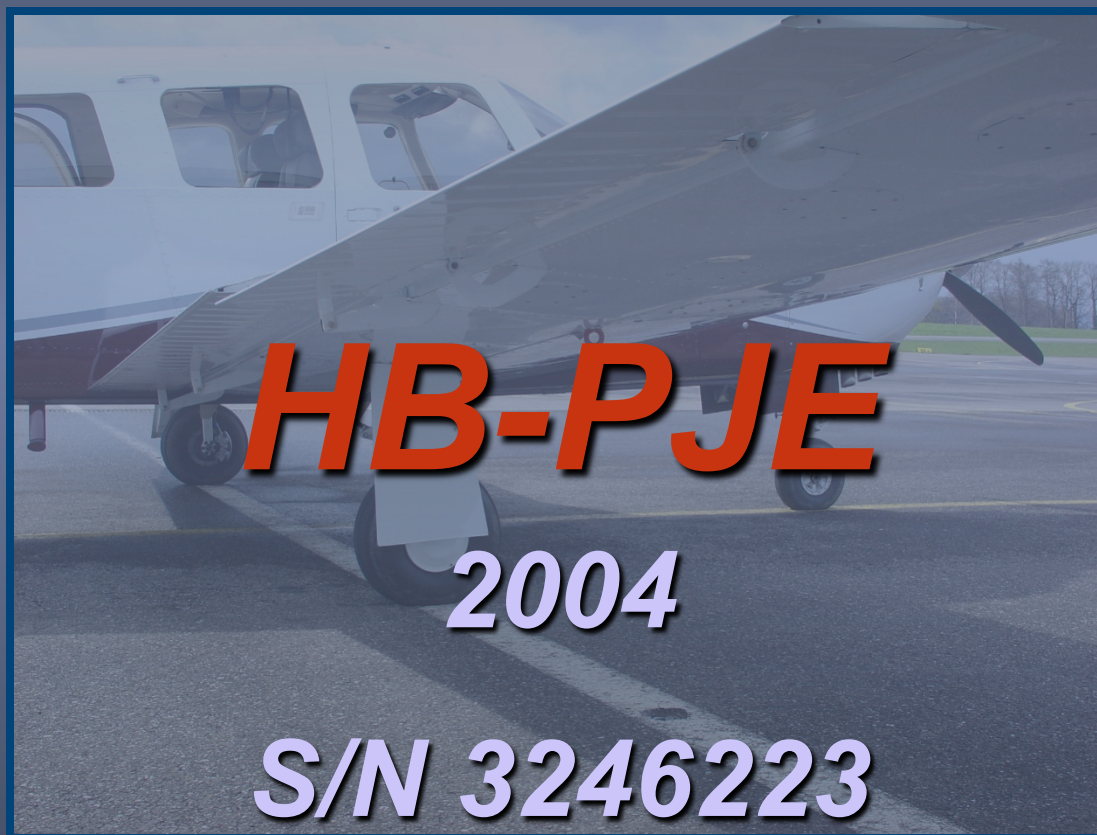


Vol à
moteur



PA-32R-301

SARATOGA II HP



HB-PJE

2004

S/N 3246223



TECHNICAL GROUND COURSE PROGRAM

- ***AIRCRAFT GENERAL***

- Airplane Equipment
- Airframe Structure
- Fuselage - Wings
- Limitations

- ***POWERPLANT***

- Engine Description
- Engine Fuel System
- Oil System
- Propeller System
- Engine Controls
- Indicating System
- Limitations
- Emergency Procedures



TECHNICAL GROUND COURSE PROGRAM

- **SYSTEMS**

- Fuel System
- Electrical System
- Landing Gear
- Environmental Systems
- Flight Controls
- Flight Instrumentation

- **Mass & Balance**

- General Loading Recommendations
- Mass & Balance Record

- **Performances**

- Airspeed Calibration
- Stall Speeds
- Wind Components
- Take-Off performances
- Climb: Time, Consumption, Distance
- Cruise Performances
- Descent: Time, Consumption, Distance
- Landings Performances



Airplane Equipment

- ✓ 3 blade propeller
- ✓ engine:
 - Lycoming 300Hp (AVGAS only)
 - Six cylinder, direct drive, horizontally opposed, air cooled, fuel injected
- ✓ retractable gear
- ✓ 6 seats (2 center seats aft facing)
- ✓ 2 doors:
 - RH for pilot & copilot
 - LH for passengers
- ✓ 2 separate baggage compartments

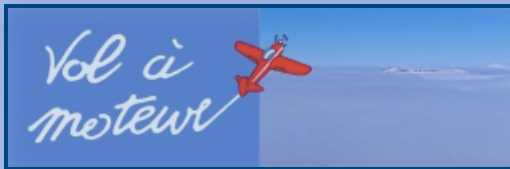


Airframe / Fuselage / Wing

- ✓ basic airframe: aluminum alloy
exemption:
 - steel engine mount
 - landing gear
 - tips of wings, tail fin, stabilisator (plastic)
- ✓ fuselage: semi-monocoque structure
front door on the RH side
rear door on the LH side
cargo door aft of the rear passenger door
- ✓ wings: semi-tapered design
main spar $\approx$ 40% of the chord
each wing: 2 interconnected fuel tanks

Airframe / Fuselage / Wing





PA-32R-301

Airframe / Fuselage / Wing





Limitations

1

✓ Airspeed:	V_{NE} :	191 KIAS (red radial)
	V_{NO} :	160 KIAS (yellow arc limit)
	V_A :	134 KIAS (3' 600 Lbs) 105 KIAS (2' 230 Lbs)
LDG Gear	V_{LO} :	extention 132 KIAS retraction 110 KIAS
	V_{LE} :	132 KIAS
Flaps	V_{FE} :	110 KIAS



