PITTS MODEL 12

PILOT OPERATING HANDBOOK

Registration: VH - SHM

Manufacturer: Jim Kimball Enterprises Inc.

Serial Number: 320

Prepared by: Mike Mayfield

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About this handbook:

This Pilot Operating Handbook contains information to assist in the safe operation of the Pitts Model 12 aircraft, however it is not a substitute for common sense or airmanship.

Warnings, cautions and notes are presented throughout the handbook in the following context:

WARNING

Information which may prevent serious injury or accident

CAUTION

Information which may prevent aircraft or engine damage

NOTE

Additional information pertinent to operation of the aircraft

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LATEST AMENDMENTS

Pg 7 **Limitations.** Added engine warm-up rpm limit as per M-14P Operating Instructions.

Pg 13 **Normal Procedures.** Engine warm-up limit included in Taxi section.

Pg 15-16 **Normal Procedures.** Brief description of upset recoveries, stalling, spinning included and amplified.

Pg 25 **Aircraft and Systems Description.** Note on air pressure reading with shutoff valve closed.

SECTION 1

GENERAL

The Pitts Model 12 is a high performance, two seat aerobatic biplane powered by a 436 HP Vedeneyev M-14P nine cylinder air-cooled radial engine modified by Barrett Precision Engines, and equipped with an MT three-blade constant speed propeller.

Dimensions

Wingspan upper ..... 6.7 m (22 ft)

Wingspan lower ..... 6.4 m (21 ft)

Length.....6 m (19 ft 8 in)

Height ..... 2.75 m (9 ft)

Wing area ..... 14.3 m^2 (154 sq.ft)

Loading.....75.7 kg/m^2 (15.5 psf)

Fuel Capacity

Main Tank..... 136 litres (36 US gal)

Wing Tank ..... 68 litres (18 US gal)

Total..... 204 litres (54 US gal)

Usable ..... ≈200 litres (53 US gal)

Oil Capacity

16 litres, minimum 7.5 litres

Consumption: approx. 0.15 litres per hour (BPE engine).

Type: ..... Aeroshell 100

Air Capacity

Air bottle pressure .....850 psi

Propeller

MTV-9 260 cm, 3 blade, constant speed

Engine

BPE M-14P, fuel injected, 436 HP rated at 2900 RPM.

Landing Gear

Main gear: Grove Aircraft aluminium spring gear.

Main Wheels: 6:00-6 with disk brakes.

Main Tyres: 6:00-6.

Tail wheel: Aviation Products 6” double fork.

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SECTION 2

LIMITATIONS

ENGINE LIMITATIONS

	Min.	Norm.	Max Cont.	Max (15 min)
Oil pressure (PSI)	-	55-85	-	-
Oil temperature (°C)	40	50-65	75	85
Cylinder Head temperature (°C)	120	140-190	220	240
Fuel pressure (PSI)	25	25-45	60	-
Max inverted flight	2.5 mins (oil scavenge limitation)			
Fuel	AVGAS 100 Octane			

ENGINE WARM-UP

It is recommended that the engine be limited to a maximum of 1400 rpm until warmed up (Oil Temp 40°C, CHTs 120° C).

START SYSTEM LIMITATIONS

Type	Dry compressed air
Air Pressure (max)	850 psi
Start Duty Cycle	30 sec on, 3 min off

CAUTION

Do not use oxygen in the air start system. Use dry compressed air. The use of oxygen will result in severe damage to the air start system.

FLIGHT LIMITATIONS

Load Factor	- 4.5 g to +7 g
Maximum Crosswind	20 kts
Stall speed (V_S)	56 KIAS
Max manoeuvring speed (V_A)	143 KIAS
Never exceed speed (V_{NE})	208 KIAS

WARNING

Flight in Instrument Meteorological Conditions or icing conditions is prohibited.

CAUTION

Aerobatic manoeuvres with baggage are prohibited.

WEIGHT LIMITATIONS (KG)

Max Gross	1043
Max Aerobatic	1043
Max Total Payload + Fuel (VH-SHM)	332
Max Baggage Capacity	20

SECTION 3

EMERGENCY PROCEDURES

ENGINE FAILURE

1. **Speed..... 85 KIAS**
2. **Propeller.....Full decrease**
3. **Landing area ..... Select**

If time permits:

4. Fuel pump ..... BOOST
5. Mixture..... RICH
6. Fuel Selector .....MAIN
7. Throttle ..... ¼ open
8. Engage starter to start propeller if it is not turning.

If engine responds:

9. Propeller/throttle ..... As required

Expect a *minimum* rate of descent of 1000 ft/min in coarse pitch, which is the best position for glide performance. Fine pitch may result in rates of descent in excess of 3000 ft/min.

ENGINE FIRE

1. **Throttle..... Close**
2. **Speed .....85 KIAS**
3. **Propeller ..... Full decrease**
4. **Landing area.....Select**
5. Mixture .....Idle Cutoff
6. Fuel Selector ..... OFF

Prior to touchdown

7. Master switch ..... OFF

BAILOUT

If it is necessary to abandon the aircraft, open the canopy and the canopy will break free. Ensure that the head is kept low to reduce the chance of injury during canopy separation.

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SECTION 4

NORMAL PROCEDURES

PRE-FLIGHT INSPECTION

Items in orange are items required for the Daily Inspection or as required by the pilot. Civil Aviation Regulations require the Daily Inspection to be certified in the Maintenance Release prior to first flight.

1. All switches.....OFF
2. Mixture..... IDLE CUTOFF
3 Fuel selector.....MAIN
4. Documentation .....Checked
5. Intake drain..... Open
6. Propeller .....Pull through

   This is to check for oil in the lower cylinders that could cause “hydraulic lock” and damage the engine during start. Pulling through at least 9 blades will ensure all pistons pass through top dead centre. If the propeller will not rotate during this check, remove the lower spark plugs and drain the oil from the cylinder.

WARNING

Exercise extreme caution when pulling through the propeller. If the ignition is on the engine may fire. The propeller may also move suddenly if stopped on a compression stroke. Do not perform this procedure on a hot engine.

Walkaround Inspection

7. Walkaround .....Completed

   Remove covers/tags, check condition of all surfaces and equipment, flying wire and strut security, control surface security and movement, and check the following:

   a. Fuel drain .....Completed

      This check is required on the first flight of the day and after refuelling. Drain a small amount of fuel from both drains to check for water or other contamination. The inboard drain is from the header tank, and the outboard drain is from the gascolator.

   b. Air bottle valve ..... Open

   c. Oil quantity ..... Checked

      Recommended oil quantity for Aerobatics: 9½ - 11 litres. Cross-country: 11 - 15 litres.

   d. Fuel quantity ..... Checked

   e. Intake drain ..... Closed

COCKPIT CHECKS

BEFORE START

1. Throttle .....Closed

   Check free movement.

2. Propeller ..... Full forward

   Check free movement.

