommended. This will produce better forward speed and increase visibility over the nose during the climb, with little sacrifice in rate of climb. Air conditioner may be turned on after all obstacles have been cleared.

**STALLS**

Angle of Bank	Flaps 40°	Flaps Retracted
0°	64 MPH	71 MPH
20°	66 MPH	73 MPH
40°	73 MPH	81 MPH
60°	90 MPH	100 MPH

Power Off - Gear Up or Down - Gross Weight 2650 Lbs.

**CRUISING**

The cruising speed of the Cherokee Arrow II is determined by many factors, including power setting, altitude, temperature, loading, and equipment installed on the airplane. The normal cruising power is 75% of the rated horsepower of the engine. True airspeed which may be obtained at various altitudes and power settings can be determined from the charts in Section XIII of this manual.

When selecting RPM below 2400, limiting manifold pressure for continuous operation, as specified by the Lycoming Operator's Manual, should be observed.

To INCREASE power, first increase RPM (propeller control); then increase manifold pressure (throttle control).

To DECREASE power, first decrease manifold pressure (throttle); then decrease RPM (propeller control).

## ARROW II

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Use of the mixture control in cruising flight reduces fuel consumption significantly, especially at higher altitudes. The mixture should be leaned during cruising operation above 5000 feet altitude and at the pilot's discretion at lower altitudes when 75% power or less is being used. If any doubt exists as to the amount of power being used, the mixture should be in the FULL RICH position for all operations under 5000 feet.

To lean the mixture, pull the mixture control until the engine becomes rough, indicating that the lean mixture limit has been reached in the leaner cylinders. Then enrich the mixture by pushing the control toward the instrument panel until engine operation becomes smooth. The fuel flow meter will give a close approximation of the fuel being consumed.

If the airplane is equipped with the optional exhaust gas temperature (EGT) gauge, a more accurate means of leaning is available to the pilot. For this procedure, refer to the Avco Lycoming Operator's Manual.

In order to keep the airplane in best lateral trim during cruising flight, the fuel should be used alternately from each tank. It is recommended that one tank be used for one hour after take-off, then the other tank be used for two hours, then return to the first tank for one hour. Each tank will then contain approximately 1/2 hour of fuel if tanks were full (24 gallons usable each tank) at take-off. Do not run tanks completely dry in flight.

### NOTE

There are no mechanical uplocks in the landing gear system. In the event of a hydraulic system malfunction, the landing gear will free fall to the gear down and locked position. The pilot should be aware that the airplane true airspeed with gear down is approximately 75% of the gear retracted airspeed for any given power setting. Allowances for the reduction in airspeed and range should be made when planning extended flight between remote airfields or flight over water.

## APPROACH AND LANDING

Before landing check list:

1. Seat backs - erect
2. Fasten belts/harness
3. Fuel - on proper tank
4. Fuel pump - ON
5. Mixture - set
6. Propeller - set
7. Gear - DOWN (150 MPH MAX)
8. Flaps - set (125 MPH)
9. Air conditioner - OFF

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**ARROW II**

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## OPERATING TIPS

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**OPERATING TIPS**

The following Operating Tips are of particular value in the operation of the Cherokee Arrow II.

1. Learn to trim for take-off so that only a very light back pressure on the wheel is required to lift the airplane off the ground.
2. On take-off, do not retract the gear prematurely. The airplane may settle and make contact with the ground because of lack of flying speed, atmospheric conditions, or rolling terrain.
3. The best speed for take-off is about 65 MPH under normal conditions. Trying to pull the airplane off the ground at too low an airspeed decreases the controllability of the airplane in event of engine failure.
4. In high density areas where high traffic pattern speeds are necessary or when it is advantageous to extend the gear, it is permissible to extend the landing gear at speeds up to 150 MPH.
5. Flaps may be lowered at airspeeds up to 125 MPH. To reduce flap operating loads, it is desirable to have the airplane at a slower speed before extending the flaps.
6. Before attempting to reset any circuit breaker, allow a two to five minute cooling off period.
7. Always determine position of landing gear by checking the gear position lights.
8. Remember that when the panel lights are on, the gear position lights are very dim.
9. Before starting the engine, check that all radio switches, light switches, and the pitot heat switch are in the off position so as not to create an overloaded condition when the starter is engaged.
10. A high fuel pressure indication on the fuel flow indicator is a possible sign of restricted air bleed nozzles.
11. The overvoltage relay is provided to protect the electronics equipment from a momentary overvoltage condition (approximately 16.5 volts and up), or a catastrophic regulator failure. In the event of a momentary condition, the relay will open and the ammeter will indicate zero output from the alternator. The relay may be reset by switching the "ALT" switch to "OFF" for approximately 1 second and then returning the "ALT" switch to "ON." If after recycling the "ALT" switch the condition persists, the flight may be continued on battery alone by reducing battery load to minimum.
12. It should always be kept in mind that the back-up gear extender system is intended to lower the gear during the approach should the pilot forget. However, the pilot should always lower the gear during normal operations by using the gear selector switch on the instrument panel.
13. The vacuum gauge is provided to monitor the pressure available to assure the correct operating speed of the vacuum-driven gyroscopic flight instruments. It also monitors the condition of the common air filter by measuring the flow of air through the filter.

## ARROW II

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If the vacuum gauge registers lower than 5" Hg  $\pm$  .1" Hg at 2000 RPM, the following items should be checked before flight:

- a. Common air filter, could be dirty or restricted.
  - b. Vacuum lines, could be collapsed or broken.
  - c. Vacuum pump, worn.
  - d. Vacuum regulator, not adjusted correctly. The pressure, even though set correctly, can read lower under two conditions:
    1. Very high altitude, above 12,000 feet.
    2. Low engine RPM usually on approach or during training maneuvers.  
This is normal and should not be considered a malfunction.
14. The rudder pedals are suspended from a torque tube which extends across the fuselage. The pilot should become familiar with the proper positioning of his feet on the rudder pedals so as to avoid interference with the torque tube when moving the rudder pedals or operating the toe brakes.
15. The shape of the wing fuel tanks is such that in certain maneuvers the fuel may move away from the tank outlet. If the outlet is uncovered, the fuel flow will be interrupted and a temporary loss of power may result. Pilots can prevent inadvertent uncovering of the outlet by avoiding maneuvers which could result in uncovering the outlet.

Extreme running turning takeoffs should be avoided as fuel flow interruption may occur.

Prolonged slips or skids which result in excess of 2000 feet of altitude loss, or other radical or extreme maneuvers which could cause uncovering of the fuel outlet must be avoided as fuel flow interruption may occur when tank being used is not full.

16. In an effort to avoid accidents, pilots should obtain and study the safety related information made available in FAA publications such as regulations, advisory circulars, Aviation News, AIM and safety aids.

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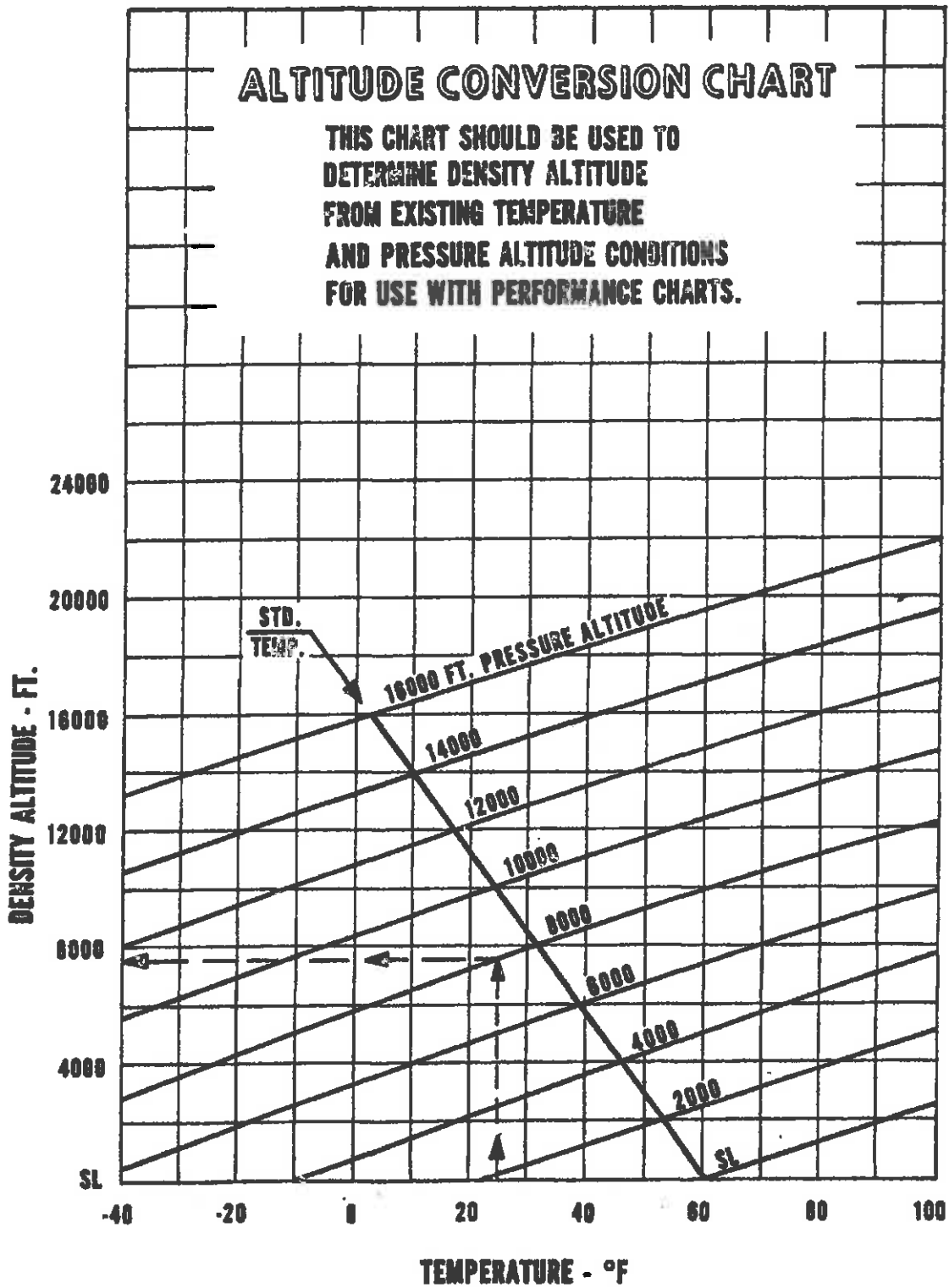
## PERFORMANCE CHARTS