PA-32R-301

Limitations

Yellow arc: 160 KIAS to 67 KIAS

Green arc: 160 KIAS to 67 KIAS

White arc: 110 KIAS to 63 KIAS

2





Limitations

2

V_x

gear down, flaps up
gear up, flaps up

not published
not published

V_y

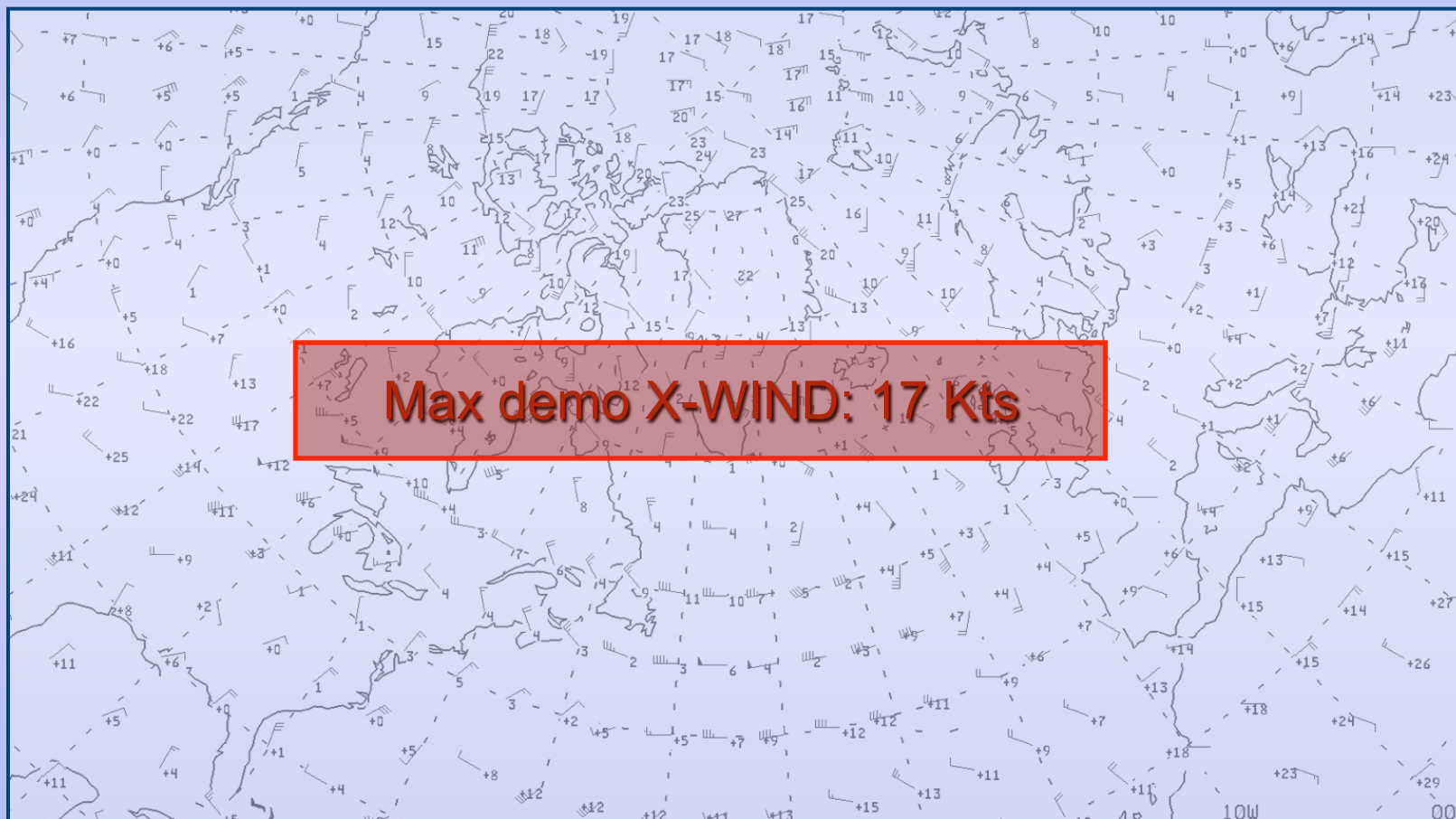
gear down, flaps up
gear up, flaps up

85 KIAS
93 KIAS



Limitations

2





Limitations

2

- ✓ Weight:
 - Max Ramp W. : 3' 615 Lbs
 - Max TOF W. : 3' 600 Lbs
 - Max Bag : 100 Lbs each comp.
! Check W & B !

- ✓ Fuel:
 - Total capacity: 107 USG
 - Unusable: 5 USG (2.5 USG / wing)
 - Usable: **102** USG (51 USG / wing)



Limitations

3

✓ Load factors: Max positive 0° flaps : 3.8 G

Max positive full flaps : 2.0 G

Max negative : no inverted
maneuvers
approved !

✓ Types of operations: Day VFR / Night VFR
Day IFR / Night IFR

Non icing !



PA-32R-301

Powerplant

1

- ✓ Lycoming: 300 Hp at 2' 700 RPM
- geared starter
- 90 A alternator
- dual magnetos
- vacuum pump drive
- diaphragm-type fuel pump
- fuel injection



Powerplant

Lycoming:

intake air box



a manually operated two-way valve



induction air

through the filter

(normal procedure)

bypass the filter
(heated air directly to the engine)

(in case of blocked filter)
Not be used for GND OP & TOF



2



Powerplant

3

✓ Lycoming:

fuel injection system

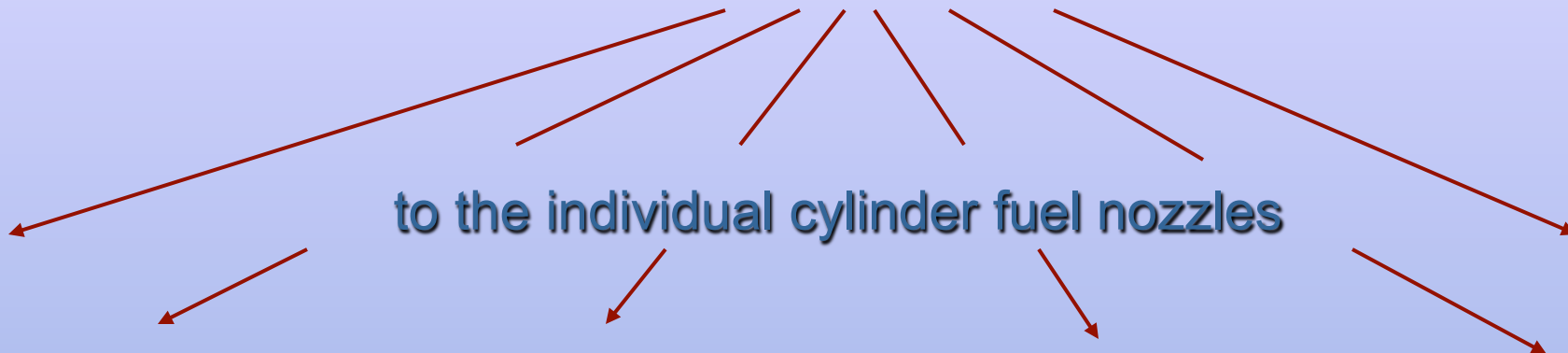


servo regulator

(meters fuel flow in proportion to airflow)

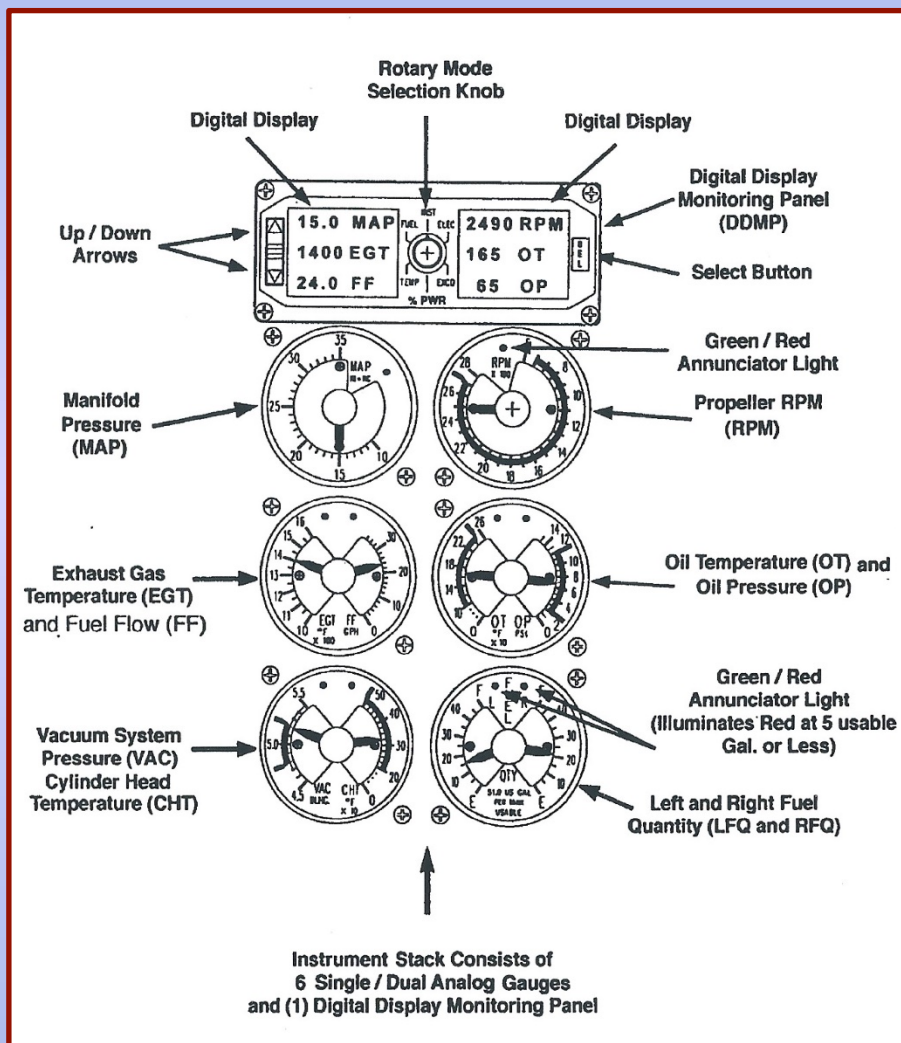


fuel flow divider



Powerplant

✓ Engine Monitoring System:



4



PA-32R-301

Powerplant

4

✓ Lycoming: Oil quantity: max 12 Qts
min 6 Qts



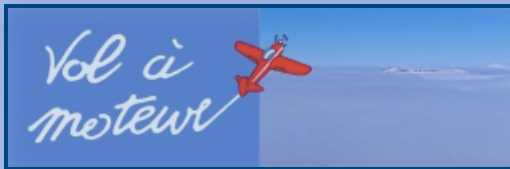


PA-32R-301

Powerplant

5

- ✓ Propeller: constant speed propeller
controlled by a governor
hydraulically actuated