3. Smoke switches .....OFF/Guarded

   Check the smoke switch is off and the fill switch guard is down.

4. Mixture..... IDLE CUTOFF
5. Elevator trim ..... Neutral
6. MASTER switch ..... ON
7. Int switch ..... As required
8. Flight Instruments.....Checked
   a. G-meter .....Checked, reset
   b. Airspeed indicator.....Checked
   c. ADI .....Checked

      The Trutrak ADI track is slaved to the GPS. If GPS is not to be used, the ADI track will function as a basic directional gyro and should be adjusted to the magnetic compass heading as required.

   d. Altimeter ..... Set

      VFR tolerance is ± 100 ft of airfield elevation with reported QNH set.

9. EDM .....Checked
   a. Fuel on board ..... Entered
   b. BAT ..... ≥ 11.5 V
   c. TANK ..... > 400 psi

NOTE

While there is no minimum tank pressure, 400 psi or more should be sufficient for a normal start. Starting may be attempted at lower pressure, however there may not be enough air to turn the propeller past the compression stroke.

   d. Display select switch...As required

10. FUEL pump switch ..... OFF
11. Side panel ..... Checked
    a. Oil Scav switch..... OFF
    b. ELT ..... Light out
    c. Circuit breakers..... In
12. Fuel selector ..... MAIN
13. Oil shutoff valve .....Push OPEN
14. Canopy.....Latched or locked

    The canopy must at least be latched to the first position for engine start.

ENGINE START

1. IGN L & R switches..... ON, lights out

   The electronic ignition LEDs will blink several times while each unit undergoes its self-test.

2. FUEL pump switch.....BOOST

   Pressure ≥ 30 psi

3. FUEL pump switch.....PRIME, OFF

   Cold: 4 sec **Warm:** 1-2 sec

4. Mixture ..... RICH
5. Throttle .....Set

Set throttle to correspond to approx. 1000 rpm (about 1 inch open).

6. START button.....Press

   The engine should start within 3 seconds. In cold conditions, the primer may need to be "bumped" to add fuel until the engine is running smoothly.

7. Throttle .....1000 rpm
8. Oil pressure .....Rising

   15 psi minimum in 20 seconds.

9. Avionics ..... As required

If engine does not start:

1. Throttle .....Closed
2. Mixture lever..... IDLE CUTOFF

   Repeat the ENGINE START procedure using prime for a "warm" engine (1-2 sec).

If engine does not start after two attempts:

1. Throttle .....Closed
2. Mixture..... IDLE CUTOFF
3. Ignition switches .....OFF

   Exit the aircraft. Open the intake drain and drain excess fuel. Repeat the ENGINE START procedure using 2 seconds prime.

If engine does not start after three attempts:

Do not attempt further starts before troubleshooting to determine the cause.

If propeller turns slightly then stops:

It is possible that the propeller stops turning after only a small movement accompanied by a loud hissing air sound while the start system is operated. The engine may be stuck on a compression stroke with starter air escaping through open lower cylinder valves. This can occur at a particular position in the cycle when the start system automatically opens the valves to clear oil from the lower cylinders. Turn all switches off, exit the aircraft, and rotate the propeller forward ½ blade by hand. This should close the cylinder valves and allow a successful start.

TAXI AND GROUND HANDLING

WARNING

Forward visibility from the cockpit is poor. Exercise caution during taxi.

The aircraft is ready to taxi when the engine responds smoothly to throttle inputs. The Pitts Model 12 ground handling qualities are typical for a tail-wheel aircraft. Taxi requires minimal power. Take care to avoid over-controlling with brakes and rudder.

During taxi and while the engine is warming up (< 40°C oil temperature and < 120°C CHT) restrict maximum power to 1400 RPM.

ENGINE RUNUP

CAUTION

Do not exceed 1800 rpm during run up or the tail may rise during prop cycling even with full aft stick and brakes applied.

1. Canopy ..... Locked
2. EDM .....Checked
   a. Oil temp .....≥ 40°C
   b. CHTs .....≥ 120°C
3. Propeller ..... Full forward
4. Mixture..... RICH
5. Throttle ..... Set 1800 rpm
6. Ignition .....Checked
   a. Left Ignition..... OFF, ON

      Max drop 125 rpm.

   b. Right Ignition ..... OFF, ON

      Max drop 125 rpm.
7. Propeller ..... Cycle 3 times

   Fully retard propeller lever momentarily, then return to full forward. On installations using the MT propeller governor, MT-Propeller recommends three cycles to ensure fresh oil is circulated completely through the pitch change mechanism.
8. Throttle ..... Idle

   Smoothly retard the throttle to idle, check idle operation, then return to 1000 rpm.

BEFORE TAKEOFF

1. Canopy.....Locked
2. Propeller..... Full forward
3. Mixture ..... RICH
4. Switches..... Red Up
   a. IGN switches..... ON, lights out
   b. FUEL pump switch.....BOOST
5. Fuel selector ..... MAIN
6. Flight Controls..... Checked

   Check ailerons, elevators, and rudder for correct sense and full and free movement throughout the operating range.
7. Harnesses.....Secure

TAKEOFF

WARNING

The propeller has low ground clearance. Do not lift the tail during the take-off roll.

Lining up, set transponder if required. When aligned on the runway centreline, smoothly apply full power. Left rudder is required to counteract yaw from the engine, and the takeoff roll is very brief. Avoid over-control of the rudder during the takeoff roll. Perform take-off with the stick held at neutral elevator and allow the aircraft to fly itself off the ground. After takeoff, reduce to Nom 1 or 2 power for climb.

AFTER TAKEOFF

1. FUEL pump switch .....OFF

INFLIGHT

Normal cruise power is Cruise 1 or Cruise 2. After setting cruise power the BPE engine may be leaned beyond peak EGT. As a guide, 25°C reduction past peak EGT ("Lean of Peak" or "LOP" operation) should give smooth performance and good economy.

CAUTION

Do not operate LOP above cruise power settings. Doing so will lead to high cylinder pressures and increased risk of cylinder damage.

ENGINE HANDLING

As with any radial engine, power changes should be made smoothly. Engine response to throttle movement on the Model 12 is rapid.

WING FUEL TRANSFER

The wing tank may be used for ferry or transit flights. Aerobatic flight with wing tank fuel is not recommended as fuel may spill from the vent line across the upper wing surface. Always switch the fuel boost pump on when changing tanks.

As there is no fuel gauge for the wing tank, fuel pressure fluctuations or loss of engine power at around the calculated time of wing tank exhaustion are the only positive indication of an empty tank. In the event of loss of engine power, the deceleration is sudden and significant. Switching the fuel boost pump on and the fuel selector to main tank will restore engine power immediately.

AEROBATIC FLIGHT

Do not perform aerobatic manoeuvres with less than ¼ tank of fuel at low altitudes. Nominal I RPM or similar is recommended for aerobatics.