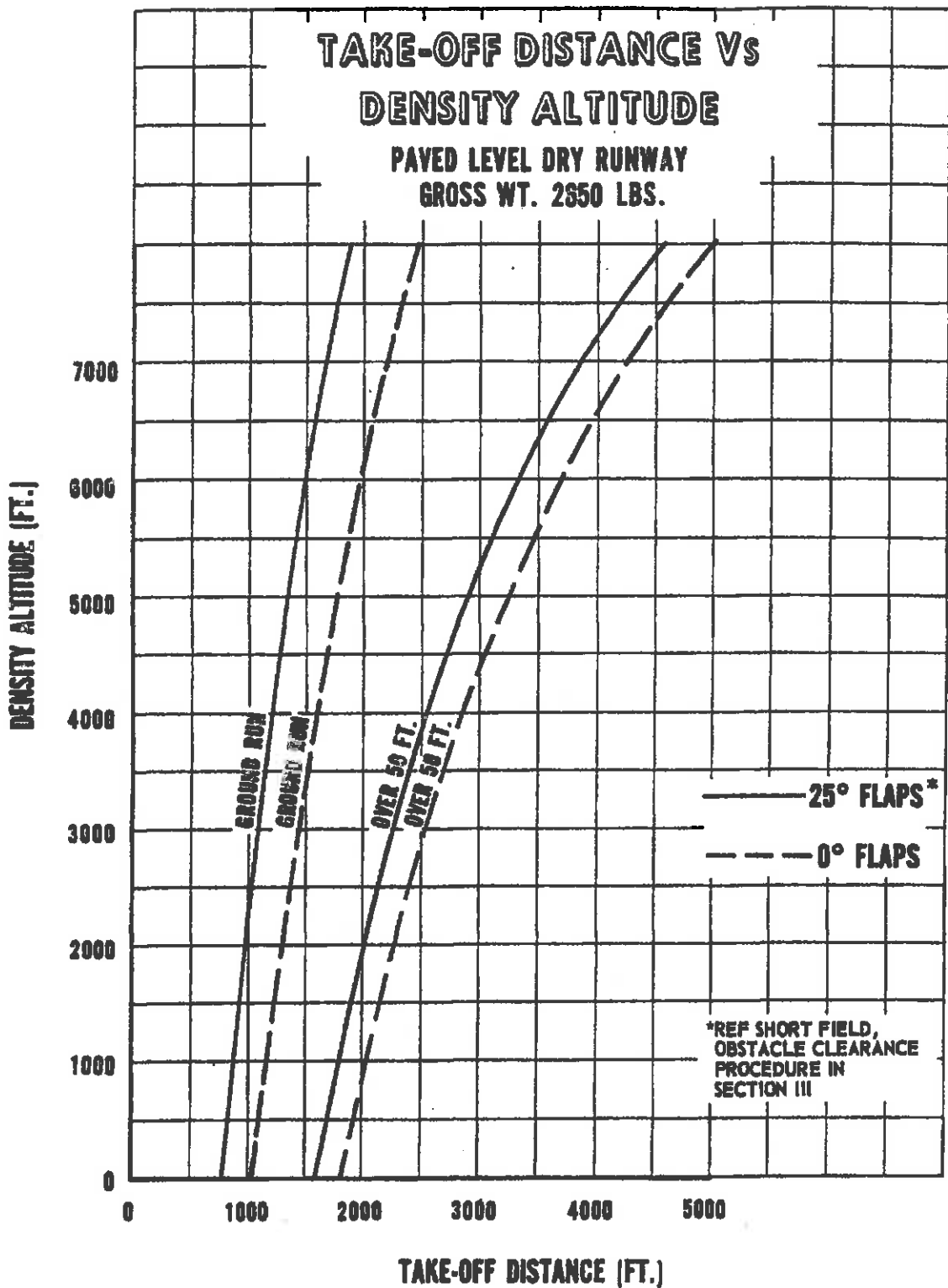
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### WARNING

Performance information derived by extrapolation beyond the limits shown on the charts should not be used for flight planning purposes.

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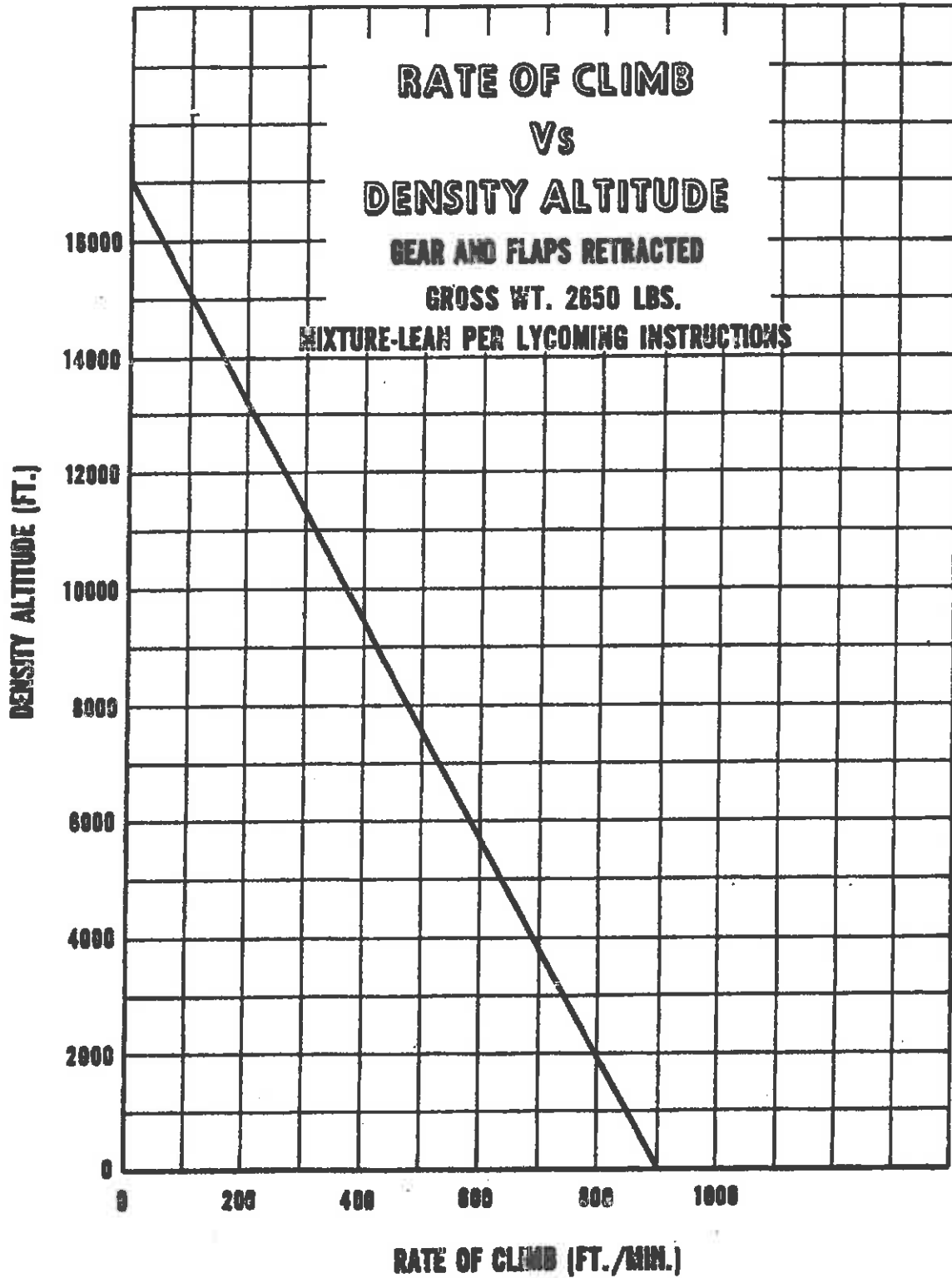




