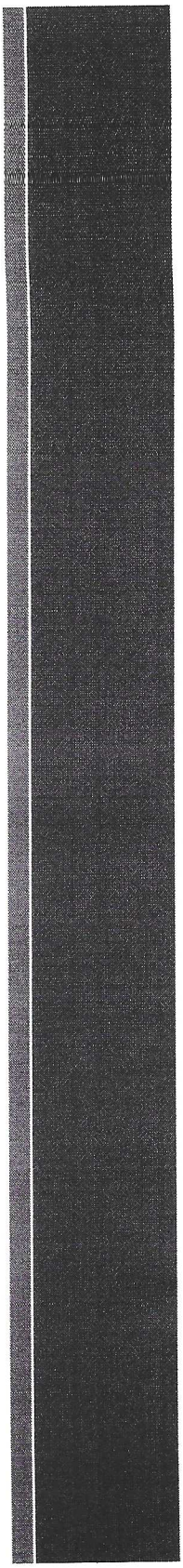

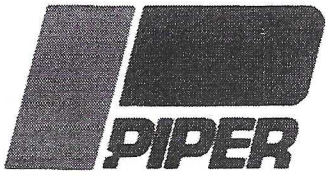

APACHE
OWNER'S HANDBOOK

APACHE

PA-23

Owner's Handbook

PIPER

Piper Aircraft Corporation, Lock Haven, Pa.
U. S. A.

Additional copies of this manual, Part No. 752 420,
may be obtained from your Piper Dealer

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FOREWORD

WITH the introduction of the Piper Apache into the utility airplane field, a new era in the development of personal and business aviation is presaged. In this era, the use and usefulness of this type of vehicle will be extended markedly through the medium of increased safety resulting from duplication of power plants.

For the Apache is the first low powered and relatively low priced twin-engined airplane to be produced in quantity anywhere in the world. It is designed to answer an accumulated demand by business and pleasure consumers for increased night, instrument and over-water utility.

Reliability, serviceability and performance have been built into the Apache to an even higher degree than in earlier Piper models. To take fullest advantage of these attributes, it is recommended that the operation and maintenance instructions provided in this manual be carefully studied and followed.

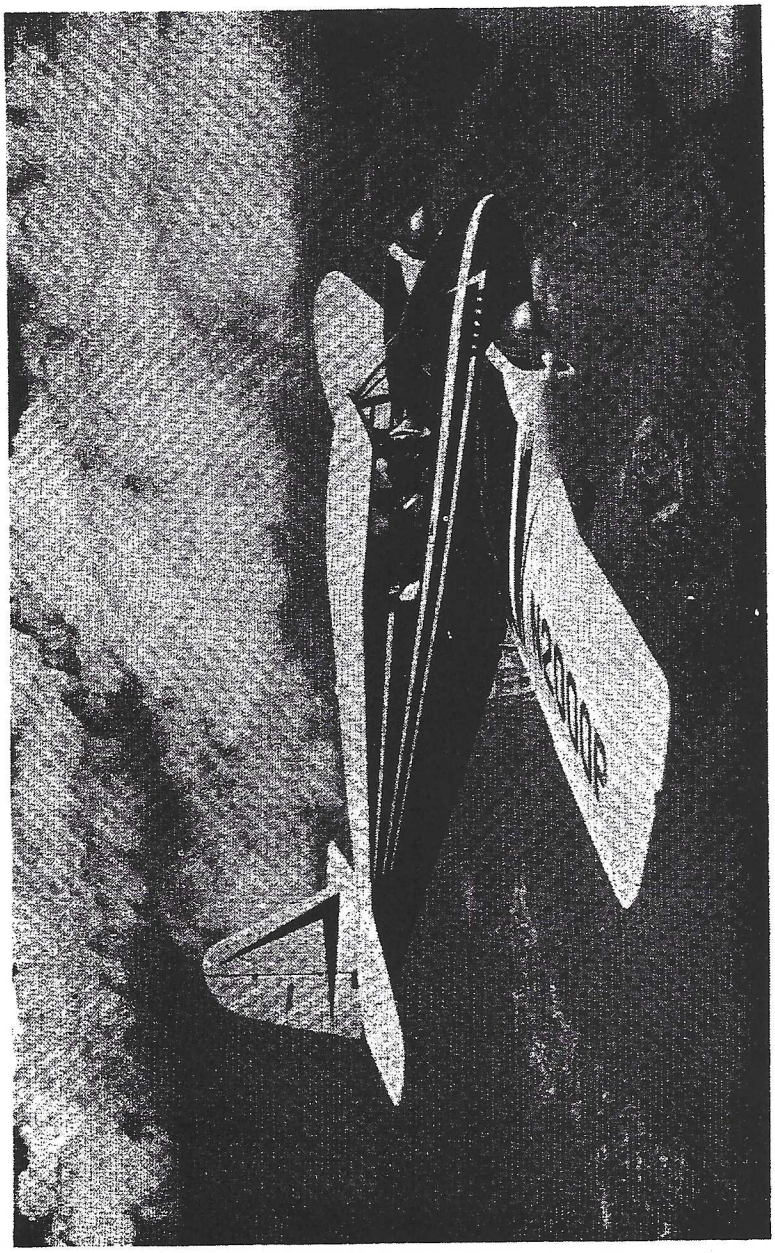


Figure 1

SECTION ONE

DESIGN FEATURES

I. SPECIFICATIONS:

Engines	Lycoming 0-320
HP and RPM	150 HP at 2700
Gross Weight (Lbs.)	3500
Empty Weight (Custom Model) (Lbs)	2200
Useful Load (Lbs.)	1300
Wing Span (Ft.)	37
Wing Area (Sq. Ft.)	204
Length (Ft.)	27.1
Height (Ft.)	9.5
Propeller Diameter (Max. In.)	76
Power Loading (Lbs. per HP)	11.7
Wing Loading (Lbs. per Sq. Ft.)	17.2
Baggage Capacity (Lbs.) Max.	200
Baggage Compartment Space (Cu. Ft.)	25
Fuel Capacity (Gals.)	72
Tire Pressure (Lbs.) Nose 27	Main 35
Wheel Base (Ft.)	7.3
Wheel Tread (Ft.)	11.3
Top Speed (MPH)	180
Optimum Cruising Speed at 75% Power, 6000' (MPH)	170
Cruising Speed at 65% Power, 9000' (MPH)	162
Sea Level Cruising Speed at 75% Power (MPH)	160
Stalling Speed (Power Off—MPH)*	59
Take-off Run (Ft.)	990
Landing Roll (Ft.)*	670
Best Rate of Climb Speed (MPH)	100
Rate of Climb (Ft. per Min.)	1350
Best Angle of Climb Speed (MPH)	76
Best Single Engine Rate of Climb Speed (MPH)	95
Single Engine Rate of Climb (Ft. per Min.)	240
Service Ceiling (Ft.)	18,500
Single Engine Absolute Ceiling (Ft.)	6750
Fuel Consumption (Gal./Hr. at 75% Power)	18.8
Fuel Consumption (Gal./Hr. at 65% Power)	16.3
Cruising Range—Maximum at 75% Power at Sea Level (Miles)	620
Cruising Range—Maximum at 65% Power at 9000' (Miles)	710
Cruising Range—Optimum (Miles)	840

* Flaps Extended.