CAUTION

Aerobatic manoeuvres with baggage are prohibited.

Inverted or negative G flight is limited to 2.5 minutes maximum at a time. This is due to the inability of the engine to scavenge oil back to the oil tank in negative G conditions. There is ample supply from the inverted oil and fuel systems for this period.

UPSET RECOVERIES

In most cases for the Model 12, moving throttle to idle and centralising controls will prevent any unusual attitude or upset deteriorating into a full loss of control.

STALL RECOVERY

Stall characteristics are conventional with light buffet onset just above stall speed. Any wing drop is easily controlled by modest use of rudder. Standard recovery actions will promptly restore normal flight path.

Simultaneously:

1. Apply full power
2. Lower nose to unstall wings
3. Apply sufficient rudder as required to prevent excessive yaw

Then:

4. Recover normal flight path

SPIN RECOVERY

Spin recovery is typical for the Pitts series aircraft. Conventional anti-spin actions should result in a prompt recovery from any spin condition in an aircraft within its normal operating limitations.

1. Throttle ..... Idle
2. Turn direction ..... Identify
3. Rudder..... Full opposite to turn
4. Elevators .....Move stick forward with ailerons neutral to unstall wings (for inverted spin, move stick aft).

When the spin stops:

5. Immediately centralise controls and recover from dive.

LANDING

BEFORE LANDING

1. FUEL pump switch .....BOOST
2. Mixture ..... RICH
3. Propeller..... 2400 rpm

Approximately 10-12 inches MAP gives a stable approach. Normal approach speed is 75-80 KIAS. Only very small power inputs are required to maintain a stable approach speed. At flare height reduce throttle to idle and aim to achieve the 3 point attitude.

WARNING

Propeller clearance is marginal with low nose attitude on touchdown. Use the “3 point” landing technique.

When the gear is on the ground with the aircraft tracking straight, only small rudder inputs are required. If runway length permits, allow the aircraft to roll to a stop with minimal braking. After all three wheels are on the ground maintain full backstick through the landing rollout to keep the tailwheel firmly on the ground, enhance directional control, and help avoid any “porpoising” in pitch.

The Model 12 control response is rapid and effective in all axes throughout the landing, however if in any doubt during any landing, execute a go-around.

CROSSWIND

In crosswinds, aim to touch down with the aircraft tracking straight down the runway and on the into-wind wheel.

GO-AROUND

With the propeller set to 2400 rpm, ample power is available for a go-around. Only half throttle is required to safely accomplish this, and power should be applied smoothly.

WARNING

Rapid application of full power from a low approach speed requires aggressive control inputs to counteract engine torque.

AFTER LANDING

1. FUEL pump switch .....OFF
2. Transponder ..... As required

   Select to STBY or GND.
3. Propeller ..... Full forward

ENGINE SHUTDOWN

1. Throttle .....1000 rpm
2. CHTs .....≤ 150°C

   Leaning the mixture slightly may assist in stabilising CHTs.
3. Mixture.....Lean to max EGT

   This helps purge excess fuel mixture from the cylinders before shutdown.
4. Mixture .....IDLE CUTOFF
5. IGN switches ..... OFF
6. Throttle ..... Closed
7. Avionics..... Off
8. Oil Shutoff valve ..... Pull Closed
9. OIL SCAV switch .....ON

   Run until the pump starts to cavitate, which is indicated by a change in the sound of the pump. This occurs when the oil in the manifold has been scavenged back to the oil tank, and can take up to several minutes. The oil scavenge system greatly reduces the probability of hydraulic lock caused by oil draining into the lower cylinders. Post-flight tasks may be accomplished while the scavenge pump is running.
10. All switches ..... OFF

SECURING AIRCRAFT

To secure the aircraft, perform a final check of the following:

1. Oil scavenge .....Completed

   Ensure the OIL SCAV switch is OFF and the oil shutoff valve is pulled fully closed.
2. Documentation .....Completed
3. All switches ..... OFF
4. Covers/Cans .....Installed
   a. Pitot cover.
   b. Exhaust stub cans.
   c. Cowl Intake drain can.
   d. Tail breather can (if req'd).

5. Intake drain..... Open
6. Air bottle valve.....Closed

   This prevents loss of air system pressure due to minor leaks over time.

7. Canopy ..... Locked

If required, the battery circuit breaker on the avionics rack behind the pilot's seat may be pulled to isolate the electrical system.

STORAGE

CAUTION

When pushing the Pitts Model 12, use the I-struts for push/pull points. Do not push the propeller spinner.

When leaving the aircraft parked outside, you should:

1. Leave it parked into the wind if possible.
2. Chock both main wheels.
3. Secure the stick with the seat harness.

If parked outside for extended periods, the aircraft should be tied down at the tie down rings provided under each wing and at the tailwheel.

SECTION 5

PERFORMANCE

GENERAL

Stall Speed	56 KIAS
Altitude loss - power off stall	450 ft
Service Ceiling	25,000 ft
Roll Rate	300+ deg/sec

TAKEOFF AND LANDING

Take-Off Run, Sea level (ISA)	168 m (550 ft)
Takeoff Dist to 50 ft (ISA)	182 m
Rate of Climb	3200+ ft/min
Landing Dist from 50 ft (ISA)	274 m
Landing Run, Sea level (ISA)	238 m (780 ft)

ENGINE OUT

Glide or power-off performance is substantially affected by the blade angle of the propeller and can exceed 3000 ft/min in fine pitch. Minimum sink rate is obtained in coarse pitch (propeller lever full aft) at approximately 85 KIAS, and is approximately 1000 ft/min.

ENGINE PERFORMANCE (BPE M14P)

	RPM	Manifold pressure	HP	litres per hour
Maximum	2,900	40	436	151
Nominal I	2,400	35	290	119
Nominal II	2,050	33	240	94
Cruise I	1,860	29	180	56
Cruise II	1,730	27	144	45
Endurance	1,520	15		28

(SECTION 6 W&B DIAGRAM FOLDOUT - INSERT HERE)

SECTION 7

AIRCRAFT AND SYSTEMS DESCRIPTION

AIRFRAME

INTERIOR FITTINGS AND EQUIPMENT

Seats

JKE carbon fibre seats are fitted in both cockpits. The seats are designed to accommodate a “Softie” backpack parachute, and are fitted with custom Oregon Aero seat cushions. The seat back cushion must be removed to accommodate a parachute.

The centre section of the rear seat can be removed to allow access to the smoke oil tank and pump, battery, and avionics/electrical rack.

Harnesses

Hooker aerobatic harnesses are standard equipment in both cockpits. The harnesses consist of shoulder straps, negative g strap, dual military style seat belts, and a stainless steel ratchet seat belt tightener.

Vents

Dual adjustable louvre fresh-air vents are provided in both cockpits.

Baggage Stowage

Baggage or miscellaneous equipment can be stowed in the turtle deck behind the rear seat.