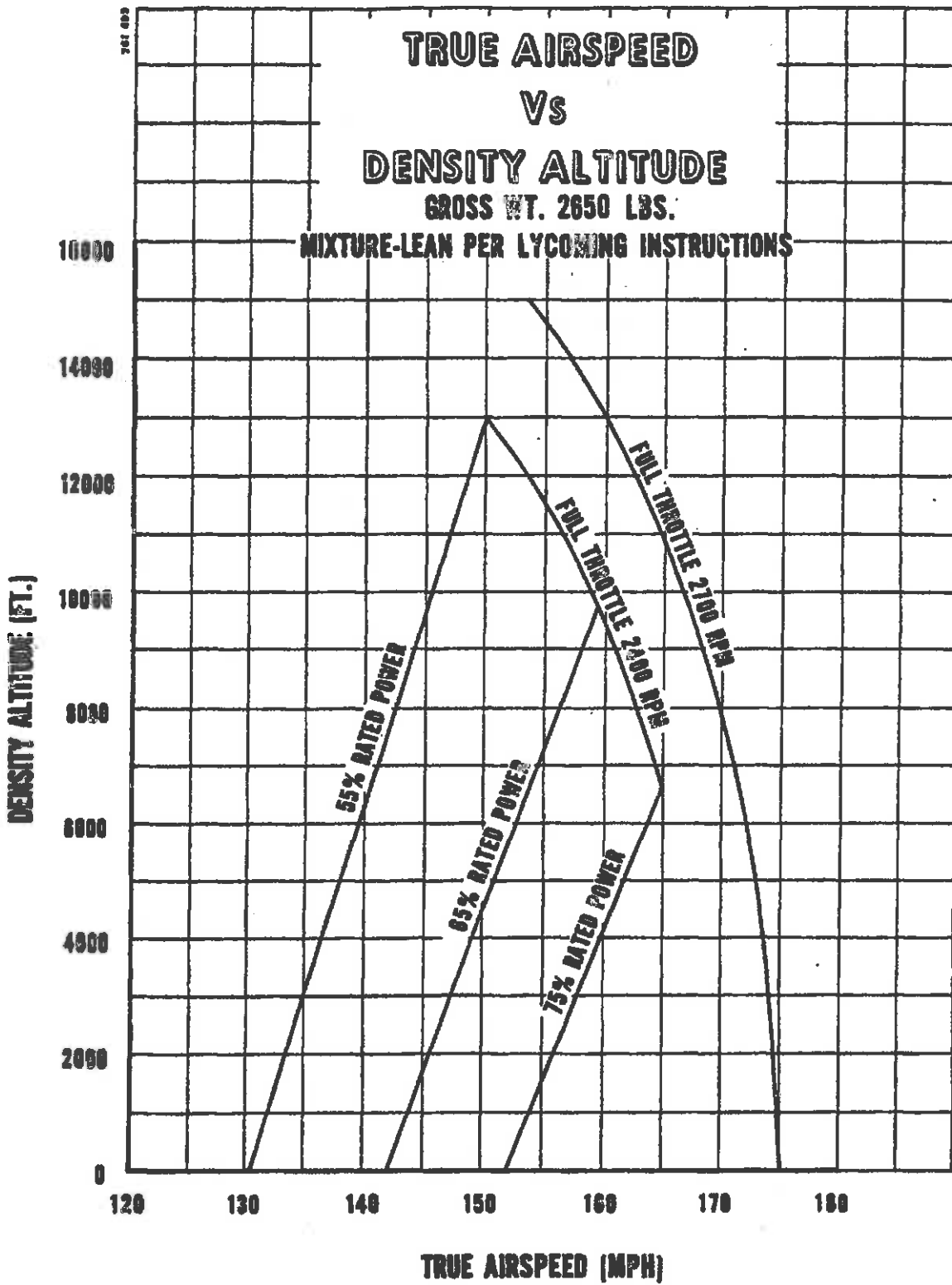
NOTE: SEE SECTION 6 FOR EFFECTS OF AIR CONDITIONING  
INSTALLATION ON TAKE-OFF DISTANCE

\*REF SHORT FIELD,  
OBSTACLE CLEARANCE  
PROCEDURE IN  
SECTION III



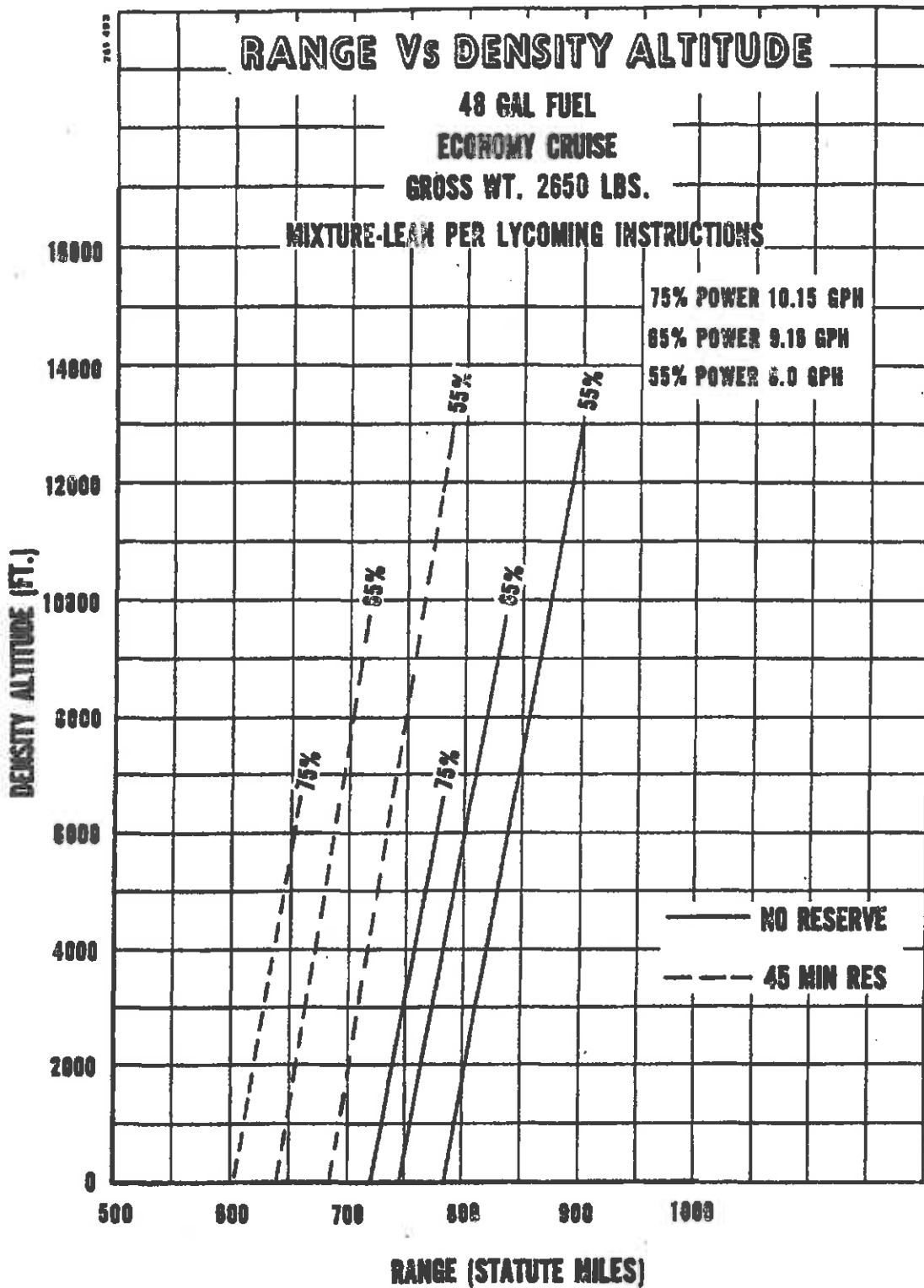


NOTE: SEE SECTION 6 FOR EFFECTS OF AIR CONDITIONING  
INSTALLATION ON RATE OF CLIMB.