Performance figures are for Custom model airplanes flown at gross weight under standard conditions at sea level. Any deviation from Custom equipment may result in changes in performance.

II. POWER PLANTS AND PROPELLERS:

The Lycoming 150 HP O-320 engines used in the Apache are developments of the well proven four-cylinder series of engines which have been giving excellent service in earlier Piper products for many years. Basically the same engine as the 135 HP O-290-D2, but with larger cylinders, the O-320 represents the latest and most efficient design in this series of smooth, reliable power plants. Although 10% larger in displacement and power than the 135 HP model, it is only 5% heavier in basic weight.

The right engine on the Apache is equipped with a vacuum pump, and the left engine with a generator and a hydraulic pump for actuating the landing gear and flaps. Both engines are shielded and are equipped with Woodward propeller governor units.

Engine mounts are of steel tubing construction and incorporate vibration absorbing Lord mounts on the upper engine pads, with conventional rubber cones at the lower pads. Engine cowls are largely interchangeable and are cantilever structures attached at the firewall. Side panels are quickly removable by means of quick release fasteners.

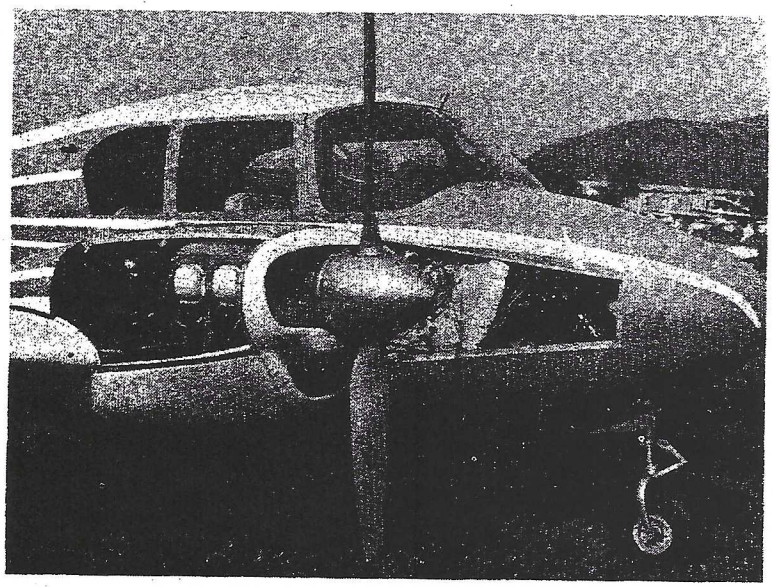


Figure 2

The exhaust system is a cross-over type with exhaust gasses directed into jet augmenter tubes located on the outboard side of each engine. This system provides for exhaust elimination without power loss, and effective engine cooling through the pumping action of the exhaust gasses into the augmenter tubes, which draws cooling air through the engine compartment; no cowl flaps or cooling flanges are needed on the cowling. Higher aircraft speeds are obtainable with this system due to reduced cooling drag and due to extra thrust furnished by the exhaust augmentation.

Efficient aluminum oil coolers are mounted on the inboard sides of each engine. Oil drainage is accomplished with quick oil drain valves located on the right rear corner of the engine crankcases.

Carburetor air is directed through quickly removable filters, located in the nose cowls, to the carburetor air boxes. Heated air for the carburetors is taken from shrouds on the exhaust manifolds through flexible tubes to the air boxes.

The propellers on the Apache are Hartzell constant-speed controllable full-feathering units. These are controlled entirely by use of the propeller pitch levers in the center of the control quadrant. Feathering of the propellers is accomplished by moving the controls fully aft through the high pitch detent into the feathering position. Feathering takes place in approximately ten seconds. The propellers are unfeathered by moving the prop controls ahead and pressing the starter buttons.

III. FUSELAGE AND WING STRUCTURES:

The Apache fuselage is a composition of four basic units: the sheet metal tail cone, cabin section and nose section, and the steel tubular structure which extends from the tail cone to the nose wheel. The steel tube unit is intended to withstand the high loads imposed on the center section region of the airplane, and provides an extra safety factor in this critical area.

Finish on the tubular unit, as on all steel tube structures in the Apache, is zinc chromate primer with synthetic enamel.

The wing structure is lightweight but rugged, and consists of a massive stepped-down front spar, a rear spar, lateral stringers, longitudinal ribs, stressed skin sheets, and a readily detachable wing tip section. The rectangular plan form of the wing permits the use of many interchangeable parts and simplifies the construction, while providing for excellent stability and performance characteristics.

The wings are attached to the tubular center section structure with fittings at the sides and in the center of this sructure, and the main spars are bolted to each other with high strength butt fittings in the center of the fuselage, making in effect a continuous main spar. This arrangement combines high strength and light weight qualities, since heavy wing hinge fittings on the spars and fuselage are eliminated, as well as an elaborate carry-through structure through the center section of the fuselage.

IV. LANDING GEAR:

All three landing gear units on the Apache incorporate the same soft acting air-oil oleo struts, and contain many directly interchangeable parts.

Main wheels are 600 x 6 Goodrich units with Goodrich expander tube brakes and 700 x 6 tires. The nose wheel is Cleveland Aircraft Products model C-38501-H, 600 x 6 with a 600 x 6 tire and tube.

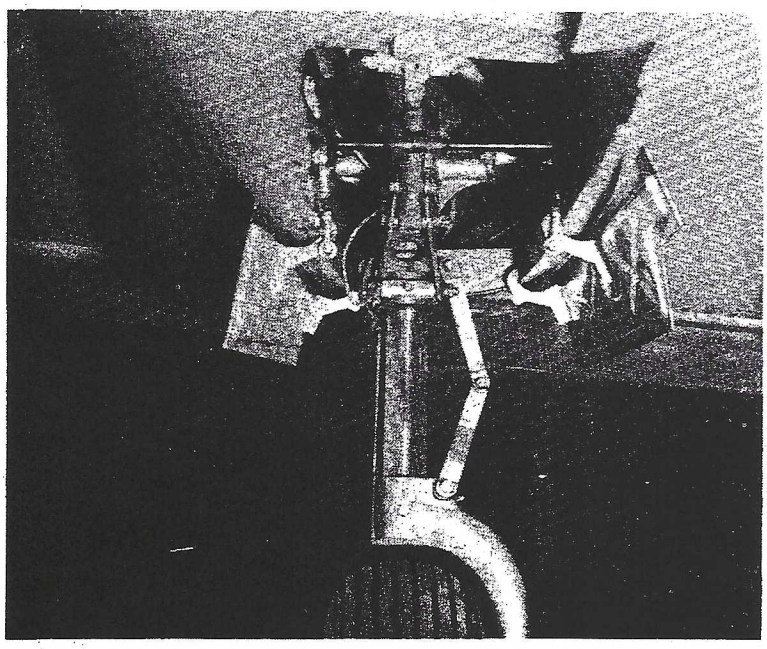


Figure 3a

Lowering and retracting of the landing gear is accomplished through hydraulic cylinders at each leg, actuated by hydraulic fluid pressure from the engine driven pump. Gear retraction is rapid, taking approximately 11 seconds. Gear lowering normally takes about 12 seconds. In the event of hydraulic pump failure, hydraulic pressure for gear or flap operation can be obtained with the manual hydraulic pump located with the gear and flap controls in the control quadrant.