CAUTION

Aerobatic manoeuvres with baggage are prohibited. Baggage is not permitted when the smoke oil tank is filled (C of G limitation).

CANOPY

The canopy system on the Pitts Model 12 is of the sideways opening type, and consists of a Plexiglas canopy with a steel frame, gas strut, and locking mechanism on the pilot’s left side.

FABRIC

The wings, tail section, and rear fuselage are covered in fabric.

The fabric covering this Pitts Model 12 is “Poly-Fiber” applied as per the Jim Kimball Enterprises Inc “double-cover” method, with PPG coating in urethane colour paint.

FUSELAGE

The fuselage of the Pitts Model 12 is of conventional welded tube construction. The entire fuselage frame assembly is powder coated for protection against corrosion. The forward section of the fuselage is aluminium sheet metal covered with the exception of the fibreglass engine cowls, while the aft section is mostly fabric covered.

METAL FINISH

The fuselage is finished in epoxy primer and the same PPG urethane colour paint as on the fabric. It is necessary to etch the metal parts prior to application of the normal finish.

TAIL ASSEMBLY

The entire tail assembly is constructed of welded tubes and sheet and is protected in the same manner as the fuselage.

WINGS

The wings are of predominantly wood construction with douglas fir spars and plywood leading edges. Internal bracing wires are stainless steel.

AIR SYSTEM

CAUTION

Do not use oxygen in the air start system. Use dry compressed air. The use of oxygen will result in severe damage to the air start system.

NOTE

Nitrogen may be added if pressure is excessively low and compressed air is not available, however starting may be less reliable depending on the proportion of nitrogen in the system.

A compressed air system consisting of an AK-50A compressor, air tank and associated components, air distribution system integral to the engine, and cockpit controls and instruments is used for starting.

The engine drives the compressor via an accessory drive. The air bottle and other associated components are mounted on the front side of the firewall beneath the oil tank. The bottle is normally charged through the engine-driven compressor but can be recharged from an external source through a refill valve if required.

Air Tank

The air tank is a Luxfer C010 aluminium tank rated at 12.4 MPa/1800 psi. This stores approximately 13.7 cu ft of air at 850 psi.

Air Pressure Gauge

A direct-reading pressure gauge is located adjacent to the air bottle, and can be viewed during the pre-flight inspection by looking up through the cooling tunnel underneath the engine cowl. The Engine Monitor also reads air bottle pressure through a sensor installed in the air start system.

NOTE

Approximately 400 psi minimum pressure is recommended to ensure a successful start. Full pressure is approximately 800-850 psi.

Shutoff Valve

The manual shutoff valve on the air bottle is accessed through the air system hatch on the left side of the engine cowl. This valve should normally be closed while the aircraft is parked to prevent gradual air leakage from the system, and opened during the preflight inspection.

NOTE

The direct reading gauge and air pressure sensor are downstream of the shutoff valve. Even with full pressure in the tank, indications on these instruments may read zero when the shutoff valve is closed.

Refill Valve

A refill valve is located next to the air bottle shutoff valve on the bottle neck. This can be accessed through the air system hatch. For refill procedures, refer to 'Air System' in Section 8.

Pressure Relief Valve

Maximum bottle pressure is set at approximately 850 psi by an adjustable pressure relief valve located adjacent to the bottle pressure gauge.

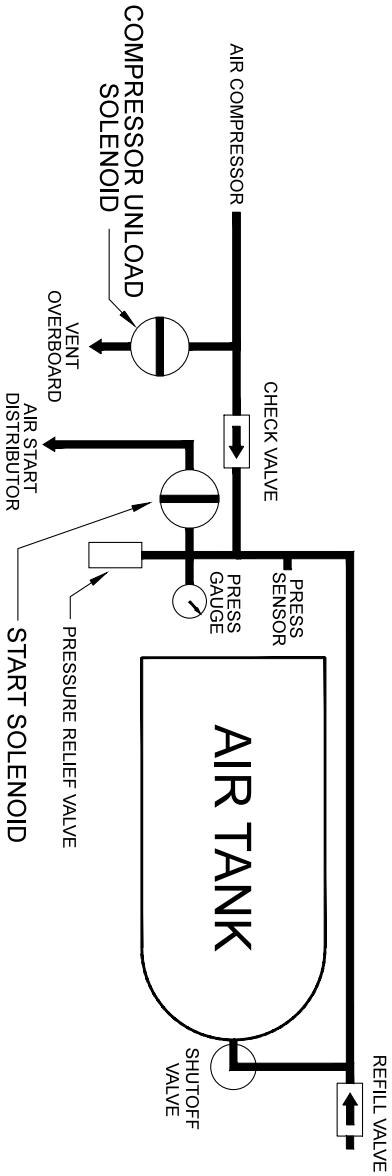
Start Solenoid

The start solenoid is operated by pressing the engine START pushbutton and allows air pressure into the air start distribution system to crank the engine. The start solenoid is electrically isolated from the start pushbutton when the oil shutoff handle is pulled closed.

Compressor Unload Solenoid

This is operated automatically by a pressure sensing switch, and unloads the compressor by venting discharge air overboard. This extends compressor life and minimises the amount of oil introduced into the air system from continuous compressor operation.

A green LED on the instrument panel illuminates to indicate that the compressor has unloaded because the tank is fully charged.



AIR SYSTEM SCHEMATIC

AVIONICS

VHF TRANSCEIVER

The aircraft is equipped with a Trig Avionics TY91 VHF communications transceiver, which consists of a main transceiver unit on the avionics rack behind the pilot's seat, and a remote control unit mounted in the rear instrument panel. Press-to-Transmit buttons are located on front and rear throttle levers. The VHF antenna is a "bent whip" style mounted on the fuselage belly.

On/Off/Squelch Knob

Rotate - powers on/off and adjusts audio volume.

Press - toggles squelch on or off.

Mon Button

Short press - activates dual reception on standby frequency.

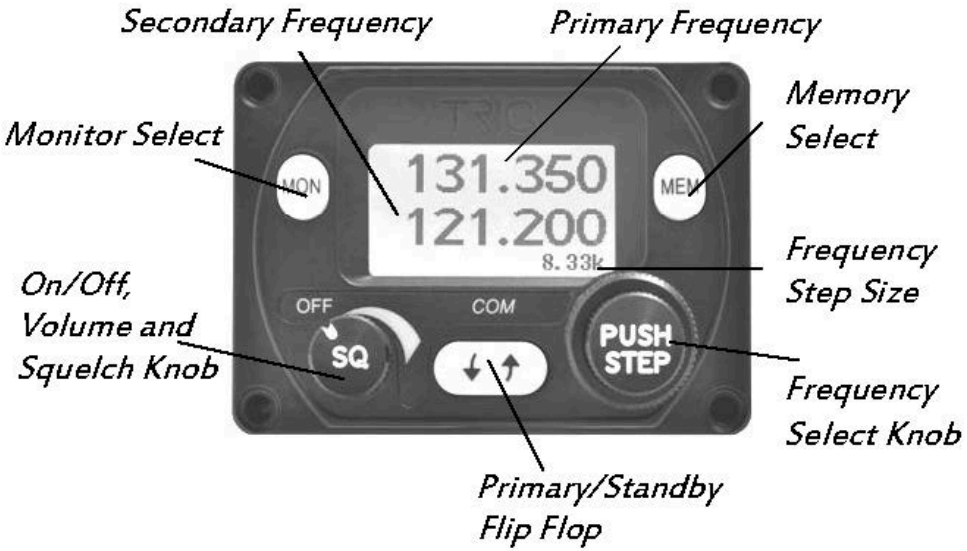
Long press (2 sec) - activates sub-menu items. Scroll through these with the outer freq knob, and adjust value with inner freq knob:

1. INT Vol	5. Sidetone Vol
2. INT Squelch	6. Squelch offset
3. Aux In Vol	7. Freq step size
4. Aux In Muting	

Mem Button

Short press - enters preset channel mode. Rotate inner frequency knob to change channels in standby window.

Long press (2 sec) - stores <u>active</u> frequency into current preset channel.



TRANSPONDER

A Trig Avionics TT22 Mode S transponder is fitted. This consists of a main transponder unit mounted on the avionics rack behind the rear seat, and a controller unit in the rear instrument panel. The transponder antenna is a Comant blade type, mounted on the fuselage belly.

Mode Knob

Normal mode of operation is “SBY” when on the ground, and “ALT” when airborne.

VFR Button

This sets the 1200 VFR code.

FN Button

This allows changing of the flight ID and should not normally be used except for initial transponder setup.

Setting A New Code

To change code, simply:

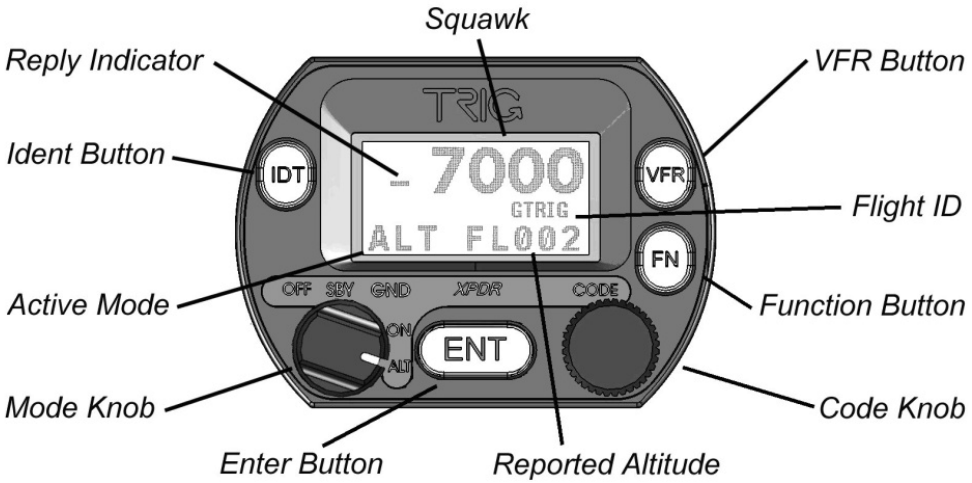
1. Turn the code knob.

   This automatically highlights and starts changing the first digit.

2. When the first digit is correct, press ENT.

   The number is stored and the next digit is automatically highlighted.

3. Repeat until all 4 digits are correct.



INTERCOM

Intercommunication between front and rear seats is through the internal intercom of the TY91 VHF transceiver. Intercom functions such as volume and squelch are controllable through the remote unit on the pilot's instrument panel. Intercom jacks are located on the right side of the rear seat frame, and the right side of the front instrument panel.

EMERGENCY LOCATOR TRANSMITTER

An ACK E-04 Emergency Locator Transmitter is carried on the equipment rack behind the rear seat. A remote control indicator unit is mounted in the rear cockpit on the right side panel. The transmitter operates on 406 and 121.5 MHz. For detailed operation of the ELT, refer to the E-04 ELT Operation Manual.

FIGURE 16

COCKPIT REMOTE

GPS

A Garmin Aera 550 portable GPS is fitted on the lower centre of the rear instrument panel. The Garmin mounting cradle is permanently installed in the panel. To install the GPS unit, fit the bottom of the GPS into the cradle, and press the top forward until it snaps into place. To remove the GPS, press the release lever on the upper right side of the cradle and lift the unit out.

The GPS is powered through the aircraft bus when locked into the cradle, and GPS ground track output is provided to the compass on the Trutrak ADI.

For detailed operation of the GPS, refer to the Garmin Aera Pilot's Guide.

ELECTRICAL SYSTEM

The Pitts Model 12 is equipped with a 12 volt DC electrical system consisting of the battery, alternator, voltage regulator and overvoltage protection, and an electrical distribution bus. Circuits are protected through circuit breakers and switch-breakers.

BATTERY

A 7.5 amp-hour 12V battery is located behind the rear seat. The Master Switch connects power from the battery to the electrical bus through the battery circuit breaker. The battery should be maintained in a charged condition at all times. If the battery requires charging, use a maximum initial charge rate of 2 amps. The master switch should be off when charging.

Master Circuit Breaker

A master circuit breaker located adjacent to the battery isolates all electrical power at the battery when pulled or tripped.

ALTERNATOR

A B & C Specialty Products SK-35 alternator is driven from the generator accessory drive on the top rear of the engine. The SK-35 is a single phase, externally regulated, wound-field alternator with a nominal output of 35 amps.

Master Switch

The master switch is a three-position locking toggle switch which controls the battery in the middle position and alternator + battery in the up position.

Voltage regulator and Overvoltage Protection

A B & C Specialty Products LR3C voltage regulator is provided to regulate the SK-35 alternator output. The LR3C is a linear-type regulator and does not require a filter capacitor. Nominal output is 14.4V, and this can be adjusted via a small screw under the plastic plug on the side of the unit. Turn clockwise to increase, and anti-clockwise to decrease output voltage (1/2 turn = 0.1V).

The voltage regulator includes built-in overvoltage protection which will trip the 5A alternator field (ALT FLD) circuit breaker on the pilot's side panel when an overvoltage is detected. Overvoltage and low voltage warnings are also provided through the preset limits on the engine monitor.

Electrical system monitoring

Battery voltage and system charge/discharge current are monitored through the engine monitoring system.

Battery voltage will be shown with the master switch on and the engine not running. With the engine running and alternator on, the voltmeter will show DC bus voltage.

ELEC SCHEMATIC

ELEC SCHEMATIC

ENGINE

This aircraft is powered by a Vedeneyev M-14P 9 cylinder radial, modified by Barrett Precision Engines Inc. Higher performance components are used in areas such as pistons, piston rings, and the reduction gearbox. This results in a higher HP output as well as reduced oil consumption and better fuel efficiency. The engine is rated at 436 HP.