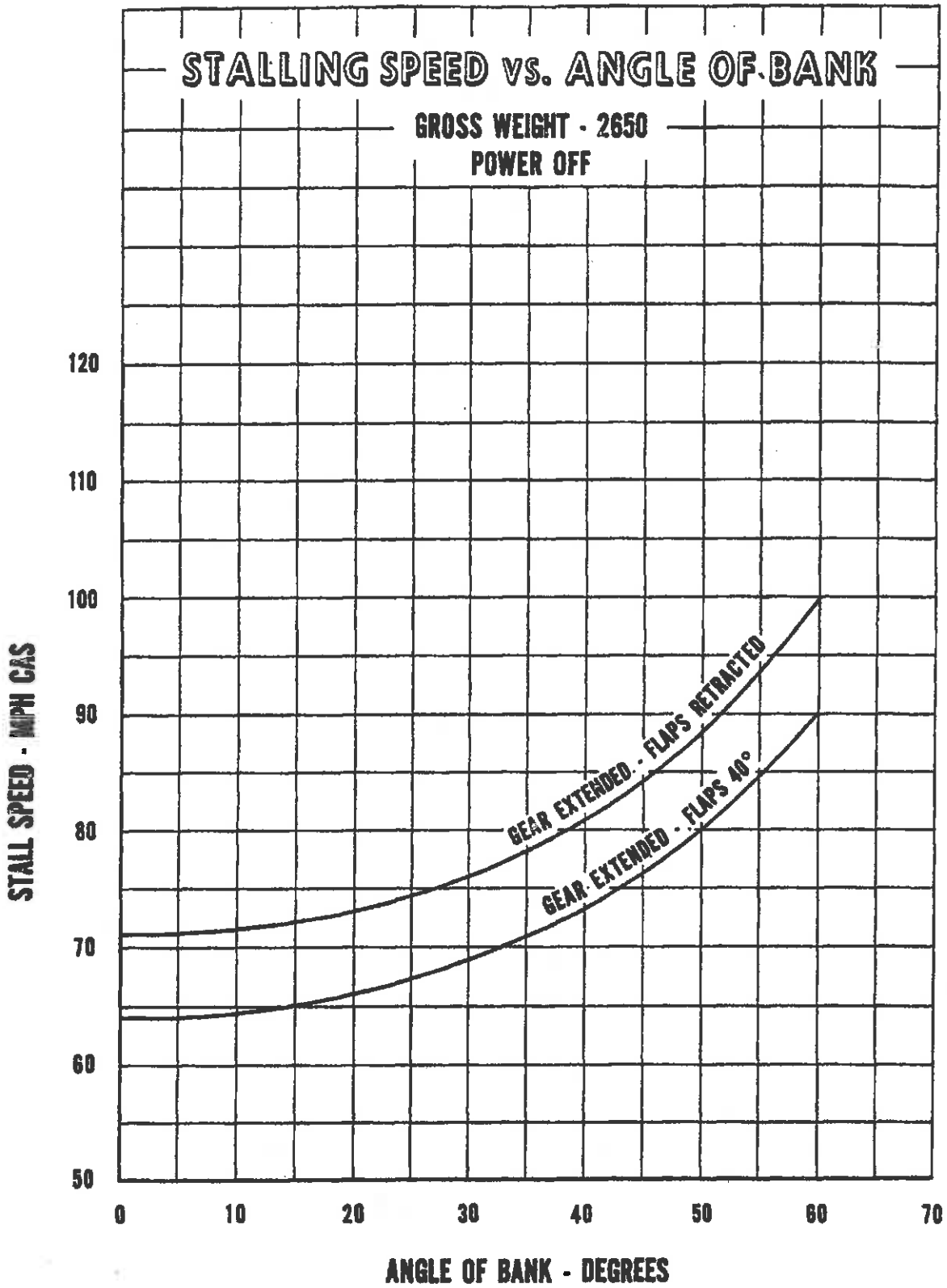
NOTE: SEE SECTION 6 FOR EFFECTS OF AIR CONDITIONING  
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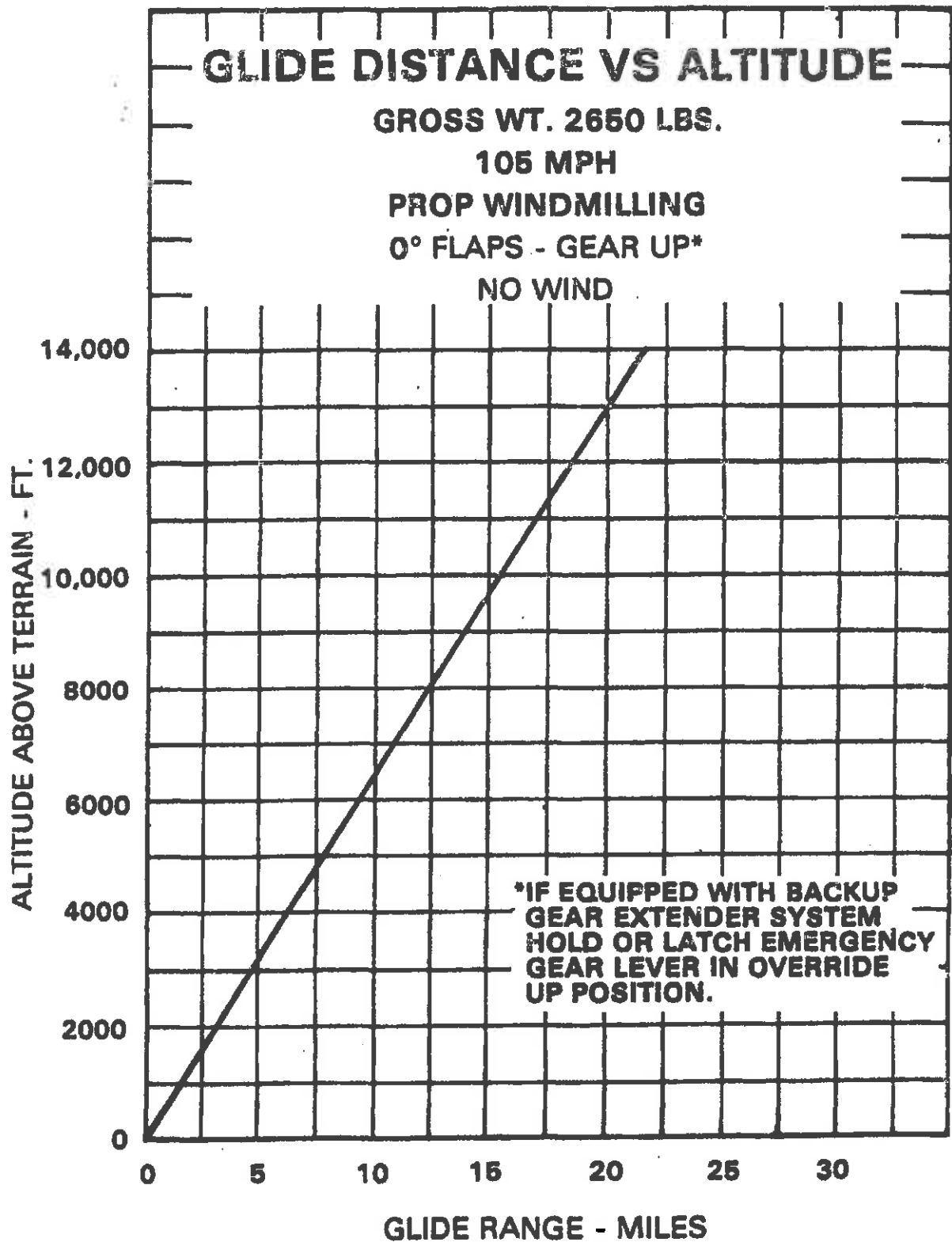
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REVISED: June 15, 1972