For emergency extension of the landing gear if failure of the hydraulic system should occur due to line breakage or selector valve malfunctioning a separate CO_2 extension arrangement is provided. When the CO_2 control under the pilot's seat is pulled, the CO_2 flows to the gear actuating cylinders through separate lines and shuttle valves located near the cylinders, forcing the gear down. (See Operating Instructions for details).

The position of the landing gear is indicated by four light bulbs located on the pedestal. When the green lights are on, all three legs of the gear are down and locked; when the amber light is on, the gear is entirely up, and when no light is on, the gear is in an intermediate position.

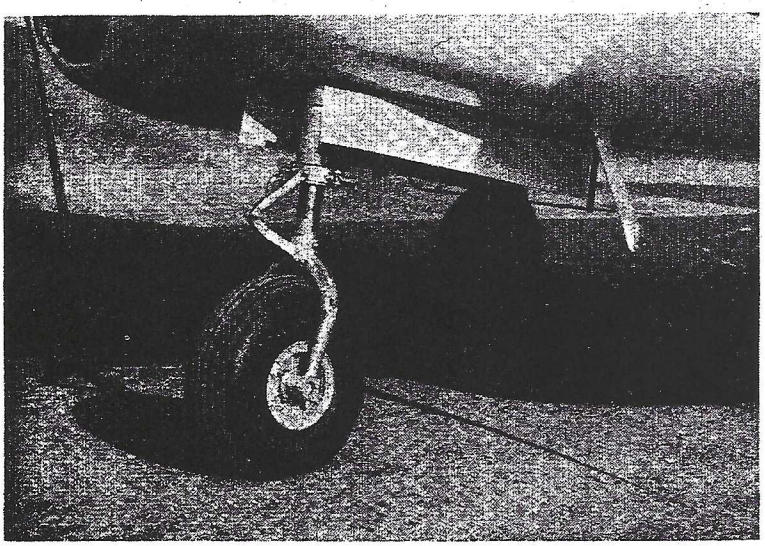


Figure 3b

A red light in the landing gear control knob flashes when the gear is up and either one of the throttles is pulled back. When both throttles are closed beyond a given power setting, with wheels not down, the landing gear warning horn sounds.

To guard against inadvertant retraction of the landing gear on the ground, a mechanical latch, which must be operated before the landing gear control can be moved upward, is positioned just above the control lever. The control knob is in the shape of a wheel to differentiate it from the flap control knob which has an airfoil shape.

The nose wheel is steerable through a 30 degree arc through use of the rudder pedals. As the nose gear retracts, the steering linkage becomes disconnected from the gear so that rudder pedal action with the gear retracted is not impeded by nose gear operation.

Main gear brakes are actuated by toe brake pedals on the left rudder pedals. Hydraulic brake cylinders located in front of the left rudder pedals are readily accessible in the cockpit for servicing. A brake fluid reservoir which is attached to the brake cylinders with flexible lines and provides a reserve of fluid for the brake system, is mounted inside the left nose access panel.

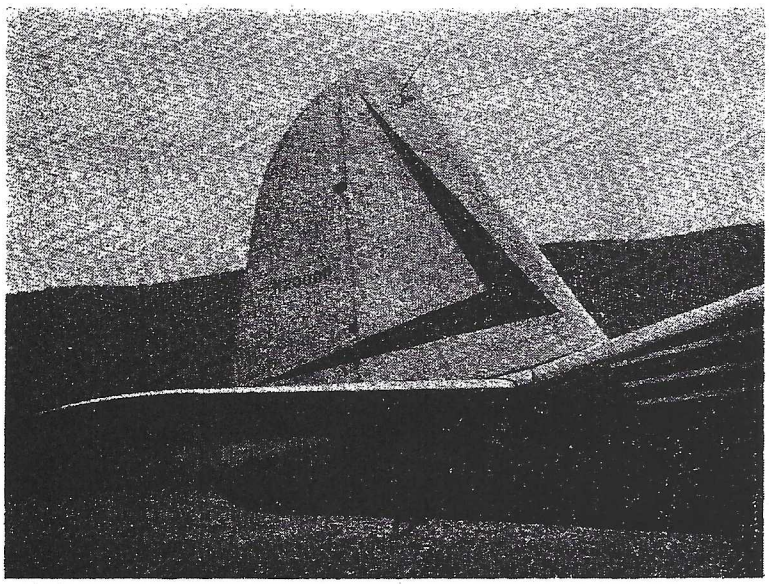


Figure 4

Parking brake valves, operated by a control on the lower left side of the instrument panel, are installed ahead of the forward cabin bulkhead and are also serviced through the left nose access panel.

V. CONTROL SYSTEM AND CONTROL SURFACES:

Dual wheel and rudder flight controls are provided in the Apache as standard equipment. All controls are light yet solid and effective in flight at all speeds down through the stalling speed. The nose wheel is steerable on the ground through the rudder pedals and the left pedals are equipped with toe brakes.

All control surfaces on the Apache are conventional sheet metal structures, fitted with cast hinges and needle bearings. The elevators are actuated by a tubular push-pull system, and the flaps by a hydraulic cylinder located in the right side of the cabin wall. Access to this cylinder is obtained by the removal of the upholstered interior panel immediately ahead of the baggage door.

The ailerons and rudder are connected by cables with the control wheel and rudder pedals. The rudder has a trim tab operated by a crank in the center of the forward cabin ceiling. Longitudinal trim is through bungee springs located back near the elevators and controlled by a larger crank adjacent to the rudder tab control.