PA-32R-301

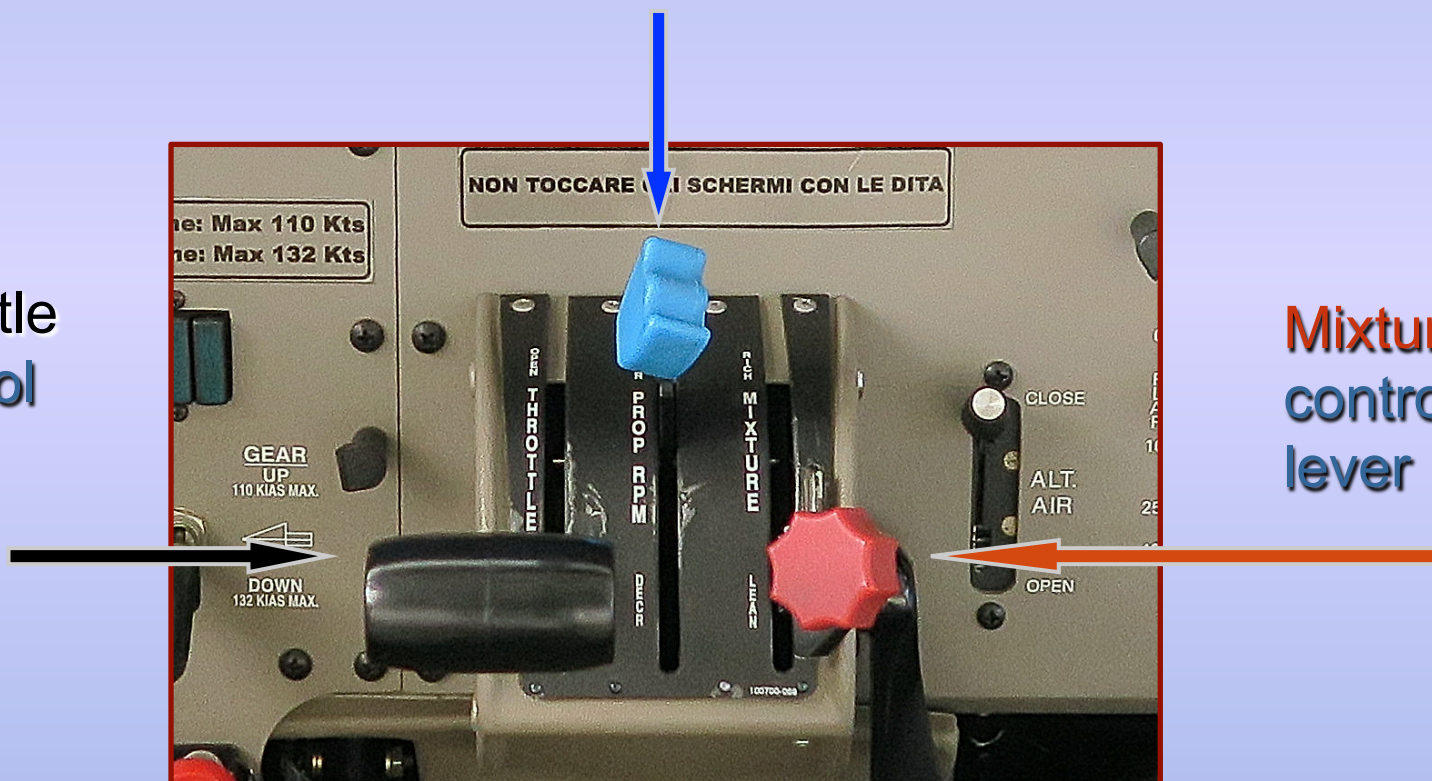
Engine controls

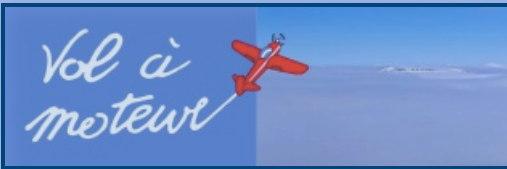
1

Propeller control lever

Throttle
control
lever

Mixture
control
lever



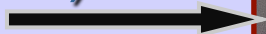


PA-32R-301

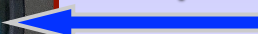
Engine controls

2

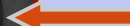
Throttle
(MP)



Propeller (RPM)



Mixture
(GPH)



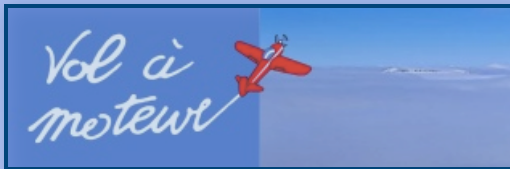


Engine limitations

2

TOF power → 2' 700 RPM → 3 blades prop:
no limitation

Max cont. power → 2' 600 RPM



Engine limitations

Emergency

1

ENGINE POWER LOSS IN FLIGHT

If at low altitude:

AirspeedMAINTAIN 83 KIAS
Minimum

Prepare for power off landing.

ENGINE POWER LOSS IN FLIGHT (continued)

If altitude permits:

Fuel selectorswitch to tank
containing fuel

Electric fuel pumpON

MixtureRICH

Alternate airOPEN

Engine gaugescheck for indication
of cause of power loss

If no fuel flow is indicated, check tank selector position to be sure it is on a tank containing fuel.

When power is restored:

Alternate airCLOSED

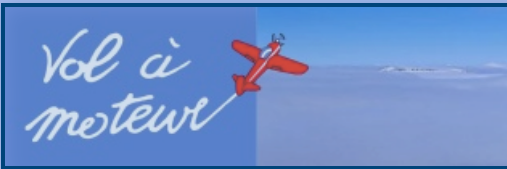
Electric fuel pumpOFF

Mixtureadjust as necessary

If power is not restored prepare for power off landing.