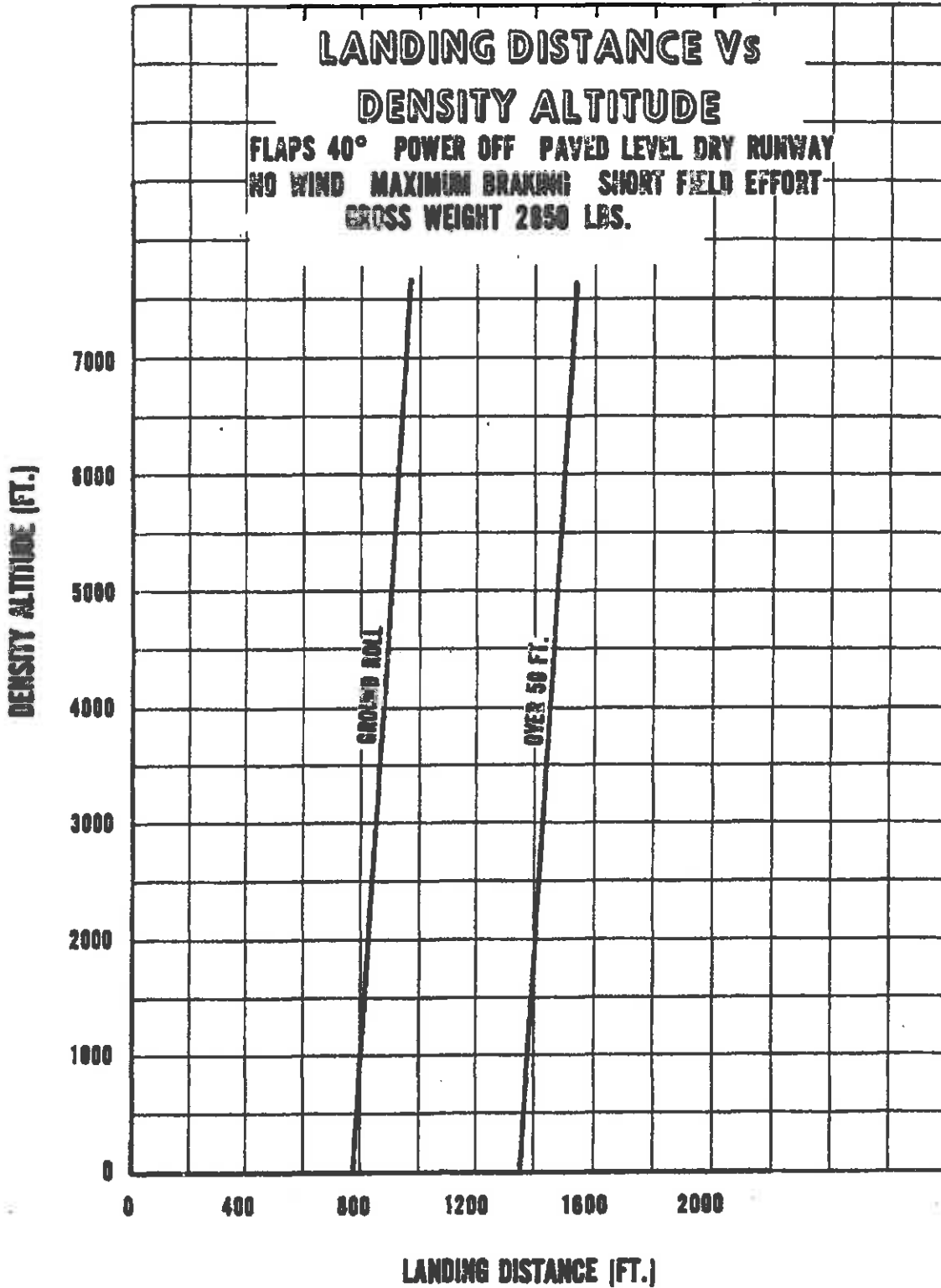


NOTE: SEE SECTION 6 FOR EFFECTS OF AIR CONDITIONING  
INSTALLATION ON RANGE.

PERFORMANCE CHARTS  
ISSUED: November 15, 1971  
REVISED: June 15, 1972







**Power Setting Table - Lycoming Model IO-360-C Series, 200 HP Engine**

Press. Alt Feet	Std. Alt Temp ° F	110 HP - 55% Rated RPM AND MAN. PRESS.		130 HP - 65% Rated RPM AND MAN. PRESS.		150 HP - 75% Rated RPM AND MAN. PRESS.		Press. Alt Feet
		2100	2400	2100	2400	2400	2400	
SL	59	22.9	20.4	25.9	22.9	25.5	24.4	SL
1,000	55	22.7	20.2	25.6	22.7	25.2	24.4	1,000
2,000	52	22.4	20.0	25.4	22.5	25.0	24.4	2,000
3,000	48	22.2	19.8	25.1	22.2	24.7	24.4	3,000
4,000	45	21.9	19.5	24.8	22.0	24.4	24.4	4,000
5,000	41	21.7	19.3	FT	21.7	FT	24.4	5,000
6,000	38	21.4	19.1	—	21.5	—	24.4	6,000
7,000	34	21.2	18.9	—	21.3	—	24.4	7,000
8,000	31	21.0	18.7	—	21.0	—	24.4	8,000
9,000	27	FT	18.5	—	FT	—	24.4	9,000
10,000	23	—	18.3	—	—	—	24.4	10,000
11,000	19	—	18.1	—	—	—	24.4	11,000
12,000	16	—	17.8	—	—	—	24.4	12,000
13,000	12	—	17.6	—	—	—	24.4	13,000
14,000	9	—	FT	—	—	—	24.4	14,000

To maintain constant power, correct manifold pressure approximately 0.16" Hg for each 10°F variation in inlet air temperature from standard altitude temperature. Add manifold pressure for air temperatures above standard; subtract for temperatures below standard.

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## HANDLING AND SERVICING

This section contains information on preventive maintenance. Refer to the appropriate Service Manual for further maintenance procedures. Any complex repair or modification should be accomplished by a Piper Certified Service Center.

### GROUND HANDLING

#### TOWING

The airplane may be moved by using the nose wheel steering bar provided, or power equipment that will not damage or cause excess strain to the nose gear assembly. The steering bar is stowed in the baggage compartment.

#### CAUTION

When towing with power equipment, do not turn nose gear more than 30 degrees in either direction as this will result in damage to the nose gear and steering mechanism.

#### TAXIING

Before attempting to taxi the airplane, ground personnel should be checked out by a qualified pilot or other responsible person. Engine starting and shut-down procedures should be covered as well as taxi techniques. When it is ascertained that the propeller back blast and taxi areas are clear, power should be applied to start the taxi roll and the following checks should be performed.

- a. Taxi forward a few feet and apply brakes to determine their effectiveness.
- b. Taxi with propeller set in low pitch, high RPM setting.
- c. While taxiing, make slight turns to ascertain the effectiveness of steering.
- d. Observe wing clearances when taxiing near buildings or other stationary objects. If possible, station a guide outside the airplane to observe.
- e. When taxiing on uneven ground, look for holes and ruts.
- f. Do not operate the engine at high RPM when running up or taxiing over ground containing loose stones, gravel or any loose material that may cause damage to the propeller blades.

## ARROW II

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### PARKING

When parking the airplane, insure that it is sufficiently protected against adverse weather conditions and presents no danger to other aircraft. When parking the airplane for any length of time or overnight, it is recommended that it be moored securely.

- a. To park the airplane, head it into the wind, if possible.
- b. Set the parking brake. (Use wheel chocks if available.)

#### NOTE

Care should be taken to avoid setting brakes that are overheated or during cold eather when accumulated moisture may freeze a brake.

### MOORING

The airplane should be moored to insure its immovability, protection and security under varying weather conditions. The following procedure should be used for proper mooring of the airplane.

- a. Head the airplane into the wind, if possible.
- b. Lock the aileron and stabilator controls by looping the seat belt through the control wheel and pulling it tight.
- c. Block the wheels.
- d. Secure tie down ropes to the wing tie down rings and tail skid at approximately 45-degree angles to the ground.

#### CAUTION

Use bowline knots or locked slip knot. Do not use a plain slip knot.

#### NOTE

Additional preparations for high winds include using tie down ropes from the landing gear forks, and securing the rudder.

---

**CLEANING****CLEANING ENGINE COMPARTMENT**

Before cleaning the engine compartment, place a strip of tape on the magneto vents to prevent solvent from entering these units.

- a. Place a large pan under the engine to catch waste.
- b. With the engine cowling removed, spray or brush the engine with solvent or a mixture of solvent and degreaser, as desired. Where heavy grease and dirt deposits have collected, it may be necessary to brush areas that were sprayed, in order to clean them.

**CAUTION**

Do not spray solvent into the alternator, vacuum pump, starter or air intakes.

- c. Allow the solvent to remain on the engine from five to ten minutes. Then rinse the engine clean with additional solvent and allow to dry.

**CAUTION**

Do not operate engine until excess solvent has evaporated or otherwise been removed.

- d. Remove the protective covers from the magnetos.
- e. Lubricate controls, bearing surfaces, etc., in accordance with the Lubrication Chart.

**CLEANING LANDING GEAR**

Before cleaning the landing gear, place a plastic cover or similar material over the wheel and brake assembly.