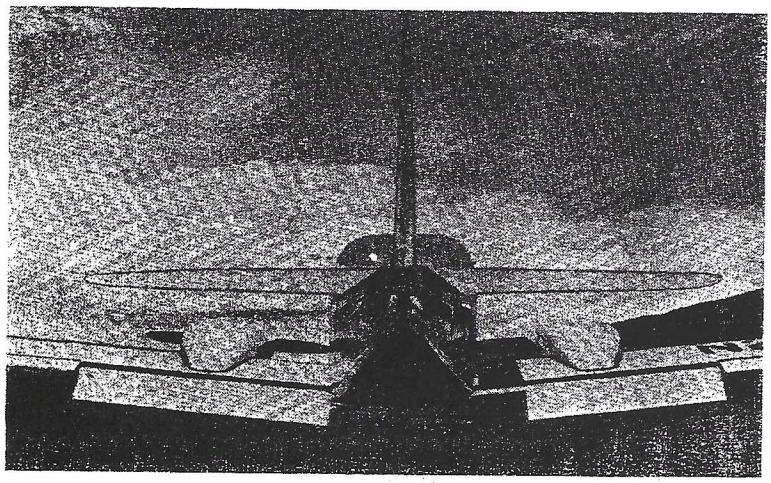
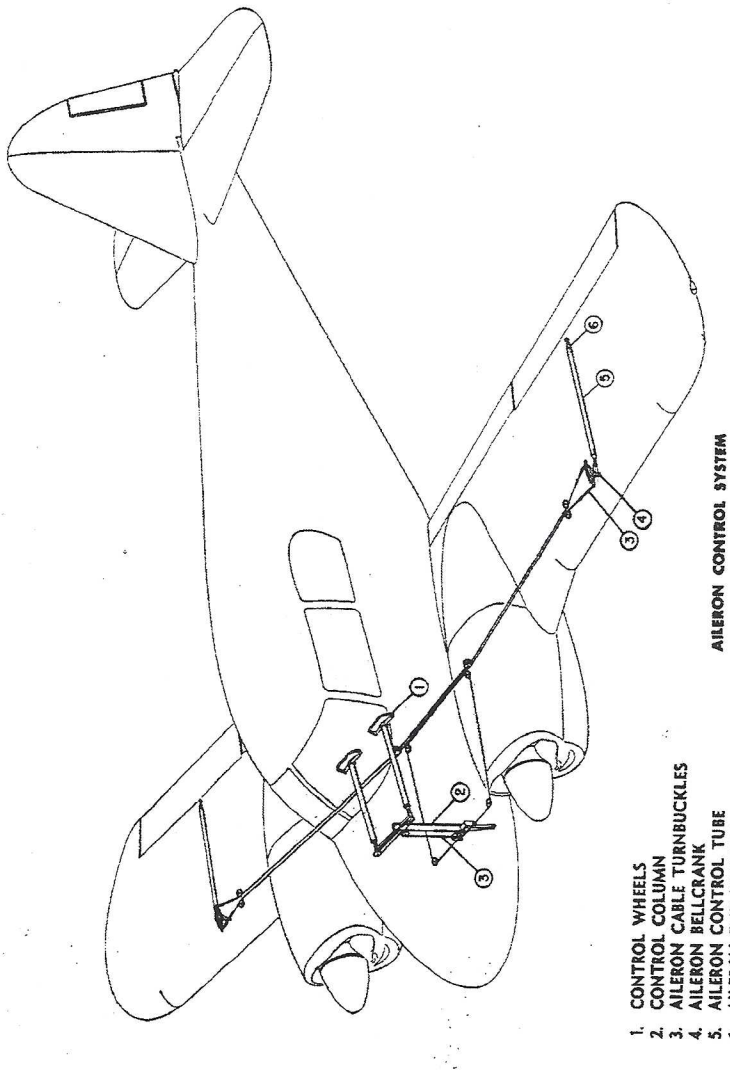
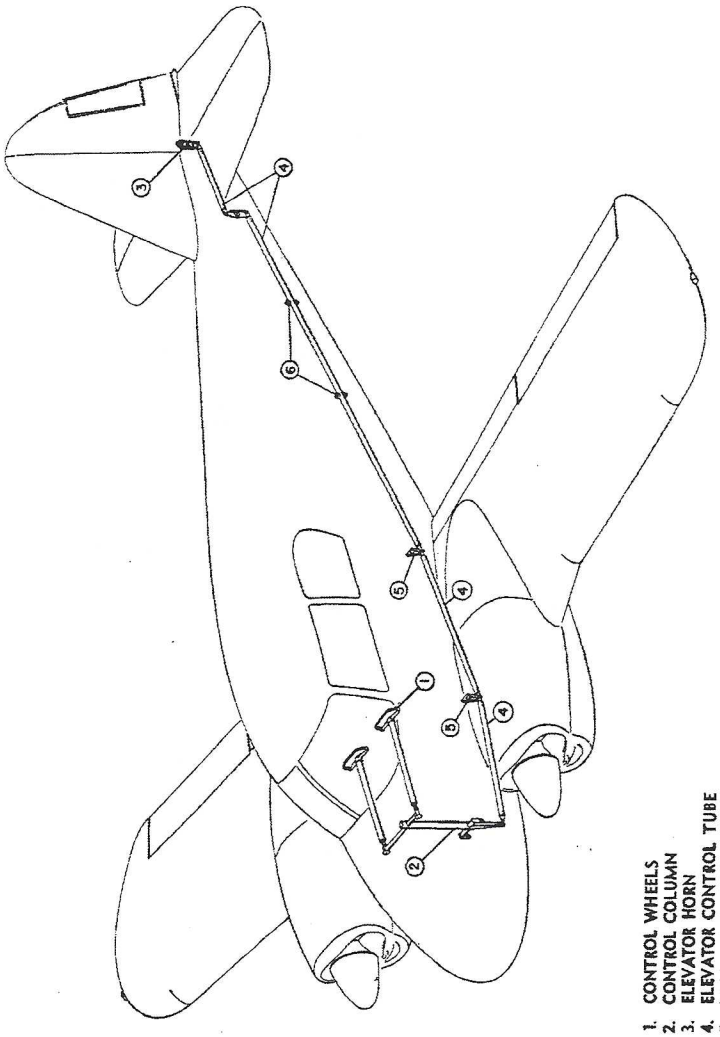


Figure 5



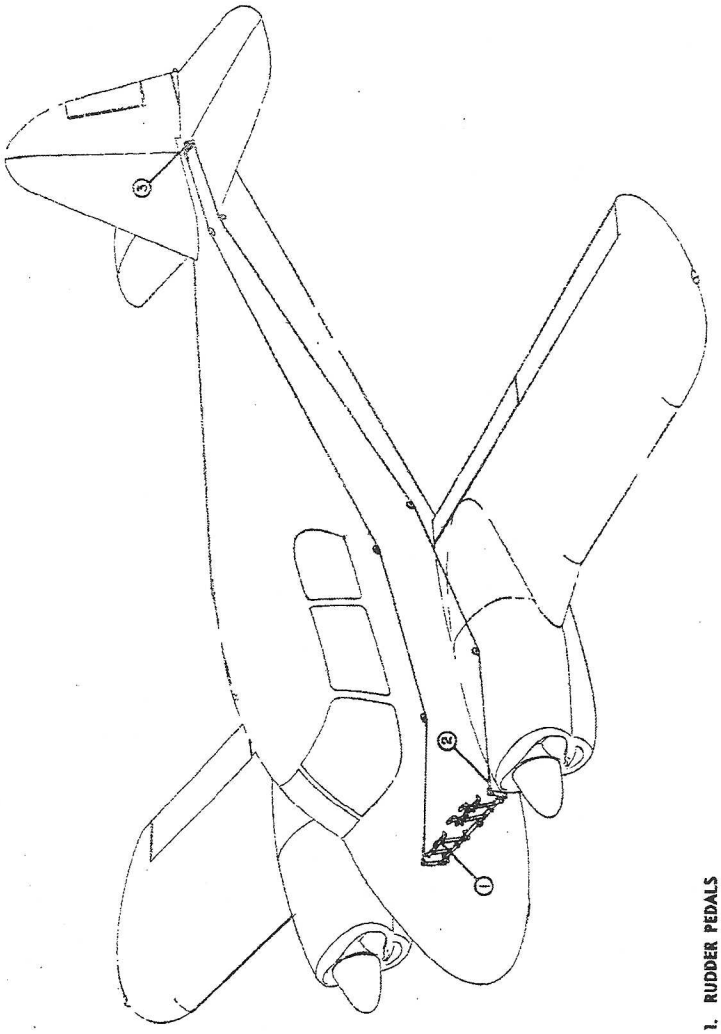
1. CONTROL WHEELS
2. CONTROL COLUMN
3. AILERON CABLE TURNBUCKLES
4. AILERON BELLCRANK
5. AILERON CONTROL TUBE
6. AILERON END BEARING