POWER OFF LANDING

Trim for 83 KIAS

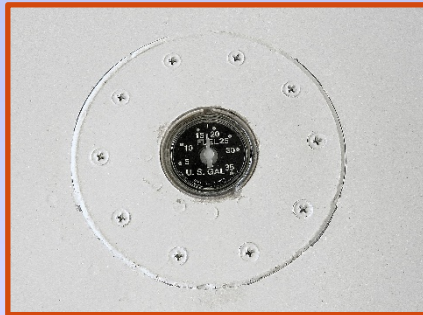


PA-32R-301

Fuel system

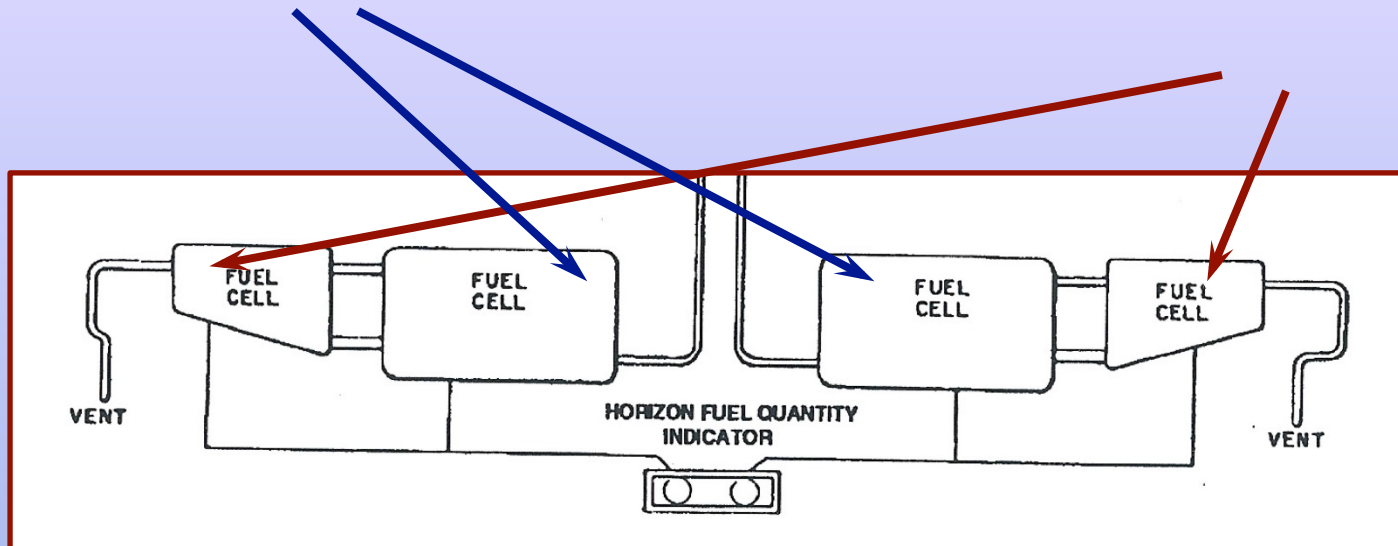
Standard capacity

1



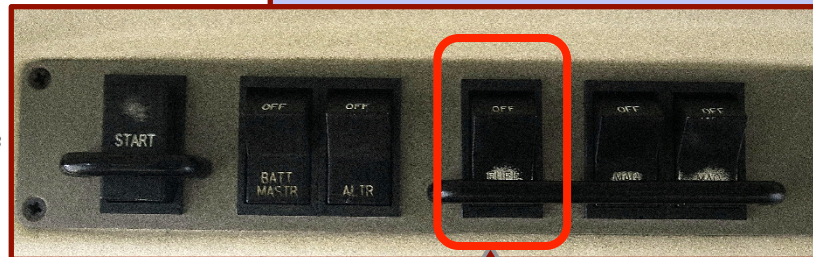
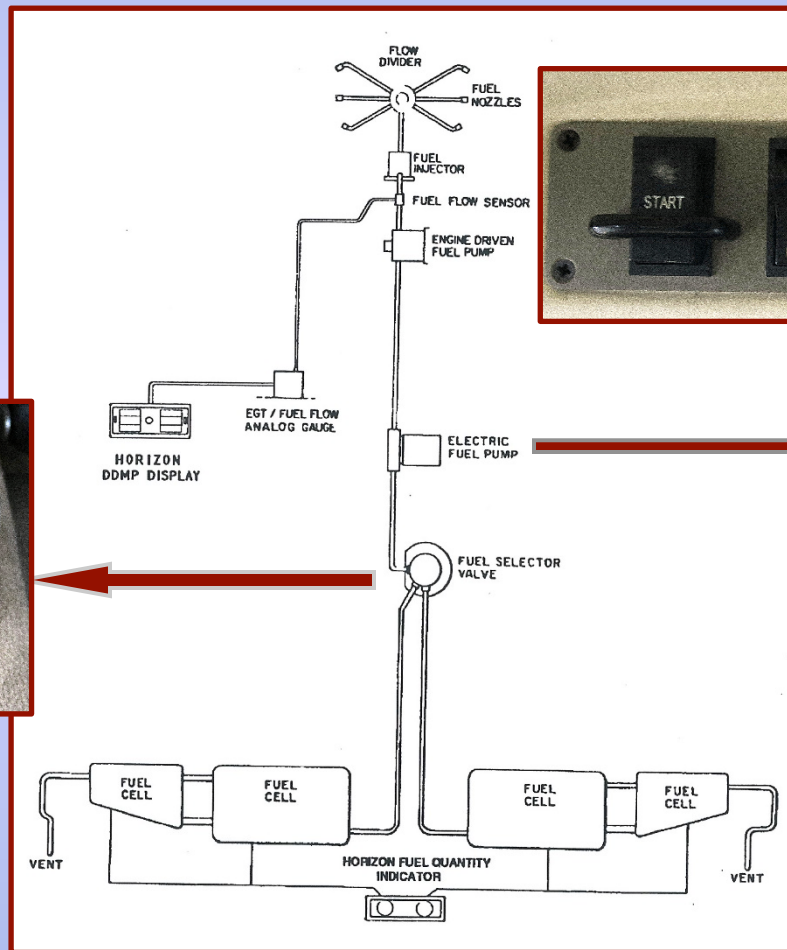
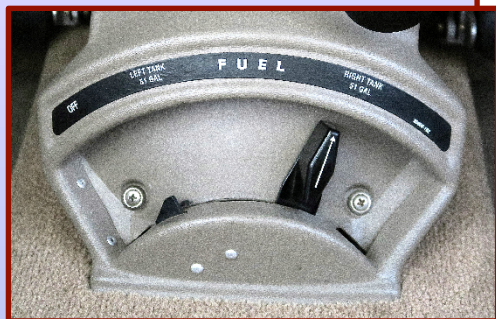
(107 USG total)