- a. Place a pan under the gear to catch waste.
- b. Spray or brush the gear area with solvent or a mixture of solvent and degreaser, as desired. Where heavy grease and dirt deposits have collected, it may be necessary to brush areas that were sprayed, in order to clean them.
- c. Allow the solvent to remain on the gear from five to ten minutes. Then rinse the gear with additional solvent and allow to dry.
- d. Remove the cover from the wheel and remove the catch pan.
- e. Lubricate the gear in accordance with the Lubrication Chart.
- f. Caution: Do not brush the micro switches.

## ARROW II

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### CLEANING EXTERIOR SURFACES

The airplane should be washed with a mild soap and water. Harsh abrasive or alkaline soaps or detergents used on painted or plastic surfaces could make scratches or cause corrosion of metal surfaces. Cover areas where cleaning solution could cause damage. To wash the airplane, the following procedure may be used:

- a. Flush away loose dirt with water.
- b. Apply cleaning solution with a rag, sponge or soft bristle brush.
- c. To remove stubborn oil and grease, use a cloth dampened with naphtha.
- d. Where exhaust stains exist, allow solution to remain on the surface longer.
- e. Any good automotive wax may be used to preserve the painted surfaces. Soft cleaning cloths or a chamois should be used to prevent scratches when cleaning or polishing. A heavier coating of wax on the leading surfaces will reduce the abrasion problems in these areas.

### CLEANING WINDSHIELD AND WINDOWS

- a. Remove dirt, mud, and other marks from exterior surface with clean water.
- b. Wash with mild soap and warm water or an aircraft plastic cleaner. Use a soft cloth or sponge using a straight rubbing motion. Do not rub surface harshly.
- c. Remove oil and grease with a cloth moistened with kerosene.

#### NOTE

Do not use gasoline, alcohol, benzene, carbon tetrachloride, thinner, acetone, or window cleaning sprays.

- d. After cleaning plastic surfaces, apply a thin coat of hard polishing wax. Rub lightly with a soft cloth. Do not use a circular motion.
- e. A severe scratch or mar in plastic can be removed by using jeweler's rouge to rub out the scratch. Smooth both sides and apply wax.

### CLEANING HEADLINER, SIDE PANELS AND SEATS

- a. Clean headliner, side panels and seats with a stiff bristle brush, and vacuum where necessary.
- b. Soiled upholstery, except leather, may be cleaned by using an approved foam upholstery cleaner. Carefully follow the manufacturer's instructions. Avoid soaking or harsh rubbing.

#### CAUTION

Solvent cleaners require adequate ventilation.

### CLEANING CARPETS

Use a small whisk broom or vacuum cleaner to remove dirt. For soiled spots, use a non-inflammable dry cleaning fluid.

## POWER PLANT INDUCTION AIR FILTER

The induction air filters must be cleaned at least once every 50 hours. Depending on the type of condition existing, it may be necessary to clean the filters more often.

### REMOVAL OF INDUCTION AIR FILTER

- a. Remove top cowl.
- b. Remove the thumb screws holding the filter cover.
- c. Remove filter.

### CLEANING INDUCTION AIR FILTER

- a. Tap filter gently to remove dirt particles. Do not use compressed air or cleaning solvents.
- b. Inspect filter. If paper element is torn or ruptured or gasket is damaged, the filter should be replaced. The usable life of the filter should be restricted to one year or 500 hours, whichever comes first.

### INSTALLATION OF INDUCTION AIR FILTER

- a. After cleaning or replacing filter, install filter in reverse order of removal.

## BRAKE SERVICE

The brake system is filled with MIL-H-5606 (petroleum base), red hydraulic brake fluid. This should be checked periodically or at every 100-hour inspection and replenished when necessary. The brake reservoir is located in the upper left corner of the front side of the firewall. Keep the fluid level at the level marked on the reservoir.

No adjustment of brake clearance is necessary. Refer to the Service Manual for the procedure for replacing brake linings.

## ARROW II

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### LANDING GEAR SERVICE

The main landing gear uses Cleveland Aircraft Products wheels and Cleveland single disc hydraulic brake assemblies. The main wheel tires are 6.00 x 6, four-ply rating, type III with tubes. The nose wheel uses a Cleveland Aircraft Products 5.00 wheel with a 5.00 x 5, four-ply rating, type III tire with tube.

Wheels are removed by taking off the hub cap, cotter pin, axle nut, and the two bolts holding the brake segment in place. Mark tire and wheel for reinstallation; then dismount by deflating the tire, removing the three through-bolts from the wheel and separating the wheel halves.

Landing gear oleos on the Cherokee Arrow should be serviced according to the instructions on the units. The main oleos should be extended under normal static load until  $2.0 \pm .25$  inches of oleo piston tube is exposed, and the nose gear should show  $2.75 \pm .25$  inches. To add air to the oleo struts, attach a strut pump to the valve assembly near the top of the oleo strut housing and pump the oleo to the desired position. To add oil, jack the aircraft, release the air pressure in the strut, remove the valve core and add oil through this opening with the strut extended. After the strut is full, compress it slowly and fully to allow excess air and oil to escape. With the strut still compressed reinsert the valve stem and pump up the strut as above.

In jacking the aircraft for landing gear or other service, two hydraulic jacks and a tail stand should be used. At least 250 pounds of ballast should be placed on the base of the tail stand before the airplane is jacked up. The hydraulic jacks should be placed under the jack points on the bottom of the wing and the airplane jacked up until the tail skid is at the right height to attach the tail stand. After the tail stand is attached and the ballast added, jacking may be continued until the airplane is at the height desired. There is also a jack point behind the nose gear actuating cylinder.

The steering arms from the rudder pedals to the nose wheel are adjusted at the rudder pedals or at the nose wheel by turning the threaded rod end bearings in or out. Adjustment is normally accomplished at the forward end of the rods and should be done in such a way that the nose wheel is in line with the fore and aft axis of the plane when the rudder pedals and rudder are centered. Alignment of the nose wheel can be checked by pushing the airplane back and forth with the rudder centered to determine that the plane follows a perfectly straight line. The turning arc of the nose wheel is 30 degrees in either direction and is factory adjusted at stops on the bottom of the forging. The turning radius of the nose wheel is 13 feet.

The steering arm stops should be carefully adjusted so that the nose wheel reaches its full travel just after the rudder hits its stops. This guarantees that the rudder will be allowed to move through its full travel.



## PROPELLER SERVICE

The spinner and backing plate should be cleaned and inspected frequently for cracks. The propeller should be inspected before each flight for nicks, scratches, and corrosion. If found, they should be taken care of as soon as possible by a rated mechanic, because nicks and scratches cause areas of increased stress which can cause serious damage or loss of a propeller tip. The back face of the blades should be painted when necessary with flat black paint to retard glare to the pilot's eyes. To prevent corrosion the surface should be cleaned and waxed periodically.

## OIL REQUIREMENTS

The oil capacity of the Lycoming engine is 8 quarts with a minimum safe quantity of 2 quarts. It is recommended that engine oil be drained and renewed every 50 hours. The oil filter element should be changed every 50 hours of operation. The interval between oil and oil filter changes should not exceed a total of four months. Under unfavorable dusty conditions, the oil and oil filter should be changed more frequently. Should fuel other than the specified octane rating for the power plant be used, refer to the latest issue of Lycoming Service Letter No. L185 for additional information and recommended service procedures.

The following seasonal aviation oil grades and seasonal ambient temperature ranges are recommended.

Average Ambient Temperature	MIL-L-6082B Mineral SAE Grade	MIL-L-22851 Ashless Dispersant SAE Grades
All Temperatures	--	15W-50 or 20W-50
Above 80°F	60	60
Above 60°F	50	40 or 50
30°F to 90°F	40	40
0°F to 70°F	30	30, 40 or 20W-40
0°F to 90°F	20W-50	20W-50 or 15W-50
Below 10°F	20	30 or 20W-30

When operating temperatures overlap indicated ranges, use the lighter grade oil.

### NOTE

Refer to the latest issue of Textron Lycoming Service Instruction 1014 (Lubricating Oil Recommendations) for further information.

## FUEL SYSTEM

The fuel screens in the strainer and the injector will require cleaning every 50 hour inspection. The screen in the injector is located in the housing where the fuel inlet line connects to the injector. The fuel strainer, located ahead of the firewall, is accessible for cleaning by removal of the lower cowl. When the strainers are reassembled after cleaning, a small amount of grease applied to the gasket will facilitate assembly.

### FUEL REQUIREMENTS (AVGAS ONLY)

A minimum octane of 100/130 Aviation Grade fuel must be used in the Arrow II. Since the use of lower grades can cause serious engine damage in a short period of time, the engine warranty is invalidated by the use of lower octanes.

## **ARROW II**

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### **FILLING FUEL TANKS**

Observe all required precautions for handling gasoline. Fill the fuel tanks to the bottom of the filler neck. Each wing tank holds a maximum of 25 gallons, giving a total of 50 gallons of fuel.