AILERON CONTROL SYSTEM
Figure 6



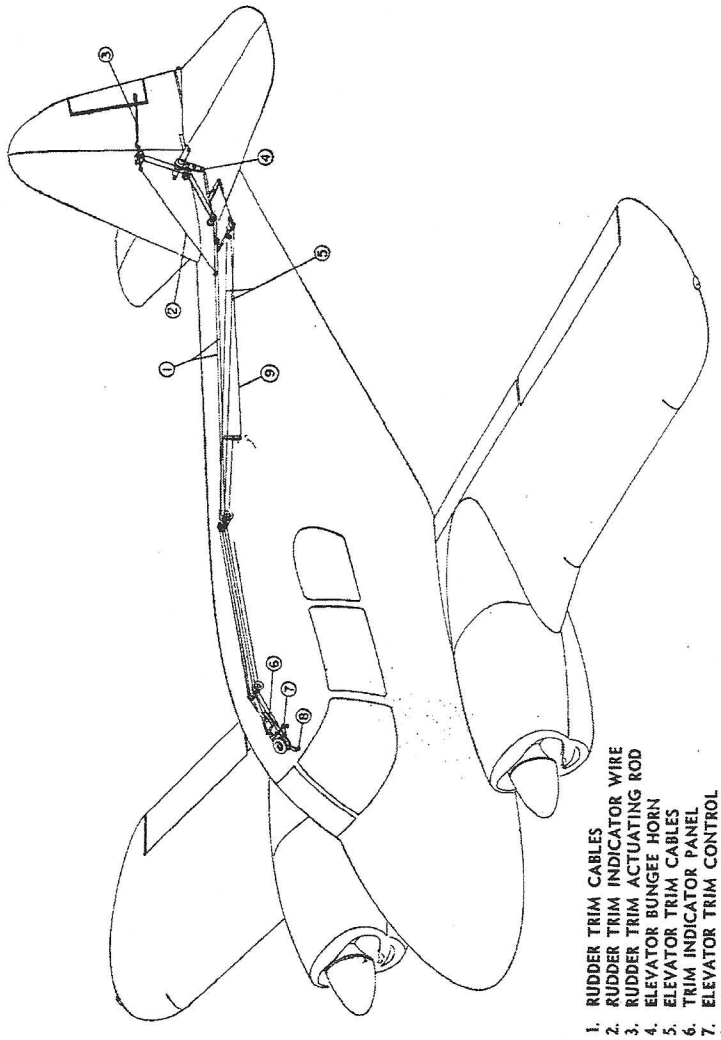
1. CONTROL WHEELS
2. CONTROL COLUMN
3. ELEVATOR HORN
4. ELEVATOR CONTROL TUBE
5. BRACKET ASSEMBLY
6. ROLLER

ELEVATOR CONTROL SYSTEM
Figure 7



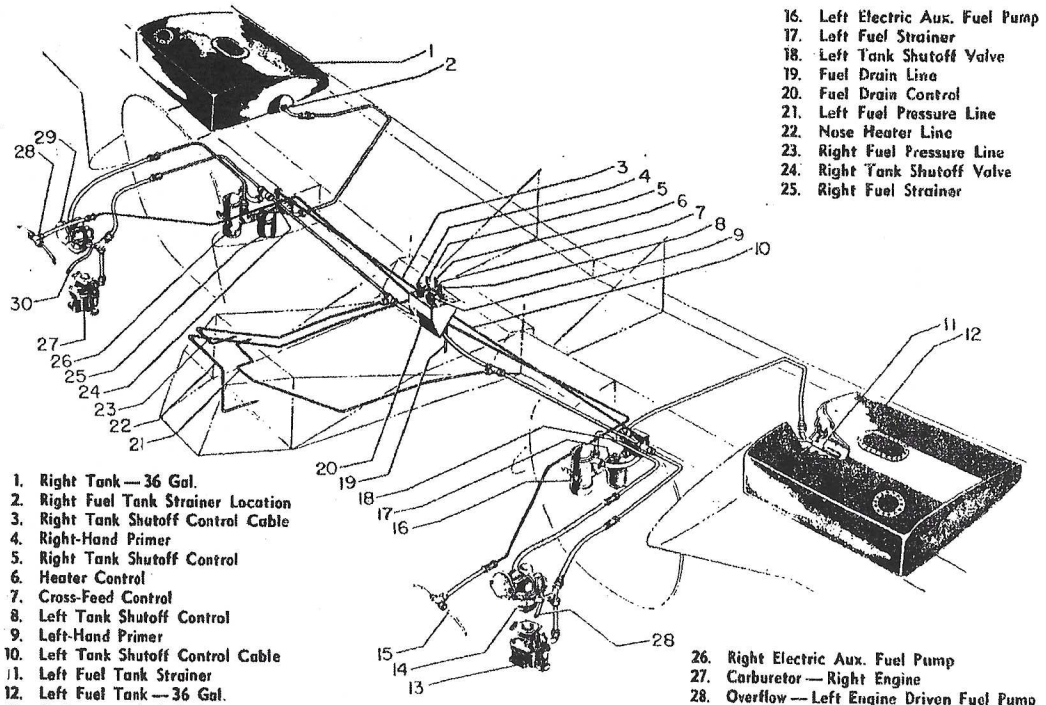
1. RUDDER PEDALS
2. RUDDER CABLE TURNBUCKLES
3. RUDDER HORN

RUDDER CONTROL SYSTEM
Figure 8



1. RUDDER TRIM CABLES
2. RUDDER TRIM INDICATOR WIRE
3. RUDDER TRIM ACTUATING ROD
4. ELEVATOR BUNGEE HORN
5. ELEVATOR TRIM CABLES
6. TRIM INDICATOR PANEL
7. ELEVATOR TRIM CONTROL
8. RUDDER TRIM CONTROL
9. ELEVATOR TRIM INDICATOR WIRE

ELEVATOR-RUDDER TRIM SYSTEM
Figure 9



1. Right Tank — 36 Gal.
2. Right Fuel Tank Strainer Location
3. Right Tank Shutoff Control Cable
4. Right-Hand Primer
5. Right Tank Shutoff Control
6. Heater Control
7. Cross-Feed Control
8. Left Tank Shutoff Control
9. Left-Hand Primer
10. Left Tank Shutoff Control Cable
11. Left Fuel Tank Strainer
12. Left Fuel Tank — 36 Gal.
13. Carburetor — Left Engine
14. Left Engine Driven Fuel Pump
15. Primer Line — Left Engine
16. Left Electric Aux. Fuel Pump
17. Left Fuel Strainer
18. Left Tank Shutoff Valve
19. Fuel Drain Line
20. Fuel Drain Control
21. Left Fuel Pressure Line
22. Nose Heater Line
23. Right Fuel Pressure Line
24. Right Tank Shutoff Valve
25. Right Fuel Strainer
26. Right Electric Aux. Fuel Pump
27. Carburetor — Right Engine
28. Overflow — Left Engine Driven Fuel Pump
29. Right Engine Driven Fuel Pump
30. Overflow — Right Engine Driven Fuel Pump

FUEL SYSTEM
Figure 10

VI. FUEL SYSTEM:

Two thirty-six gallon nylon and neoprene fuel cells located outboard of the engines provide fuel storage in the Apache. The tanks should be kept full of fuel during storage of the airplane to prevent accumulation of moisture, and to prevent deterioration of the rubber cells. For long term storage without fuel, the cells should be coated with light engine oil to keep the rubber from drying out.