**102 USG usable
(51 USG each wing)**



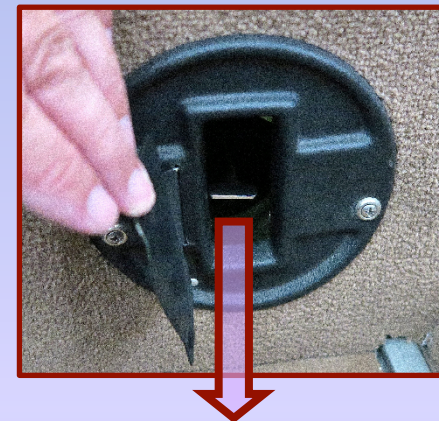
Fuel system

2

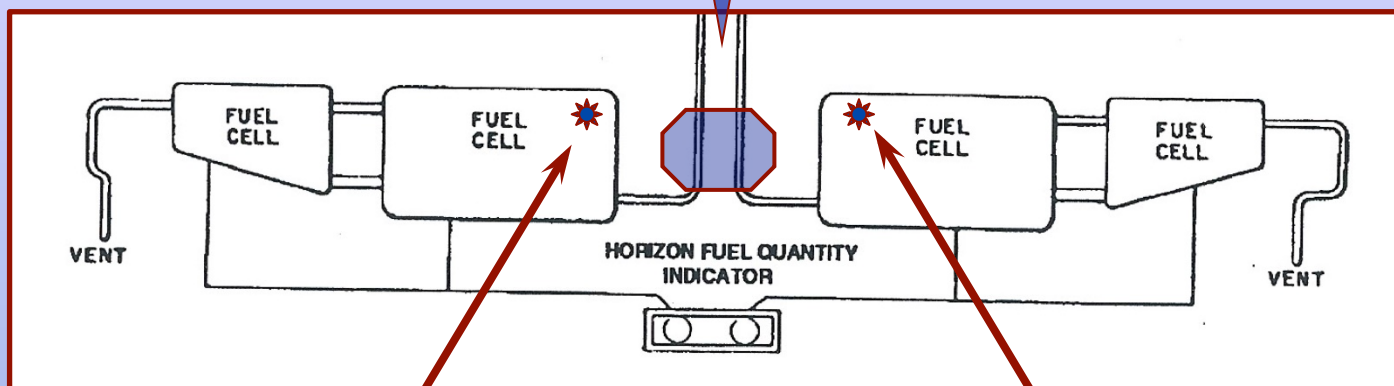


Fuel system

3 drains



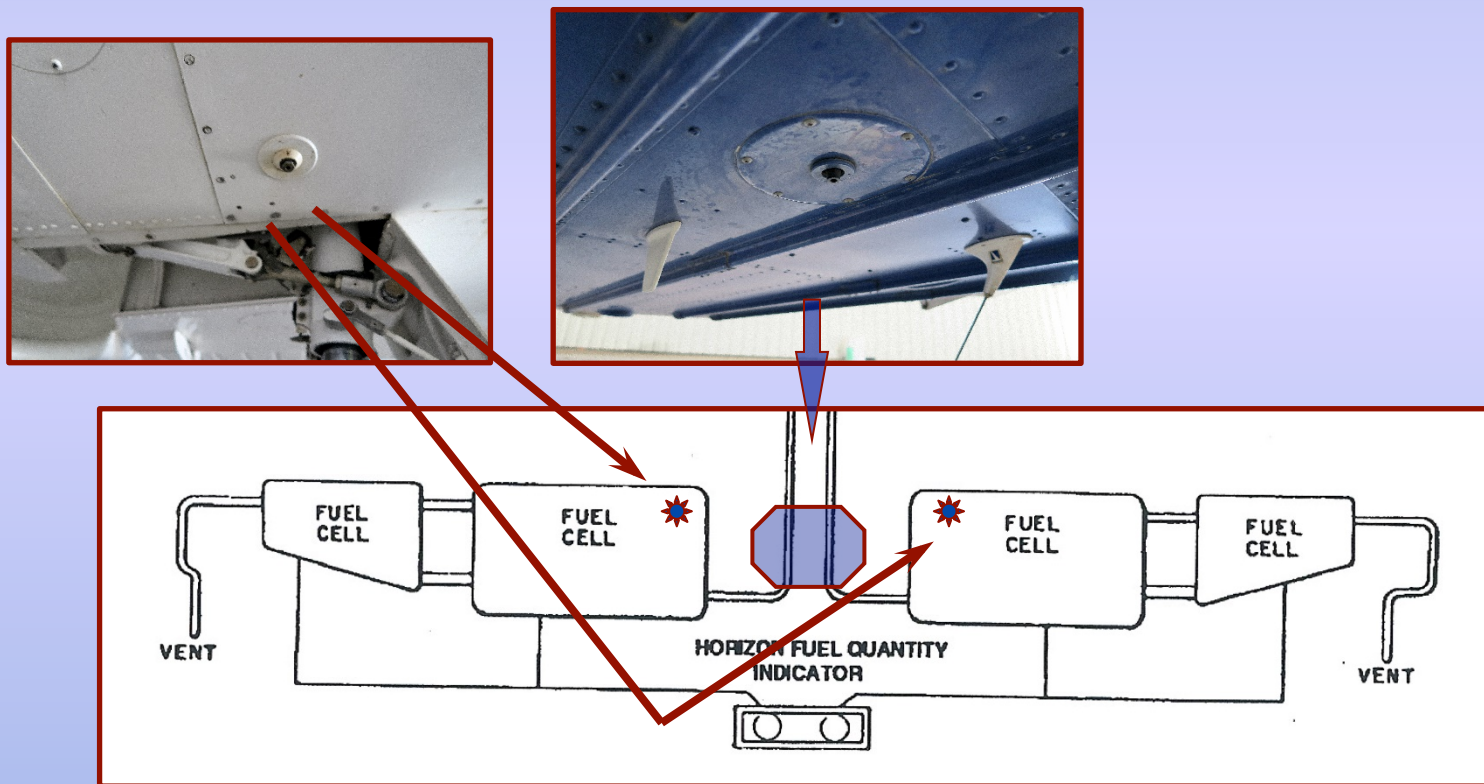
3

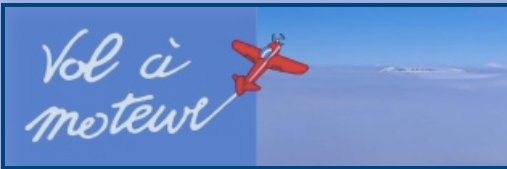


Fuel system

3 drains

3



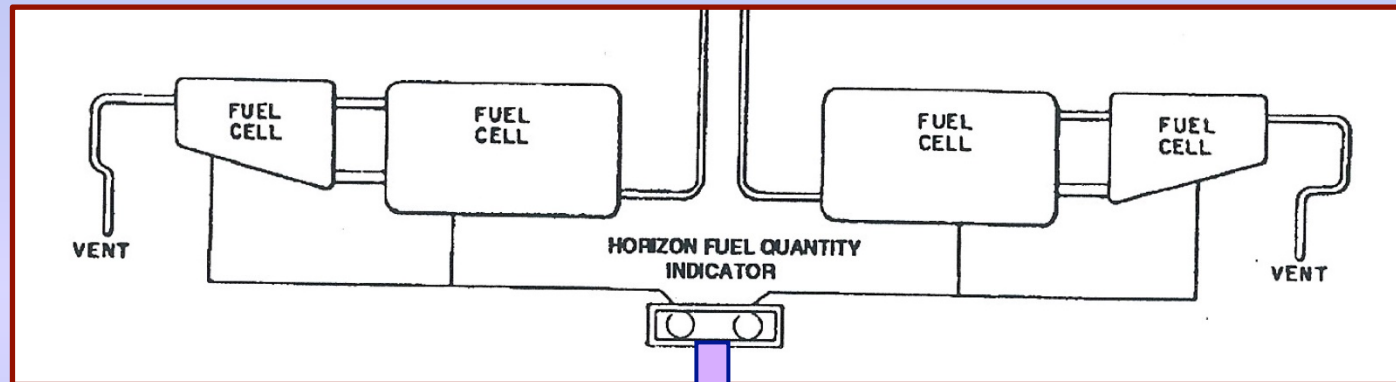


PA-32R-301

Fuel system

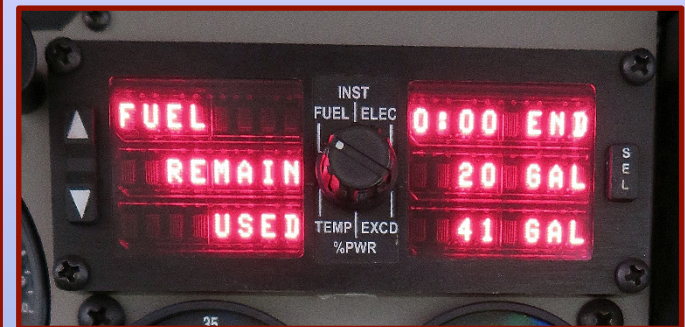
2 gauges in the cockpit

3



51 usable USG

51 usable USG





PA-32R-301

Electrical system:

1

24 volts system

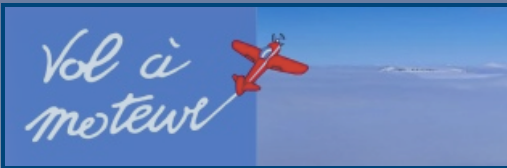
24 volts battery

(beneath the floor of aft
baggage compartment)

90 A alternator

External power relay (right side)





Electrical system:

Remember: starting with external source is in **normal procedure** !!

1

SECTION 4 PA-32R-301, SARATOGA II HP NORMAL PROCEDURES

STARTING WITH EXTERNAL POWER SOURCE

NOTE: If the optional Avidyne Flightmax Entegra Primary Flight/Multi-Function Displays are installed. Refer to Supplements 19 or 23 found in Section 9 for additional operating instructions.

CAUTION: It is possible to use the ship's battery in parallel by turning only the battery master switch ON. This will give longer cranking capabilities, but will not increase the amperage. Care should be exercised because if the ship's battery has been depleted, the external power supply can be reduced to the level of the ship's battery. This can be tested by turning on the battery master switch momentarily while the starter is engaged. If cranking speed increases, the ship's battery is at a higher level than the external power supply.

NOTE: For all normal operations using external power, the battery master and alternator switches should be OFF.

Battery master switchOFF
Alternator switchOFF
Magnetos switchesON
All electrical equipmentOFF
External power pluginsert in fuselage
Proceed with normal start
Throttle.....lowest possible RPM
External power plug.....disconnect from fuselage
Battery master switch.....ON
Alternator switchON - check ammeter
Oil pressure.....check