### **DRAINING FUEL VALVES AND LINES**

The fuel strainer, located on the lower left side of the firewall, is provided with a quick drain which should be drained before the first flight of the day or after refueling, to check for fuel contamination. If contamination is found, fuel should be drained until the contamination stops. If contamination persists after draining fuel for a minute, contact a mechanic to check the fuel system.

Each fuel tank is provided with a fuel quick drain to check for contamination. Each tank should be checked for contamination in accordance with the above procedure.

### **DRAINING FUEL SYSTEM**

The bulk of the fuel may be drained from the fuel cells by the use of a siphon hose placed in the cell or tank through the filler neck. The remainder of the fuel may be drained by opening all the drain valves.

### **CAUTION**

Whenever the fuel system is completely drained and fuel is replenished it will be necessary to run the engine for a minimum of 3 minutes at 1000 RPM on each tank to ensure no air exists in the fuel supply lines.

### **TIRE INFLATION**

For maximum service from the tires, keep them inflated to the proper pressure of 30 psi for nose tire and 27 psi for main tires. Interchange the tires periodically for even wear. All wheels and tires are balanced before original installation, and the relationship of the tire, tube and wheel should be maintained upon reinstallation. In the installation of new components, it may be necessary to rebalance the wheels with the tire mounted. Unbalanced wheels can cause extreme vibration in the landing gear.

### **BATTERY SERVICE**

Access to the battery is gained through the baggage compartment. It is located just aft of the baggage compartment. The battery container has a plastic drain tube which is normally closed off. This tube should be drained periodically to remove battery acid which may have collected in the tube.

The battery fluid level must not be brought above the baffle plates. It should be checked every 30 days to determine that the fluid level is proper and the connections are tight and free of corrosion.

If the battery is not properly charged, recharge it starting with a rate of four amperes and finishing with a rate of two amperes. The battery should be removed from the airplane for charging, and quick drains are not recommended.

The external power receptacle, if installed, is located on the right side of the fuselage aft of the baggage compartment door.

Refer to the Arrow II Service Manual for battery servicing procedure.

#### **WINTERIZATION**

For winter operation a winterization kit is installed on the inlet opening of the oil cooler plenum chamber. This kit should be installed whenever the ambient temperature is 50° F or less. When the kit is not being used it can be stowed on a bracket provided for this purpose on the outboard side of the oil cooler plenum chamber.

**ARROW II**

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## FACTS YOU SHOULD KNOW

The Federal Aviation Administration (FAA) occasionally publishes **Airworthiness Directives (AD's)** that apply to specific groups of aircraft. They are mandatory changes and are to be complied with within a time limit set by the FAA. When an AD is issued, it is sent by the FAA to the latest registered owner of the affected aircraft and also to subscribers of their service. Owners should periodically check with their Piper Service Center or Piper's Customer Services Department to see whether they have the latest AD against their airplane. The owner is solely responsible for keeping up with ADs.

Piper Aircraft Corporation takes a **continuing interest** in having owners get the most efficient use from their airplane and keeping it in the best mechanical condition. Consequently, Piper Aircraft, from time to time, issues service releases including Service Bulletins, Service Letters, Service Spares Letters, and others relating to the airplane.

**Piper Service Bulletins** are of special importance and Piper considers compliance mandatory. These are sent directly to the latest FAA-registered owners in the United States (U.S.) and Piper Service Centers worldwide. Depending on the nature of the release, material and labor allowances may apply. This information is provided to all authorized Piper Service Centers.

**Service Letters** deal with product improvements and servicing techniques pertaining to the airplane. They are sent to Piper Service Centers and, if necessary, to the latest FAA-registered owners in the U.S. Owners should give careful attention to Service Letter information.

**Service Spares Letters** offer improved parts, kits, and optional equipment which were not available originally, and which may be of interest to the owner.

Piper Aircraft Corporation offers a **subscription service** for Service Bulletins, Service Letters, and Service Spares Letters. This service is available to interested persons such as owners, pilots, and mechanics at a nominal fee, and may be obtained through an authorized Piper Service Center or Piper's Customer Services Department.

**Service manuals, parts catalogs, and revisions to both, are available from Piper Service Centers or Piper's Customer Services Department. Any correspondence regarding the airplane should include the airplane model and serial number to ensure proper response.**

**Pilot's Operating Manual** supplements are distributed by the manufacturer as necessary. These revisions and additions should be studied and put into the operating manual to keep it up to date. This manual contains important information about the operation of the aircraft and should be kept with the aircraft at all times, even after resale. Every owner, to avail himself of Piper Aircraft's support systems, should stay in close contact with an authorized Piper Service Center or Piper's Customer Services Department so that he can receive the latest information.

If the owner desires to have his aircraft modified, he must obtain FAA approval for the alteration. **Major alterations** accomplished in accordance with Advisory Circular 43.13-2, when performed by an A & P mechanic, may be approved by the local FAA office. Major alterations to the basic airframe or systems not covered by AC 43.13-2 require a Supplemental Type Certificate.

## ARROW II

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The owner or pilot is required to ascertain that the following Aircraft Papers are in order and in the aircraft.

- a. To be displayed in the aircraft at all times:
  1. Aircraft Airworthiness Certificate Form FAA-1362B.
  2. Aircraft Registration Certificate Form FAA-500A.
  3. Aircraft Radio Station License Form FCC-404A, if transmitters are installed.
- b. To be carried on the aircraft at all times:
  1. Aircraft Flight Manual.
  2. Weight and Balance data plus a copy of the latest Repair and Alteration Form FAA-337, if applicable.
  3. Aircraft equipment list.

Although the aircraft and engine logbooks are not required to be in the aircraft, they should be made available upon request. Log books should be complete and up to date. Good records will reduce maintenance cost by giving the mechanic information about what has or has not been accomplished.

## PREVENTIVE MAINTENANCE

The holder of a pilot certificate issued under Federal Aviation Regulations (FAR) Part 61 may perform certain preventive maintenance as defined in the FARs. This maintenance may be performed only on an aircraft which the pilot owns and operates, and which is not used in air carrier or air taxi/commercial operations service

All other aircraft maintenance must be accomplished by a person or facility appropriately certificated by the Federal Aviation Administration (FAA) to perform that work.

Anytime maintenance is accomplished, an entry must be made in the appropriate aircraft maintenance records. The entry shall include:

- (a) The date the work was accomplished.
- (b) Description of the work.
- (c) Number of hours on the aircraft.
- (d) The certificate number of pilot performing the work.
- (e) Signature of the individual doing the work.

## REQUIRED SERVICE AND INSPECTION PERIODS

The Owner Service Agreement which the owner receives upon delivery of the aircraft should be kept in the aircraft at all times. This identifies him to authorized Piper dealers and entitles the owner to receive service in accordance with the regular service agreement terms. This agreement also entitles the transient owner full warranty by any Piper dealer in the world.

Piper Aircraft Corporation has developed inspection items and required inspection intervals for the PA-28 (see PA-28 Service and Inspection Manuals). The PA-28 Inspection Manual contains appropriate forms, and all inspection procedures should be complied with by a properly trained, knowledgeable, and qualified mechanic at a Piper Authorized Service Center or a reputable repair shop. Piper Aircraft Corporation cannot accept responsibility for the continued airworthiness of any aircraft not maintained to these standards, and/or not brought into compliance with applicable Service Bulletins issued by Piper Aircraft Corporation, instructions issued by the engine, propeller, or accessory manufacturers, or Airworthiness Directives issued by the FAA.

A Progressive Inspection, approved by the Federal Aviation Administration (FAA), is also available to the owner. This involves routine and detailed inspections to allow maximum utilization of the airplane. Maintenance inspection costs are reduced, and the maximum standard of continued airworthiness is maintained. Complete details are available from Piper Aircraft Corporation.

In addition, but in conjunction with the above, the FAA requires periodic inspections on all aircraft to keep the Airworthiness Certificate in effect. The owner is responsible for assuring compliance with these inspection requirements and for maintaining proper documentation in logbooks and/or maintenance records.

A spectrographic analysis of the engine oil is available from several sources. This inspection, if performed properly, provides a good check of the internal condition of the engine. To be accurate, induction air filters must be cleaned or changed regularly, and oil samples must be taken and sent in at regular intervals.