The BPE engine is equipped with a fuel injection system, and electronic ignition.

ENGINE INSTRUMENTS

Rear Cockpit

Primary engine instrumentation is provided through the Engine Monitor. Electrical sender units are used for system parameters. Fuel used and remaining are calculated by the system based on fuel flow and the starting quantity of fuel input to the unit before flight.

Predefined limits are set into the unit (see Operating Manual). When these are exceeded, the respective reading flashes in red, and the “EDM” light on the instrument panel will blink. The engine monitor is powered up upon selecting the battery MASTER switch to either BATT or ON. The system is protected through the 5A “JPI” circuit breaker.

Front Cockpit

An Electronics International tachometer and manifold pressure gauge are located on the front instrument panel. The front tachometer operates independently of the engine monitor but takes its signal from the same electronic ignition system. Manifold pressure is taken from a “T” junction in the manifold pressure sense line directly to the sender unit located on the rear of the instrument. These instruments are protected through the 2A “ENG INST” circuit breaker.

ENGINE FUEL SYSTEM

Fuel is delivered from the engine driven pump to the BPE fuel injection nozzle in the supercharger air intake. The injection nozzle comprises of numerous radially arranged holes which produce a fine, uniformly atomise fuel mixture within the supercharger intake. The fuel-air mixture then flows through the supercharger to the cylinder inlet valves.

EXHAUST SYSTEM

A stainless steel exhaust system is fitted which ports exhaust from the nine cylinder outlets to the two exhaust pipes through the bottom of the engine cowling.

Bayonet-type exhaust gas temperature (EGT) sensors are fitted near the exhaust outlet for each cylinder and send EGT data to the engine monitor.

Near the end of each main exhaust pipe stub is a smoke oil outlet. When the smoke system is switched on, smoke oil is pumped from the smoke tank through the smoke solenoid valve and directly into the hot exhaust flow.

IGNITION SYSTEM

A dual-redundant “Gemini” electronic ignition system is fitted. The ignition controller modules are located on the rear of the engine in place of the conventional M-9F magnetos. Primary power for the ignition modules is drawn from the aircraft electrical bus through the “L IGN” and “R IGN” 5A circuit breakers, however each module contains its own internal alternator as a backup power source in the event of loss of the electrical bus. The electronic ignition can remain self-powered down to idle RPM.

Ignition power is delivered from the two modules to the ignition coils for each cylinder. Each cylinder has one coil per spark plug, powered from the left (front spark plugs) and right (rear spark plugs) ignition control modules respectively.

OIL SYSTEM

Oil Shutoff Valve

A “press to release” push-pull knob in the rear cockpit operates an oil shutoff valve on the oil tank outlet to help prevent oil leakage from the system when the aircraft is parked. The shutoff valve also electrically disables the engine start solenoid when the oil shutoff valve is in the OFF position.

Oil Scavenge Pump

An electrically operated oil scavenge pump is located on the firewall. This scavenges excess oil which has drained into the manifold from the engine and pumps it back to the oil tank. This greatly reduces the probability of hydraulic lock caused by oil draining into the lower cylinders. The scavenge pump is for ground use only, and is operated through the guarded “OIL SCAV” switch-breaker on the circuit breaker panel.

Oil cooler

An oil cooler and inlet scoop is located beneath the engine. The oil cooler operation is fully automatic with a thermostat set to operate at approximately 60°C. Below this temperature, the oil cooler is bypassed. Above this, the oil is diverted through the oil cooler before being pumped back to the oil tank. Operation at prolonged high power settings in very warm ambient temperatures may exceed the oil cooler’s capacity and can require a temporary reduction in power to avoid exceeding oil temperature limits.

PROPELLER

The engine drives an MT-Propeller three blade 260 cm MTV-9 constant speed hydraulically controlled propeller. The propeller hub is manufactured from aluminium and the blades are of a laminated wood composite design covered with fibreglass. A bonded stainless steel sheath protects the outer portion of the leading edges.

The propeller blades for installation on aerobatic aircraft are fitted with counterweights to drive the propeller towards coarse pitch (low RPM). This is to prevent the propeller overspeeding in the event of a loss of oil pressure during manoeuvring.

Propeller Governor

An MT-Propeller P-8 hydraulic propeller governor controls the propeller pitch according to the position of the propeller levers in the front and rear cockpits. The governor uses engine oil supplied through the crankshaft, and increases oil pressure to approximately 300 psi to operate the pitch change mechanism. Positive oil pressure will attempt to drive the propeller to fine pitch.

FLIGHT CONTROLS

Conventional ailerons, elevators and rudder are provided. All flight controls are of metal construction with fabric covering. Extensive use of ball bearings in the control system assures smooth trouble free operation and minimum wear. Adjustable trim tabs are provided for elevators only. Elevator trim tab control is manual, through the trim lever below the throttle quadrant.

FLIGHT INSTRUMENTS

Accelerometer (G-meter)

A direct reading, three-pointer mechanical accelerometer is located in both cockpits. The main pointer indicates current g reading. The secondary pointers will indicate the maximum and minimum recorded g readings. The maximum and minimum pointers can be reset to indicate 1 g by pressing the reset button.

Airspeed Indicator

A conventional airspeed indictor calibrated in knots is provided in both cockpits.

Direct Reading Compass

A Precision Aviation PAI-700 direct reading vertical card magnetic is fitted in the front cockpit. The compass has two adjustment screws. The left screw adjusts for north-south errors, and the right screw adjusts for east-west errors.

Altimeter

A dual-scale (mB and Inches Hg) altimeter is fitted in both cockpits.

Slip Indicator

A conventional skid-ball type slip indicator is located below the front panel compass. An electronic slip indicator is built into the TruTrak ADI display in the rear cockpit.

Attitude Director Indicator (ADI)

WARNING

Flight in Instrument Meteorological conditions is prohibited in this aircraft. The ADI is installed as a backup instrument only, and cannot display extreme roll or pitch angles (eg, during aerobatics).

A TruTrak “Gemini” electronic ADI is provided in the rear cockpit. The ADI contains integral solid state sensors for attitude detection and is powered from the aircraft electrical bus.

A linear horizontal compass segment beneath the ADI is slaved to the GPS output and indicates ground track. In the event of a loss of GPS signal, the compass functions as an unslaved gyro compass and should be checked against magnetic heading from the compass in the front cockpit.

Pitot-Static System

Pitot and static pressures are measured through a single unheated pitot tube on the lower left wing. Pitot and static lines branch out to both ASIs, altimeters, the Trig transponder for altitude encoding, and the Trutrak ADI for bank angle calculations.