WARM-UP

Throttle.....1000 to 1200 RPM

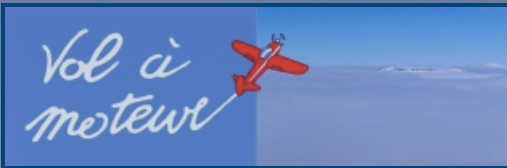


PA-32R-301

Electrical system: switches

2

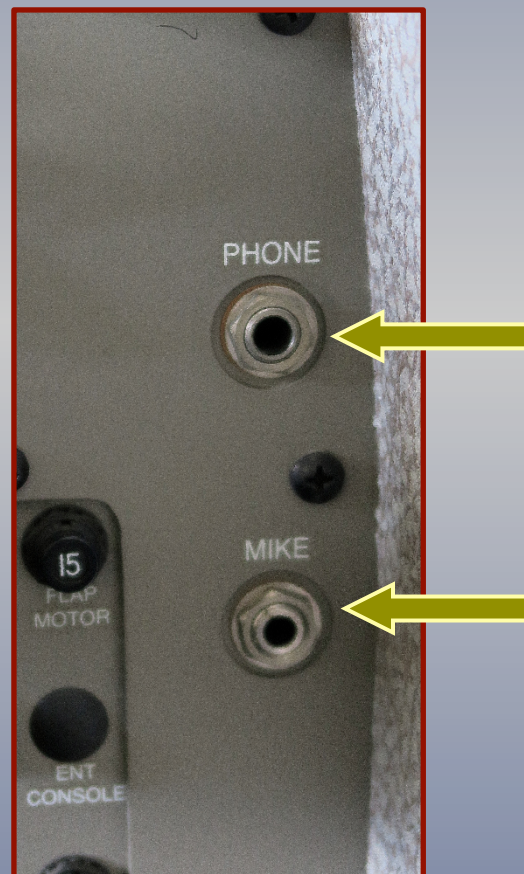
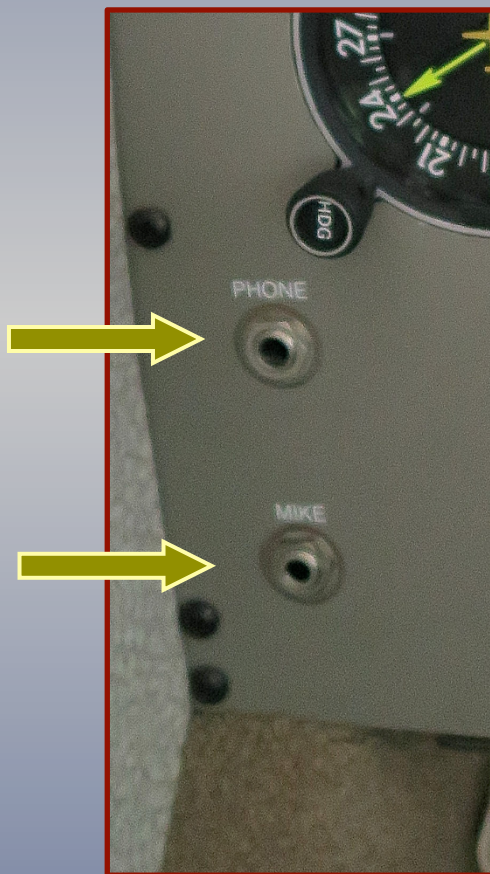




PA-32R-301

Electrical system: switches

3





PA-32R-301

Electrical system:

breakers

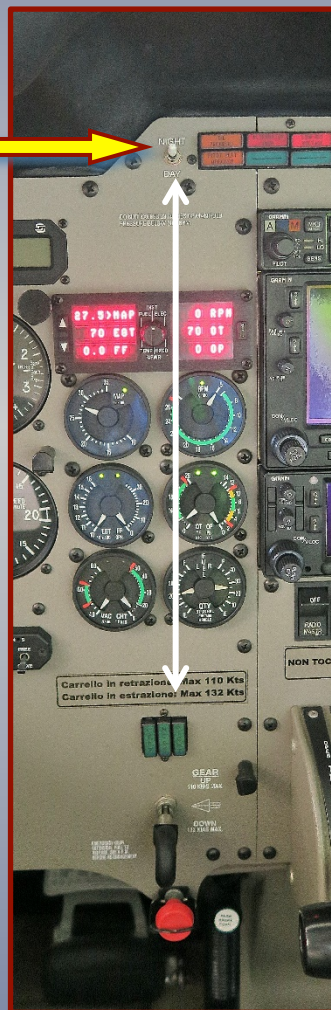
4

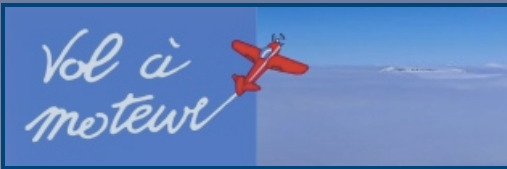


Electrical system:

rheostat switches

Must be to
DAY position
to check
LDG Gear
3 green lights



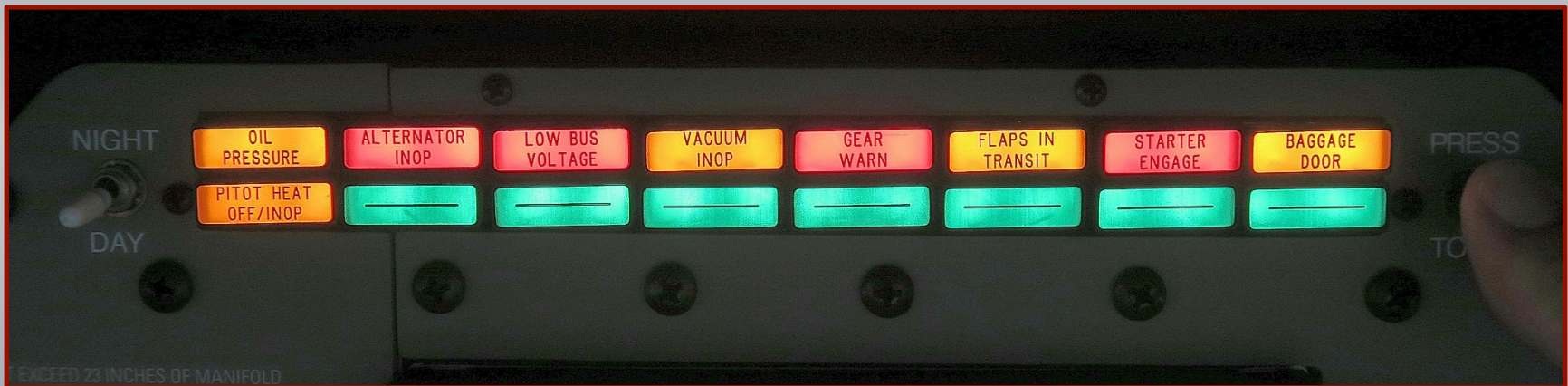


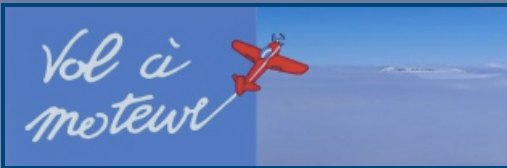
PA-32R-301

Electrical system:

5

Anunciator panel





PA-32R-301

Electrical system: avionic master switch

6





PA-32R-301

Electrical system:

avionic master switch **bypass**

7

?



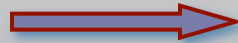
PA-32R-301

Electrical system:

cabine lights

8

Check
OFF position
when leaving





Electrical system: 2 cabin courtesy lights !!

Directly wired to the hot battery



2



PA-32R-301

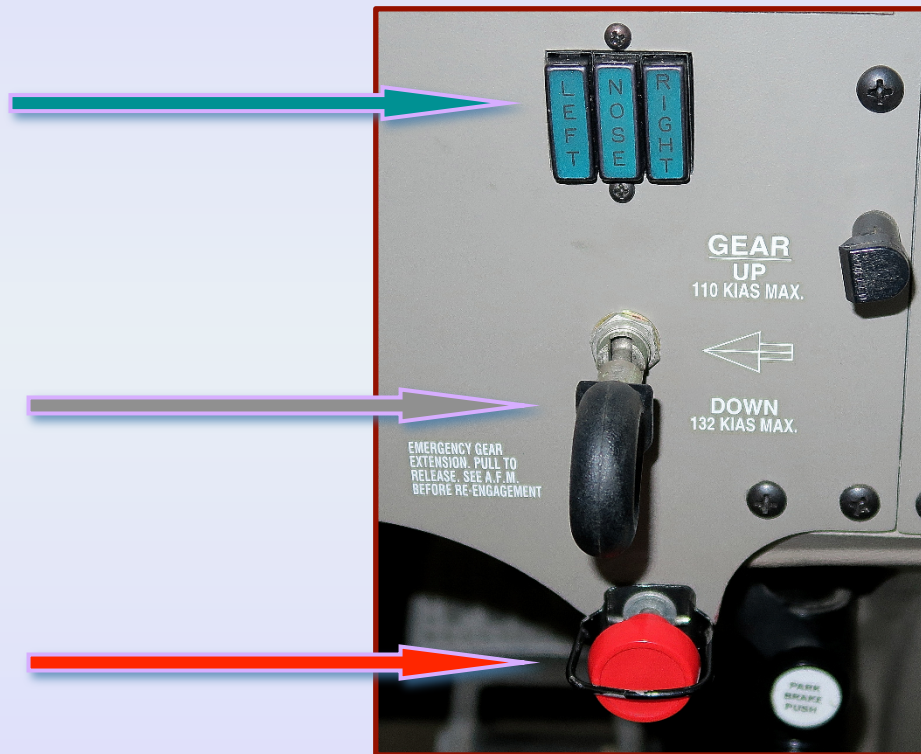
Landing gear: retractable tricycle
hydraulic actuated by an electrically
powered reversible pump

1



Landing gear: selector switch

2



LDG Gear is retracted or extended in about **7 seconds**



PA-32R-301

Landing gear:

Gear Warning Light + Warning Horn

2



- ☐ Gear Up + PWR < 14 inches (Manifold Pressure)
- ☐ Gear Selector Switch UP + ACFT on Ground
- ☐ Gear not down and locked + Flaps beyond Approach Position (>10°)



Landing gear: emergency procedure

4

- distinguish between **emergency** and training (next page) !!