The fuel system in the Apache is simple, but completely effective. Fuel can be pumped from either tank to both engines, through use of the four fuel pumps provided for this purpose.

For normal operation, fuel is pumped by the engine driven pumps from the tanks directly to the adjacent carburetors. The fuel valves can be left on at all times and the crossfeed left in the off position. Electric auxiliary fuel pumps are installed in by-pass fuel lines between the tanks and the engine driven pumps. The electric pumps can be used to provide pressure in the event of failure of the regular pumps. They are normally turned on to check their operation before starting the engines, and left on during take-off and landing, to preclude the possibility of fuel pressure loss due to pump failure at critical times.

If one of the engine driven pumps fails, the electric pump to that engine can be turned on to supply the fuel. However, if desired, the fuel can be pumped by the operating engine driven pump to the failed pump engine simply by turning on the crossfeed. The good pump will then be supplying both engines from its tank. If this tank runs low on fuel, fuel can be drawn from the opposite tank by turning on the electric pump on the failed pump side, leaving the crossfeed on, and turning the fuel valve on the empty tank off. Then the electric pump on the failed pump side will be supplying both engines from its tank.

Fuel can thus be used from one tank or the other, by shutting off one main valve and turning on the crossfeed, to balance fuel loads or for other purposes. For all normal operation, it is recommended that fuel be pumped directly from the tanks to their respective engines, with the crossfeed off.

The fuel valve controls and crossfeed control are located with the engine primer pumps in fuel control panel between the front seats. Two electric fuel gauges in the engine gauge cluster on the instrument panel indicate the fuel quantity in each tank. The electric fuel pump switches are on the lower left side of the instrument panel.

A crossfeed line drain valve control is mounted on the front face of the fuel control panel box. This valve should be opened occasionally, with the crossfeed on, to allow any water that might accumulate at that point to be drained out. The heater fuel control is also placed on the fuel control panel, so that fuel to the heater can be turned off if necessary.

The main fuel strainers are located in the inboard sides of the main wheel wells. They are fitted with quick drains and should be drained regularly through their small access ports. Fuel screens are provided at the tank outlets, in the strainers and at the carburetors.

Idle cut-offs are incorporated in the mixture controls and should always be used to stop the engines.

VII. ELECTRICAL SYSTEM:

The master switch for the electrical system is located on the lower left side of the control pedestal, along with the heating and ventilating control panel. Other electrical switches and circuit breakers are grouped on the lower left side of the instrument panel. The starter buttons are installed on the underside of the extreme left of the panel where they are concealed from those not familiar with the airplane. Adjacent to the starter buttons are the ignition switches.

Automatic circuit breakers are provided for the lights, generators, radios, landing gear indicator system, Turn and Bank, fuel pumps and cabin heater. These units automatically break the electrical circuit if an overload is applied to the system, preventing damage to any electrical component. To reset the circuit breakers, simply push in the buttons. Continual popping out of a circuit button indicates trouble in the electrical system and should be investigated immediately.

A 12-volt 33-ampere hour battery, enclosed in a sealed stainless steel battery box, is mounted in the nose section on the right side. (See Section Four, III, Battery Service).

The position and panel lights are operated by a rheostat switch located with the other electrical switches. The position lights are turned on with the first movement of the knob; panel light intensity is increased by further rotation of the control. A dome light switch is incorporated in the light unit in the center of the cabin ceiling.

A voltage regulator, attached to the rear side of the firewall in the left engine nacelle, regulates the flow of current from the 35 ampere generator to the battery.

VIII. FINISH:

All alumnium sheet components of the Apaches are carefully finished inside and outside to assure maximum service life. Both sides of all pieces are alodine treated, then sprayed with zinc chromate primer. External surfaces are coated with durable synthetic enamels in attractive high gloss colors. The application of primer to interior surfaces will prevent corrosion of structural and non-structural parts on the inside where there is no access for normal maintenance.

Steel tubular structures are also finished with zinc chromate primer and enamel.

IX. CABIN FEATURES:

The instrument panel of the Apache has been designed to accommodate all of the customary advanced blind flight instruments on the left side in front of the pilot, and all required engine instruments on the right side. Provision for extra instruments has been made in both sections. The flight instrument group is shock mounted in an easily removed sub-panel. All instruments are accessible for maintenance by removing a portion of the fuselage cowl over the instruments.

The Artificial Horizon and Directional Gyro in the flight group are vacuum operated through use of a vacuum pump installed on the right engine. The Turn and Bank is an electrically operated instrument and serves as a standby for the Gyros in case of vacuum system failure. A switch for the Turn and Bank is included in the switch grouping on the lower left of the panel. The vacuum gauge in the engine instrument group normally indicates 3½ to 4½ inches of suction, required to operate the gyros.

Two Recording Tachometers are provided to eliminate the need for constant reference to aircraft and engine log books. A 9 gauge engine instrument cluster, at the bottom of the engine group, includes two oil pressures, two oil temperatures, two fuel pressures, two fuel gauges and one ammeter. The gauges in this cluster can be replaced individually by removing the column of three gauges in which the defective unit is incorporated, then detaching the proper gauge from this column.

Radio units are installed in the extreme left and right sections of the main panel, with the primary radios in front of the pilot and the auxiliary units on the right. Radio power supplies are mounted in the forward part of the nose section near the battery.

The landing gear and flap selector valve unit is housed within the control pedestal under the engine controls, with the landing gear control lever projecting rearward on the right side and the flap control lever on the left. To effect extension or retraction of the gear or flaps, the controls are moved from the center "off" position in the desired direction. When the selected component is fully extended or retracted, hydraulic pressure within the selector valve unit forces the control back to the "off" position, so that the component actuating cylinders and lines are not under constant hydraulic pressure. This prevents complete loss of hydraulic fluid in the event of a leak in the lines between the selector valve and the component or at the actuating cylinders. The movement of the control handles back to "off" indicates that the components have reached full extension or retraction.