FUEL SYSTEM

The Pitts Model 12 is equipped with a main tank in the forward fuselage and a wing tank in the upper wing, with a total capacity of 204 litres, a minimum of 200 litres being usable. A header tank with flop tube is located beneath the main tank and provides the fuel supply for inverted flight. The main tank (including header tank) has a capacity of 136 litres (min 132 useable). The wing tank has a capacity of 68 litres, all of which is useable.

Both tanks are filled through conventional filler caps on top of the tanks. A three-position fuel selector valve (OFF-MAIN-WING) is controlled from the rear cockpit.

CAUTION

Wing tank fuel is for cruise only. Do not perform aerobatics with wing tank fuel, or fuel may be vented across the top wing surface.

FUEL DRAINS

Two fuel drains are connected to the header tank and gascolator respectively at the lowest points in the fuel system. They are accessible under the fuselage near the front cockpit, and should be sampled prior to the first flight of the day or if the aircraft has been refuelled to check for water contamination.

FUEL PUMPS

Both an engine-driven fuel pump (see M14P maintenance manual for details) and a 12V electric boost pump are provided. The boost pump is required for priming, takeoff, landing, or in the event of loss of fuel pressure from the engine driven pump.

FUEL PRIMER SOLENOID

A fuel primer solenoid allows fuel to be injected into the priming port in the intake system by the electric boost pump for engine priming prior to start.

FUEL SYSTEM CONTROLS

Fuel Pump switch

A three-position double-pole switch labelled OFF – BOOST - PRIME is located next to the starter button on the right side of the rear instrument panel. The BOOST position activates the electric boost pump only. The PRIME position is spring- loaded to return to BOOST. When held in the PRIME position, the primer solenoid opens while the boost pump is running.

Fuel Valve

A three position fuel selector valve is located on the lower right side of the rear cockpit. The valve is labelled OFF-WING-MAIN for fuel selection from the appropriate tank.

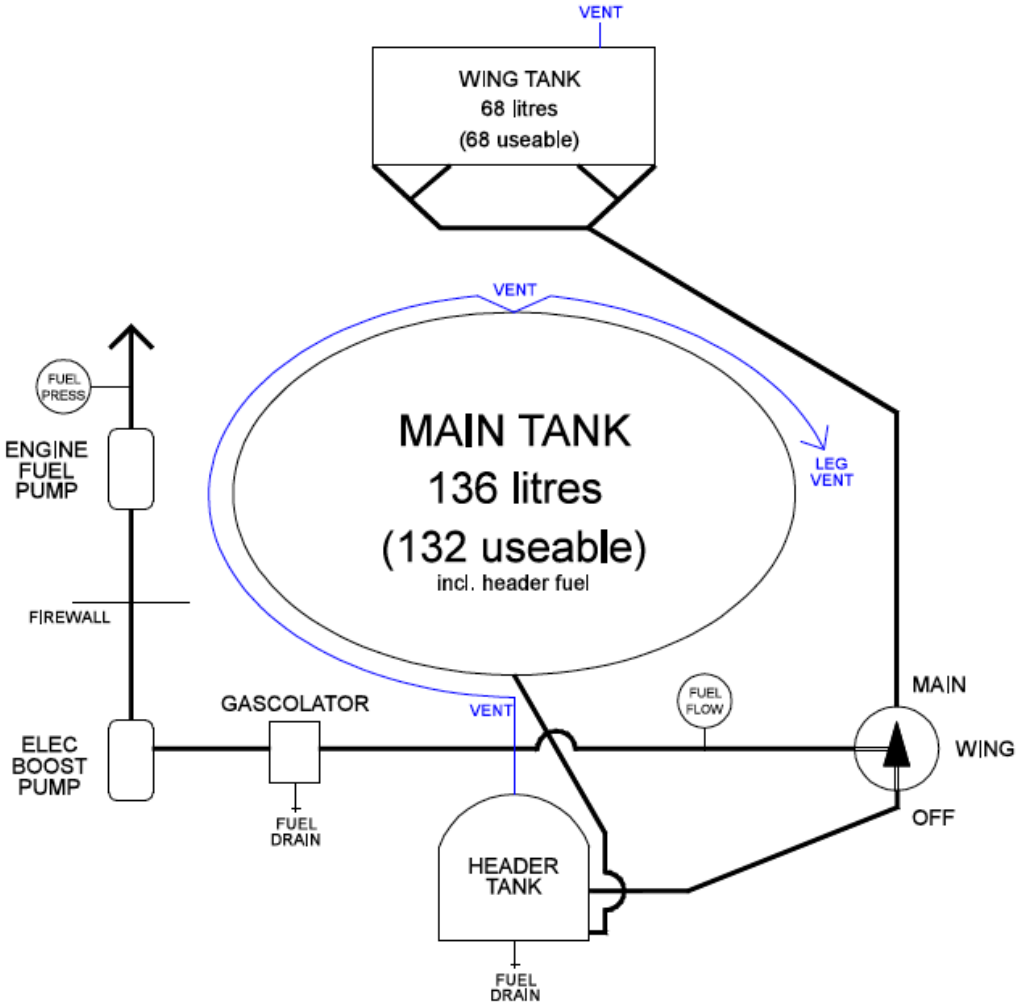
FUEL SYSTEM INSTRUMENTATION

Fuel Gauge

The main tank is equipped with a visual sight gauge (spiral magnetic float type) on the top of the fuel tank to give a direct visual indication of fuel remaining.

Fuel Flow and Pressure

Flow rate and pressure are continuously monitored by sensors connected to the engine monitor. Fuel flow rate is used to calculate fuel quantity parameters displayed on the engine monitor. Wing tank fuel remaining can only be judged from fuel burn displayed on the engine monitor (empty when approaching 68 litres consumed from full tanks), or from a drop or fluctuations in fuel pressure when the tank is empty.



FUEL SYSTEM SCHEMATIC

LANDING GEAR, WHEELS AND BRAKES

The main landing gear is a spring aluminium landing gear type manufactured by Grove Aircraft. The tail gear consists of a steerable swivel tail wheel assembly, a stainless steel spring for energy absorption, and two steering spring assemblies.

BRAKE SYSTEM

The brake system is filled with a petroleum base hydraulic fluid complying with MIL-H-5605 or other approved product.

TYRES

The tyres can be removed from the wheels by first deflating the tubes, then removing the wheel through bolts allowing the wheel halves to be separated. See wheel and brake manufacturer's information for additional details and procedures.

SMOKE SYSTEM

A 26 litre smoke tank and pump are located aft of the rear seat under the turtle deck/baggage compartment. Smoke oil is transferred through the smoke solenoid valve to the engine exhaust outlets by a 12V reversible fluid pump. No baggage is allowed when the smoke oil tank is full due to CG limitations.

Smoke Solenoid Valve and Regulator

The smoke solenoid valve is activated by the "SMOKE" switch on the throttle quadrant to allow smoke oil to be pumped into the regulator on the forward side of the firewall. This distributes oil to each exhaust stack and regulates the flow. The solenoid valve only opens when the guarded fill switch is in the NORM position.