IDENTIFICATION LETTER	LUBRICANT	SPECIFICATION	PREFERRED PRODUCT AND VENDOR
A	LUBRICATING OIL, GENERAL PURPOSE, LOW TEMP	MIL-L-7870	
B	LUBRICATING OIL, AIRCRAFT RECIPROCATING ENGINE (PISTON) GRADE AS SPECIFIED SAE 50 ABOVE 80°F AIR TEMP, SAE 40 30°F TO 80°F AIR TEMP, SAE 30 0° TO 70°F AIR TEMP, SAE 20 BELOW 10°F AIR TEMP.	MIL-L-6082	
C	HYDRAULIC FLUID	MIL-H-5506	
D	PETROLEUM BASE GREASE, AIRCRAFT AND INSTRUMENT, GEAR AND ACTUATOR SCREW GREASE, AIRCRAFT, HIGH TEMP.	MIL-G-23827	TEXAGO MARFAK ALL PURPOSE GREASE, MOBIL GREASE 77 (OR MOBILUX EP2), SHELL ALVANIA EP GREASE 2
E			
F	COMPOUND, SILICONE, SOFT FILM	MIL-C-21567	FISKE BROS. REFINING CO.
G	PARKER "O" RING LUBRICANT		
H	AERO LUBRIPATE		
I	FLUOROCARBON RELEASE AGENT DRY LUBRICANT	MS-122	
J	GEN PURPOSE AIRCRAFT	MIL-G-7711	

**SPECIAL INSTRUCTIONS**

1. AIR FILTER - TO CLEAN FILTER, TAP GENTLY TO REMOVE DIRT PARTICLES. DO NOT BLOW OUT WITH COMPRESSED AIR OR USE OIL. REPLACE FILTER IF PUNCTURED OR DAMAGED.
2. BEARINGS AND BUSHINGS - CLEAN EXTERIOR WITH A DRY TYPE SOLVENT BEFORE LUBRICATING.
3. WHEEL BEARINGS - DISASSEMBLE AND CLEAN WITH A DRY TYPE SOLVENT. ASCERTAIN THAT GREASE IS PACKED BETWEEN THE BEARING ROLLER AND CONE. DO NOT PACK GREASE IN WHEEL HOUSING.
4. OLEO STRUTS, HYDRAULIC PUMP RESERVOIR AND BRAKE RESERVOIR - FILL PER INSTRUCTIONS ON UNIT OR CONTAINER, OR REFER TO SERVICE MANUAL, SECTION II
5. PROPELLER - REMOVE ONE OF THE TWO GREASE FITTINGS FOR EACH BLADE. APPLY GREASE THROUGH FITTING UNTIL FRESH GREASE APPEARS AT HOLE OF REMOVED FITTING.
6. LUBRICATION POINTS - WIPE ALL LUBRICATION POINTS CLEAN OF OLD GREASE, OIL, DIRT, ETC. BEFORE LUBRICATING.
7. INTERVALS BETWEEN OIL CHANGES CAN BE INCREASED AS MUCH AS 100% ON ENGINES EQUIPPED WITH FULL FLOW (CARTRIDGE TYPE) OIL FILTERS, PROVIDED THE ELEMENT IS REPLACED EACH 50 HOURS OF OPERATION.

**SPECIAL INSTRUCTIONS (cont)**

8. RECOMMENDED FOR USE WHEN OPERATING AT TEMPERATURES BELOW 20°F.
9. "O" RING, CONTROL SHAFT BUSHING - DISASSEMBLE "O" RING RETAINER PLATES FROM INSTRUMENT PANEL. LUBRICATE "O" RING AND REASSEMBLE.
10. GREASE HOLES REQUIRE A NEEDLE TYPE ADAPTER ON THE GREASE GUN NOZZLE.
- 11.AILERON HINGES WITH TERLON SLEEVES SHOULD NOT BE LUBRICATED. AILERON HINGES WITHOUT TERLON SLEEVES SHOULD FIRST BE CLEANED WITH A DRY TYPE SOLVENT THEN LUBRICATED WITH MIL-L-7870 LUBRICATING OIL.

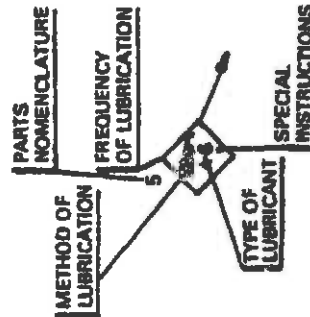
**NOTES**

1. PILOT AND PASSENGER SEATS - LUBRICATE TRACK ROLLERS AND STOP PINS AS REQUIRED. (TYPE OF LUBRICANT: "A")
2. WHEEL BEARINGS REQUIRE CLEANING AND REPACKING AFTER EXPOSURE TO AN ABNORMAL QUANTITY OF WATER.
3. FUEL SELECTOR VALVE - LUBRICATE SELECTOR VALVE AS REQUIRED, REFER TO PIPER SERVICE LETTER NO. 351
4. SEE LYCOMING SERVICE INSTRUCTIONS NO. 1014 FOR USE OF DETERGENT OIL
5. ON AIRCRAFT EQUIPPED WITH BACKUP GEAR EXTENDER.

**CAUTIONS**

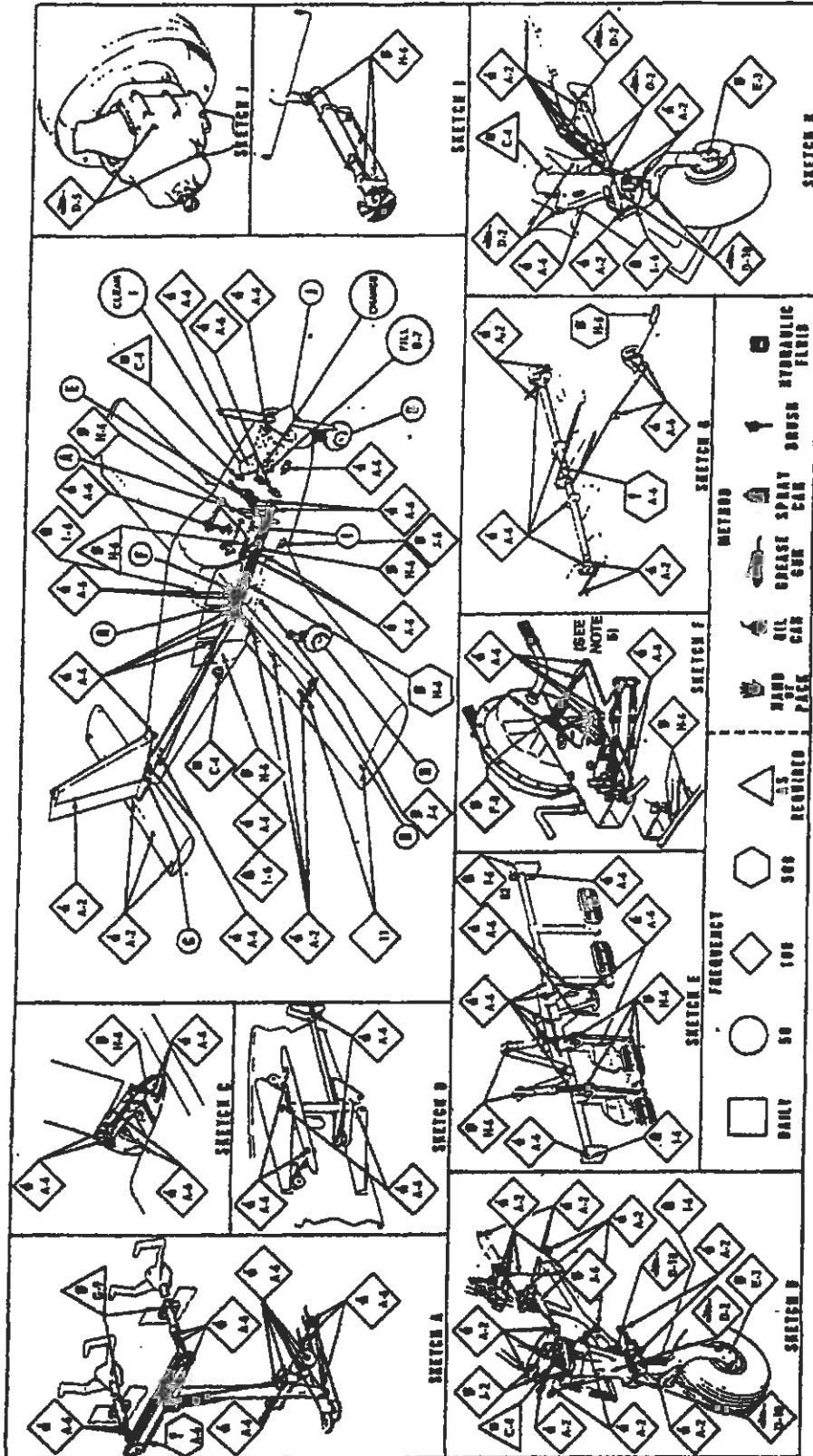
1. DO NOT USE HYDRAULIC FLUID WITH A CASTOR OIL OR ESTER BASE.
2. NO NOT OVER-LUBRICATE COCKPIT CONTROLS.
3. DO NOT APPLY LUBRICANT TO RUBBER PARTS.

**EXAMPLE**



Lubrication Nomenclature





Lubrication Chart