The emergency hydraulic pump, which is integral with the selector valve, is used to obtain hydraulic pressure in case of failure of the hydraulic pump or failure of the left engine. To operate the pump the handle should be extended to its full length by pulling

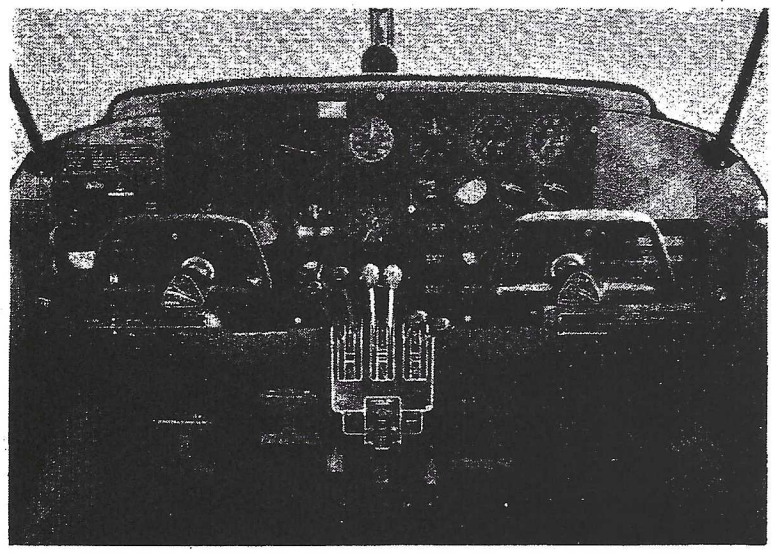


Figure 11

aft. 30-40 pump strokes are required to raise or lower the landing gear, and about 20-30 seconds.

The front seats in the Apache are constructed of steel tubing, with no-sag springs and foam rubber cushions. Upholstery is top grain leather and nylon frieze fabric. The seats are adjustable fore and aft through a 7-inch range by operation of a release control under the front of each seat. The right seat is also adjustable aft beyond the normal range to provide ease of entrance to the pilot's seat. Both seats are easily removed by taking out the lower bolts in the stop plates at the rear of the seat structure, swinging the stop plates laterally and sliding the seats forward off their tracks.

The rear seat area is readily convertible to a cargo compartment by removing all or half of the rear seat. To take out the entire rear seat, first the bottom and back cushions are removed, then the seat support tubes are rotated 90 degrees, withdrawn from their brackets and removed with the canvases.

Half of the rear seat can be removed with the other half still in place, if it is desirable to carry cargo or a stretcher as well as a

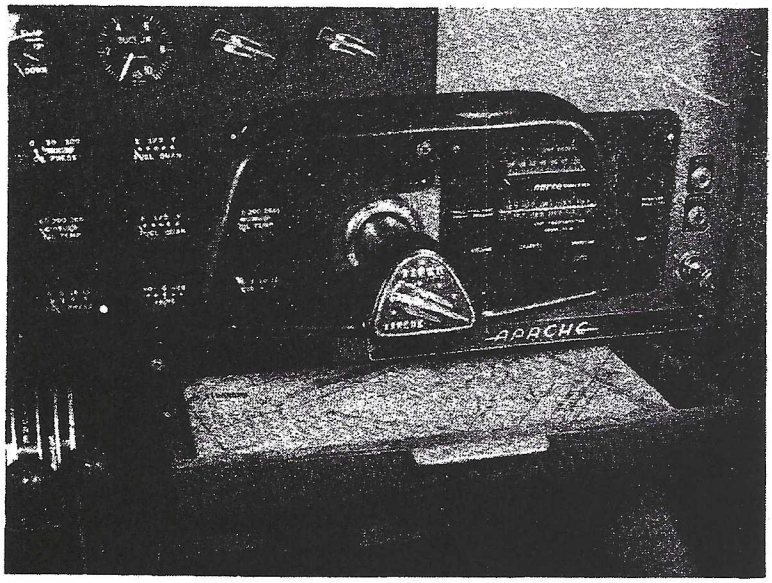


Figure 12

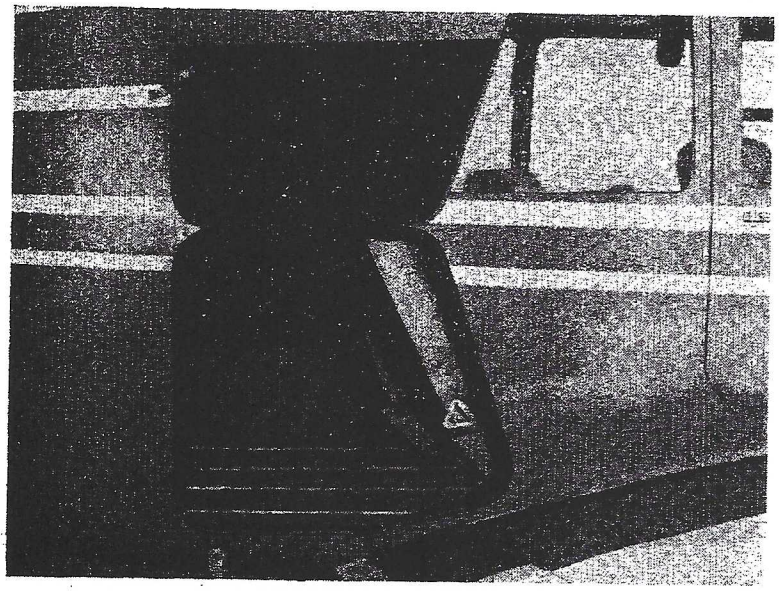


Figure 13

rear seat passenger or attendant. This is accomplished in the same manner as in removing the entire seat, but by taking out only one set of cushions and one canvas.

Arm rests for all seats, coat hangars, ash trays, a cigarette lighter, and a spacious map drawer are all standard on the Apache. The cabin door and baggage doors are equipped with locks operated by the same key. With each Apache are also furnished a tow bar and a detachable mounting step. The tow bar is installed in the baggage compartment when not in use, and the step can be removed for long-trips by removing a bolt under an access plate in the baggage compartment.

In the standard model of the Apache, provisions for radio installations include dual microphone and headset jacks, a microphone and headset mounting bracket, a loud speaker, wiring to these units, and panel space for at least four radio sets.

The Custom model includes the above along with the installation of a group of radio units which are specifically chosen to

provide in the Apache all of the most recent radio developments normally desired in this type of aircraft. The Lear ADF-12 gives low frequency range and entertainment bands with a long range Automatic Direction Finder. The Narco Omnigator with 8 channel VHF transmitter provides Omni navigation and primary VHF communications, and the Narco Simplexer with its 12 transmitting frequencies and special tuning frequency locater gives additional and standby VHF communications.

The Omnigator also incorporates a Marker Beacon receiving unit, and VAR and ILS runway localizer receiving features.

The flow of air for cooling or heating the Apache cabin is regulated at the Cabin Air Control Panel, at the bottom of the pedestal, where five separate knobs provide positive control of the volume and temperature of the incoming air. (See Figure 16).

The amount of air entering the cabin is adjusted by use of the two controls on the left side of the panel. The left hand control regulates air flowing to the front seat and the second knob from the left controls air flowing to the rear seat.

The center knob controls the defroster and the two right hand knobs control cold air inlets. The one on the extreme right side, marked Cold Air Inlet--Heater System, adjusts an inlet valve at the air intake near the landing light, letting air into the heater system ahead of the heater. The second knob from the right controls the air flowing from an intake box under the nose to the firewall.

An 18,000 BTU Southwind heater installed in the nose of the Apache furnishes a source of hot air for the cabin and for defrosting the windshield. Heater operation is controlled by an Off—Fan—Low Heat—High Heat switch located under the left control wheel.