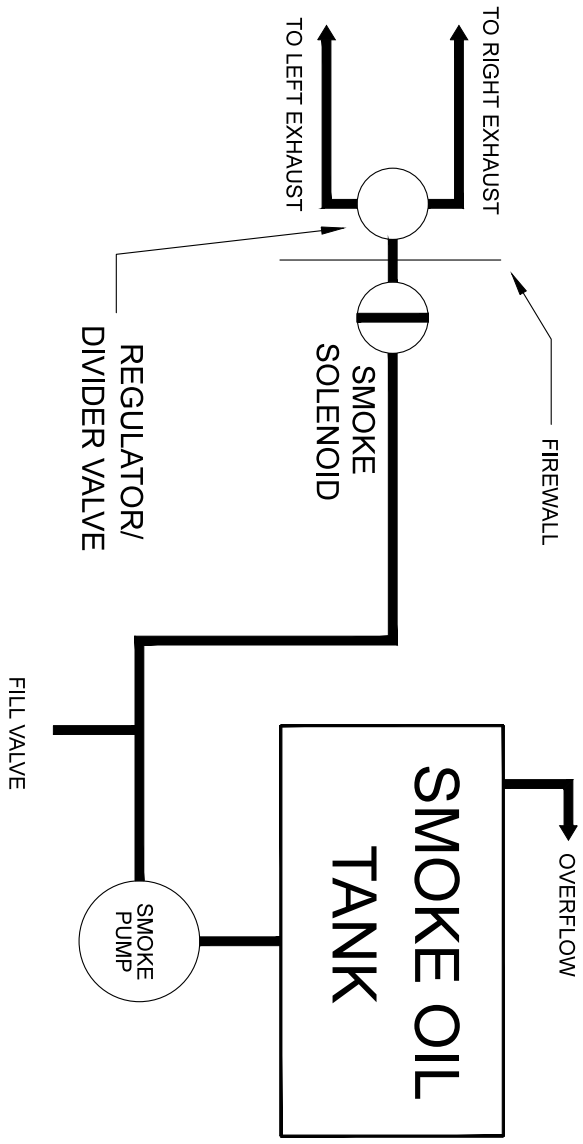
Smoke Switch

Aside from opening the smoke solenoid, the SMOKE switch simultaneously activates the smoke pump to draw oil from the tank and pump it through the system.

Smoke Fill Switch

A guarded two position SMOKE NORM/FILL switch on the pilot's throttle quadrant allows the pump to be reversed for the purpose of filling the smoke tank. In the "NORM" position, the smoke system operates in the conventional sense through activation of the SMOKE switch.

With the guard lifted and the switch in the "FILL" position, the pump circuit is reversed and the solenoid valve remains in the closed position. This allows smoke oil to be drawn from the quick connect fitting located on the underside of the fuselage, into the tank. The smoke system is protected by a 5A circuit breaker.



SMOKE SYSTEM SCHEMATIC

SECTION 8

HANDLING, SERVICE AND MAINTENANCE

DAILY AND PERIODIC INSPECTIONS

Daily and Periodic (Annual) Inspections shall be performed in accordance with Civil Aviation Regulations.

SERVICING

This Pitts Model 12 is certified in the "Experimental - Exhibition" category and requires any maintenance procedures other than those listed in Schedule 8 of the Civil Aviation Regulations to be performed by appropriately qualified aircraft maintenance engineers.

Fuel

The BPE M14P engine uses 100 Octane aviation gasoline. Total fuel capacity is 204 litres (136 litres main tank, 68 litres wing tank), with a minimum 200 litres usable.

AIR SYSTEM

CAUTION

Do not use oxygen in the air start system.

Use dry compressed air to recharge the system. The use of oxygen will result in severe damage to the air start system components if a start is attempted. Nitrogen may be used to augment the available bottle pressure if compressed air is not available, however the engine will become harder to start as the proportion of nitrogen to compressed air increases.

The fill fitting is located near the air tank valve assembly. To fill the tank from an APU bottle:

1. Remove the safety cap.
2. Connect the fill hose onto the fitting.
3. Check that bleed valve on the APU tank is closed. Open the tank and allow air to flow into the airplane tank. Fill to 800 psi. Close OFF both bottle and APU.
4. Open bleed valve to relieve hose pressure. Remove hose from fill fitting and tank and replace the safety valve cap.

BRAKES

System Refill

If it is necessary to add fluid to the system:

1. Remove filler plugs from master cylinders.

2. Fill with correct hydraulic fluid such that the level is ½" below the top of the reservoir.
3. Reinstall filler plugs
4. Check brake system for proper operation

System Bleeding

When it is necessary to refill or to bleed the brake system:

1. Remove filler plugs from master cylinders.
2. Loosen bleeder screw on brake unit at wheel and drain system.
3. Onto the loosened bleeder screw, insert brake bleeder hose, which is fastened to a pump-type pressure oil can filled with correct hydraulic fluid.
4. Fill the system from the bottom up using the pump-type pressure oil can.
5. When master cylinder is filled to within ½" from top of reservoir, tighten brake bleeder screw and removing bleeder hose.
6. Reinstall filler plugs in master cylinders.
7. Check system for proper operation.

TYRES

For maximum service keep the tyres inflated to 35 psi.

OIL SYSTEM

Oil capacity.....16 litres

Oil change interval (rec.)..... 25 hrs

Oil type (climate 15-30°C).....W100

Use 60 wt Aeroshell or equivalent oil.

CAUTION

Do not use multi grade oil.

In very cold conditions, 50 wt W100 can be used. Also if travelling and it is hard to get 60 wt, use 50 wt. For aerobatics oil level should be 9.5 to 11 litres. For cross country 11-15 litres. Most of the oil is lost through the vent system.

SMOKE SYSTEM

To refill the smoke oil tank (total capacity 26 litres) proceed as follows:

1. Connect the special hose fitting onto the smoke tank refill valve under the belly of the aircraft behind the rear seat.
2. Run the other end of the hose into the smoke oil drum.
3. Master switch ..... BATT
4. Smoke Fill switch ..... FILL
5. Smoke switch ..... ON

When oil siphoning is complete:

6. Smoke switch ..... OFF
7. Smoke Fill switch ..... NORM
8. Master switch ..... OFF

CANOPY

In order to keep the canopy clean, the following procedure is recommended:

1. Flush with clear water to dislodge dirt, mud, smoke oil, etc.
2. Clean with an aircraft grade Plexiglas windshield cleaner, using a soft cloth.
3. Scratches may be removed by polishing with proper Plexiglas products.

FLIGHT CONTROLS

Keep all jam nuts and all bolts in rod end bearings tight. The inner race of all ball bearings must be tight and not allowed to rotate on the thru bolt.

MODEL 12 RIGGING INSTRUCTIONS

See Pitts Model 12 rigging instructions included in the aircraft records.

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SECTION 9

SUPPLEMENTS

RESERVED