To heat the cabin (1) turn the heater switch to High heat or Low heat, as desired, (2) adjust the left hand Cabin Air Control to get the required heat to the front seat, (3) adjust the Rear Seat Control to obtain the required flow to the back of the cabin. The amount of heated air passing to the rear seat area can also be regulated by opening or closing the shutters at the outlets in the floor.

Additional adjustment of the quantity and temperature of the air coming from the heater can be obtained by operating the right hand knob on the Control Panel which regulates the flow of cold air into

the heater system. Normally the heater passes air recirculated from the cabin.

To cool the cabin (1) open the Cabin Air Controls on the left side of the panel, (2) open the Cold Air inlets on the right side, as required, (3) adjust the overhead individual Fresh Air vents.

To defrost or defog the windshield (1) turn on the heater in cold weather, or open the right hand Cold Air Inlet in warm weather, (2) adjust the defroster control as required.

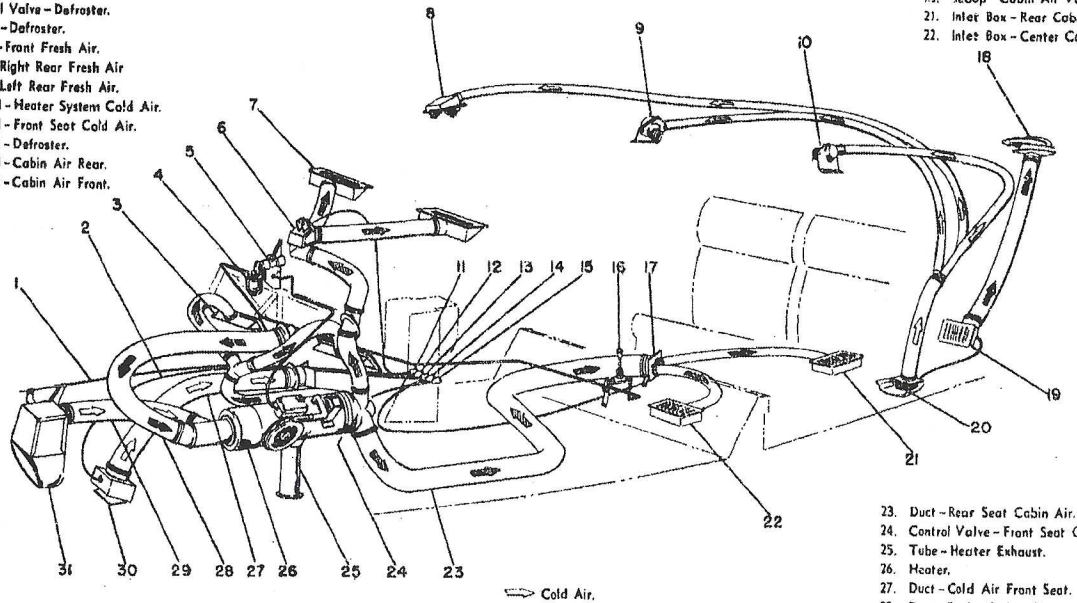
The cabin heater uses gasoline from the left main fuel tank when the fuel crossfeed is off, and from both tanks when the crossfeed is on. Only about one quart of gasoline per hour is used by the heater at maximum output.

To turn the heater on, first ascertain that the heater fuel valve (on the fuel control panel) is on, then move the heater switch to High or Low heat. If the heater does not start promptly, return the heater switch to Fan position for 15 seconds to prime the heater; then upon moving the switch to High heat, the heater should start and continue to operate after 1-1½ minutes of warm-up.

After the heater switch is turned to the Off position, combustion in the heater stops, but the combustion fan and the circulating air fan continue to operate for about two minutes, while the heater cools slowly and purges itself of hot air and fumes. To obtain best service life from the heater components, it is recommended that the heater switch be turned off about two minutes before stopping the engines and shutting off the master switch. This should normally be done during taxiing after landing.

The heater can be used to warm up the cabin before flight by turning on the master switch, the left electrical fuel pump, and the heater switch. The operation of these units takes about 8 amps, and they should not be used in such a way as to run down the battery, making starting difficult.

1. Cable – Cold Air Inlet Box – Heater System.
2. Cable – Cold Air Inlet Box – Front Seat.
3. Heater System Air Inlet – Front Seat.
4. Filter – Heater Fuel.
5. Control Valve – Heater Fuel.
6. Control Valve – Defroster.
7. Outlet – Defroster.
8. Vents – Front Fresh Air.
9. Vent – Right Rear Fresh Air
10. Vent – Left Rear Fresh Air.
11. Control – Heater System Cold Air.
12. Control – Front Seat Cold Air.
13. Control – Defroster.
14. Control – Cabin Air Rear.
15. Control – Cabin Air Front.
16. Control – Heater Fuel Shut-off.
17. Control Valve – Rear Seat.
18. Exhaust Outlet – Cabin Air.
19. Exhaust Box – Cabin Air.
20. Scoop – Cabin Air Vent.
21. Inlet Box – Rear Cabin Air.
22. Inlet Box – Center Cabin Air.



Cold Air.
Heater System Air.
Cabin Air.

23. Duct – Rear Seat Cabin Air.
24. Control Valve – Front Seat Cabin Air.
25. Tube – Heater Exhaust.
26. Heater.
27. Duct – Cold Air Front Seat.
28. Duct – Recirculating Air.
29. Duct – Cabin Air Heater System.
30. Box – Cold Air Inlet, Front Seat.
31. Box – Cold Air Inlet, Heater System.

Ventilating and Heating
Figure 14

SECTION TWO

OPERATING INSTRUCTIONS

I. PREFLIGHT CHECKS:

The airplane should be given a careful visual inspection prior to flight to ascertain that tires and shock struts are properly inflated, control surfaces are free, fuel tank caps tight, cowling and other openable parts are secure, and no obvious damage exists. Propellers should be examined for nicks, tow bar stowed under the rear seat, and gascolators drained. Upon entering the plane, the pilot should make sure that all controls operate normally, that the landing gear and other controls are in proper positions, and that the main door is firmly secured.

II. STARTING:

Before starting the engine, the pilot should set the parking brake and turn on the master switch and the electric fuel pumps. When the engine is cold, prime three to five strokes, making sure fuel valves are on, cross-feed off, fuel pressures normal and fuel quantity checked. Push mixture controls to full rich, carburetor heat off, and open throttles about one-quarter inch. If the engines are extremely cold, they should be pulled through by hand four to six times.

Next turn all ignition switches on and engage starter on left engine first. After engine starts, idle at 800 to 1000 RPM and start right engine. If battery is low, before starting right engine, run left engine over 1200 RPM to cut in the generator. This will produce extra power for starting the right engine. If the engine does not start in the first few revolutions, open the throttle on that engine while the engine is turning over with the ignition on. When the engine starts, reduce the throttle.

If the above procedure does not start the engine, reprime and repeat the process. Continue to load cylinders by priming or unload by turning the engine over with the throttle open. If the engine still doesn't start, check for malfunctioning of ignition or fuel system.

Priming can be accomplished by pumping the throttle controls, and excessive pumping may over-prime the engines, making starting difficult.

When the engines are warm, do not prime, but turn ignition switches both on before engaging starter. The engines should start after rotating through about four compression strokes.