PA-32R-301, SARATOGA II HP **SECTION 3
EMERGENCY PROCEDURES**

EMERGENCY LANDING GEAR EXTENSION

NOTE:

Refer to paragraph 4.39 for differences when emergency gear extension is being performed for training purposes.

Prior to emergency extension procedure:

Batt. Master switchcheck ON

ALTR switchcheck ON

Landing gear:

emergency procedure / TRAINING

5

In Normal Procedures (section 4)

4.39 LANDING GEAR

The pilot should become familiar with the function and significance of the landing gear position indicators and warning lights.

The red gear warning light on the instrument panel and the horn operate simultaneously 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.

The red gear warning light in the annunciator cluster and the horn will operate simultaneously on the ground when the master switch is ON and the gear selector switch is in the UP position.

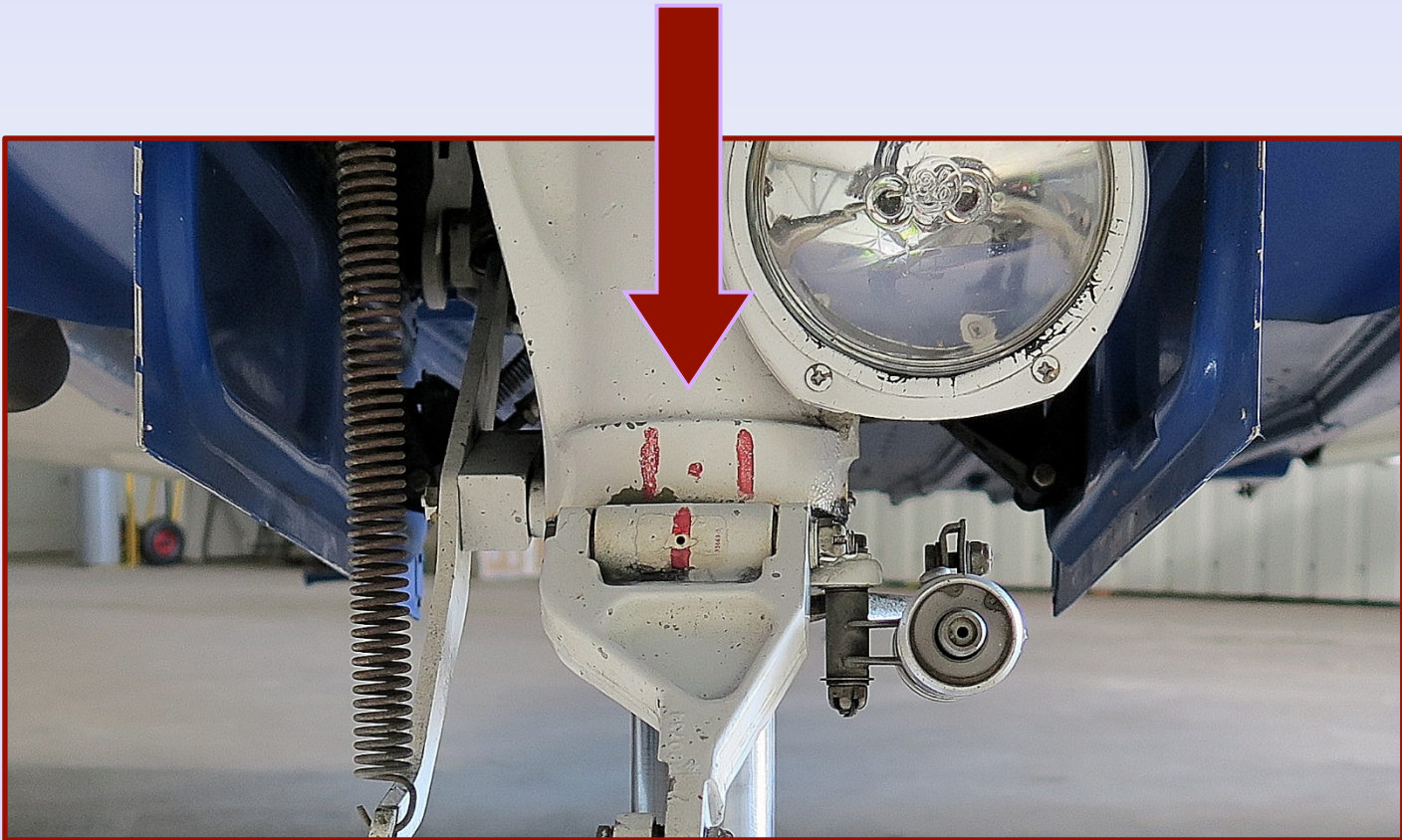
The three green lights on the instrument panel operate individually as each associated gear is locked in the extended position.

When the Emergency Landing Gear Extension Procedure (Par. 3.31) 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. Pull the LANDING GEAR PUMP circuit breaker prior to executing the emergency extension procedure. The circuit breaker must be reset after completion of the procedure to allow normal gear system operation.



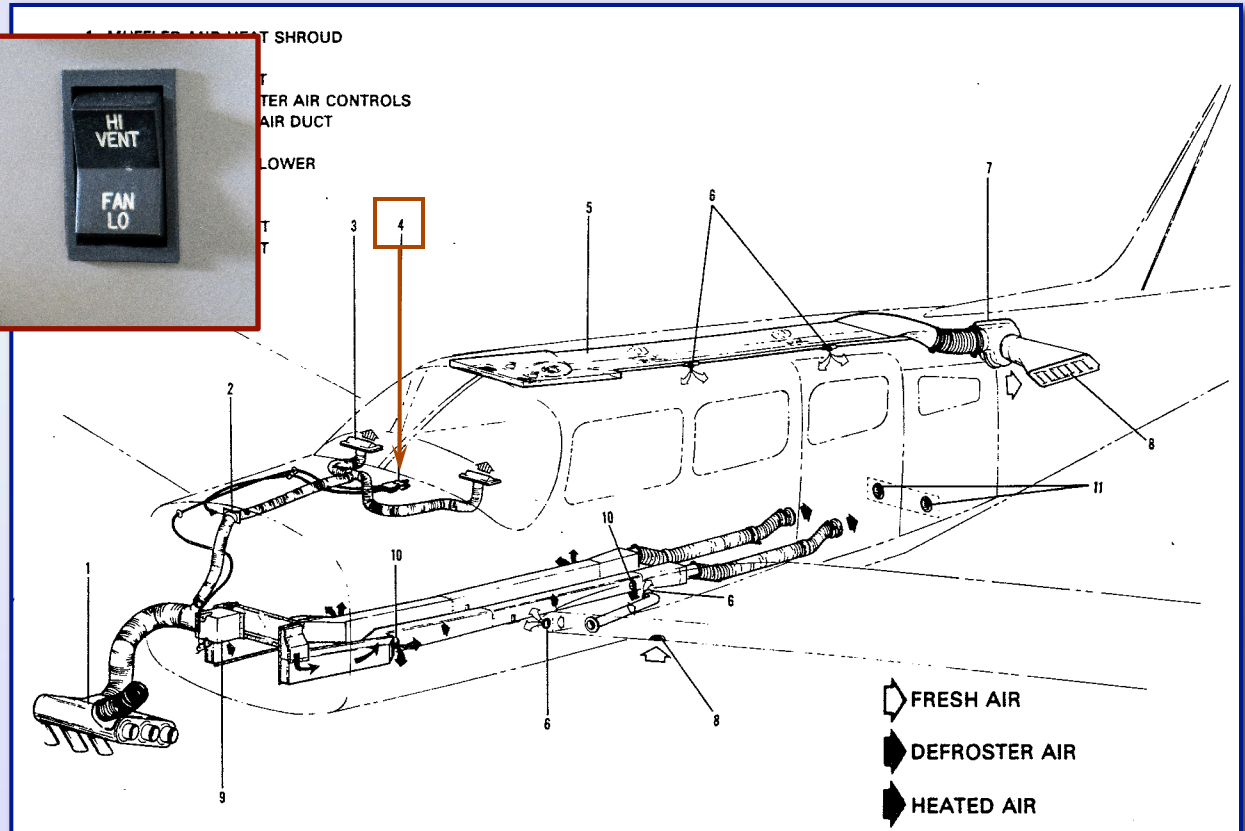
Landing gear: steering & towing

6



Environmental system: heating & ventilating system

1



Environmental system:

heating & ventilating system

2



Flight controls: dual flight controls

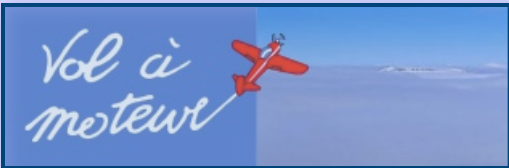
1



Flight controls: trims

2





PA-32R-301

Flight controls: rudder trims

4





PA-32R-301

Flight controls:

Flaps

5





PA-32R-301

Flight controls:

Flaps

5

0° & 10°



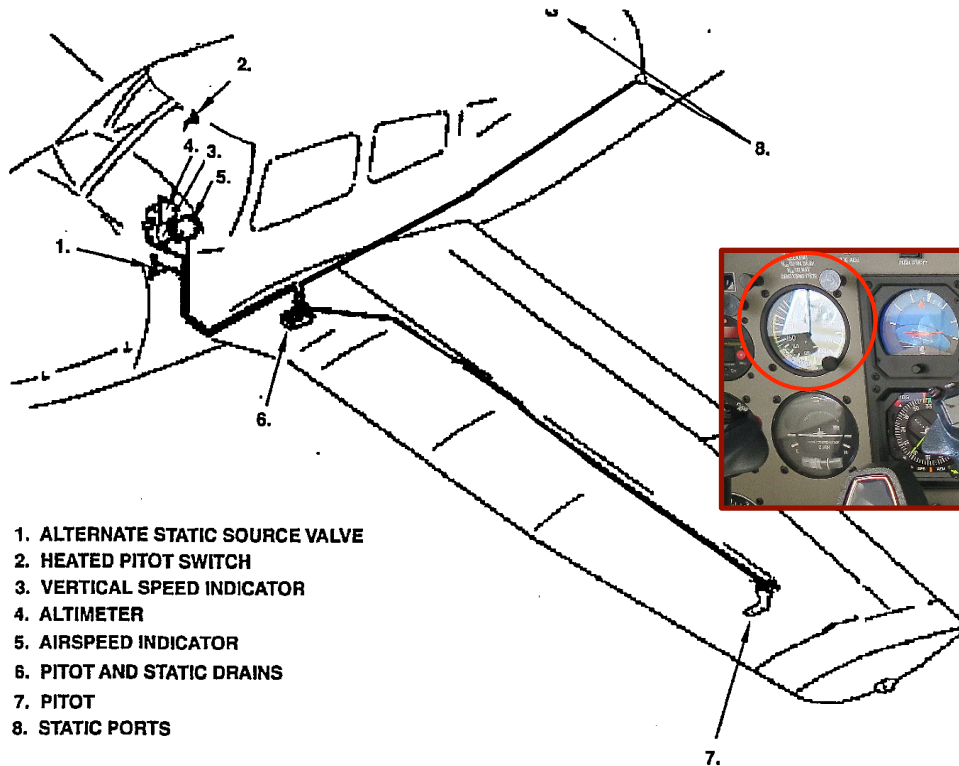
25° & 40°

Flight instruments:

pitot-static system

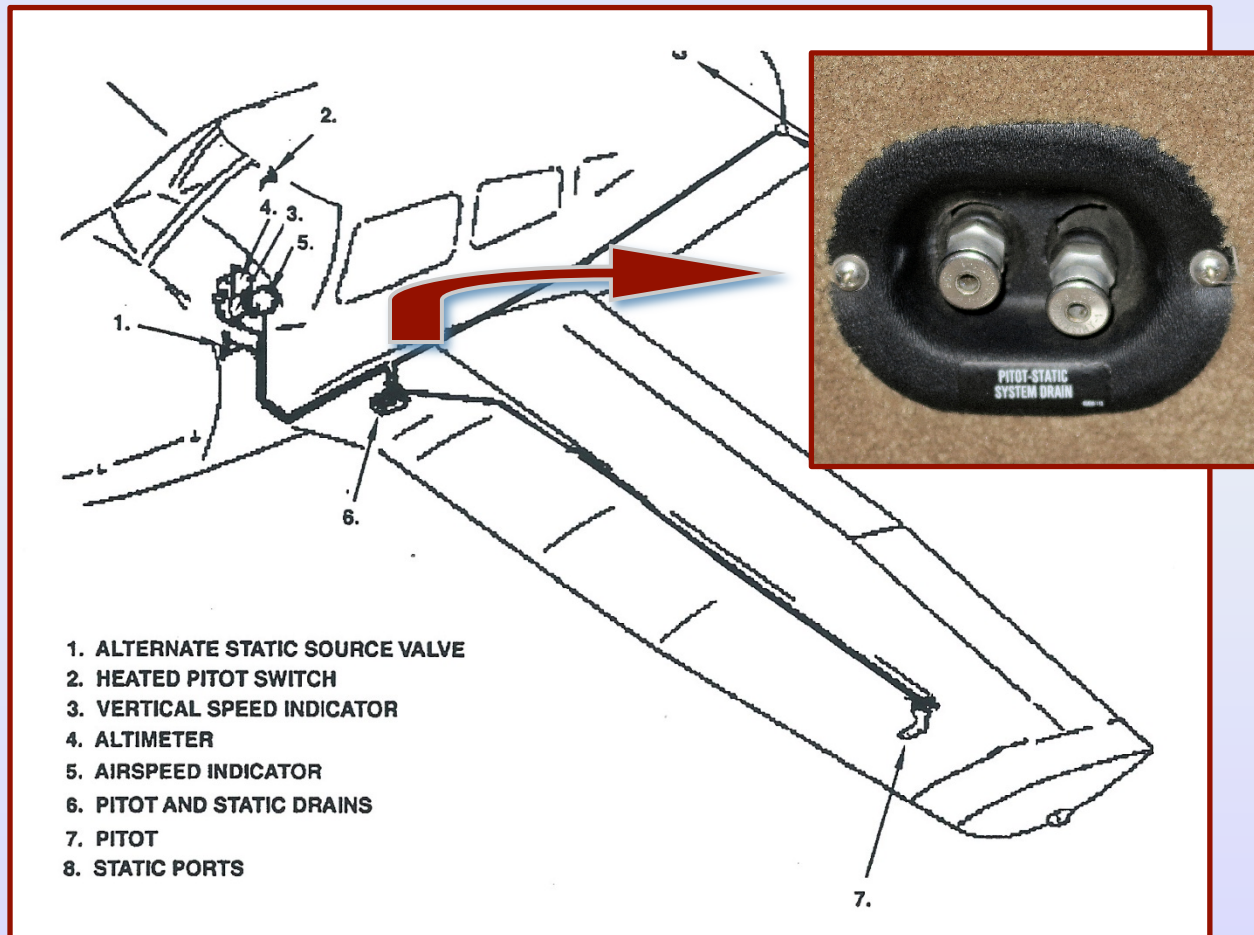
1

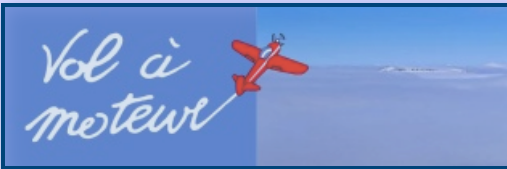
Airspeed indicator
Altimeters (2)
Vertical speed indicator



Flight instruments: pitot-static system

2



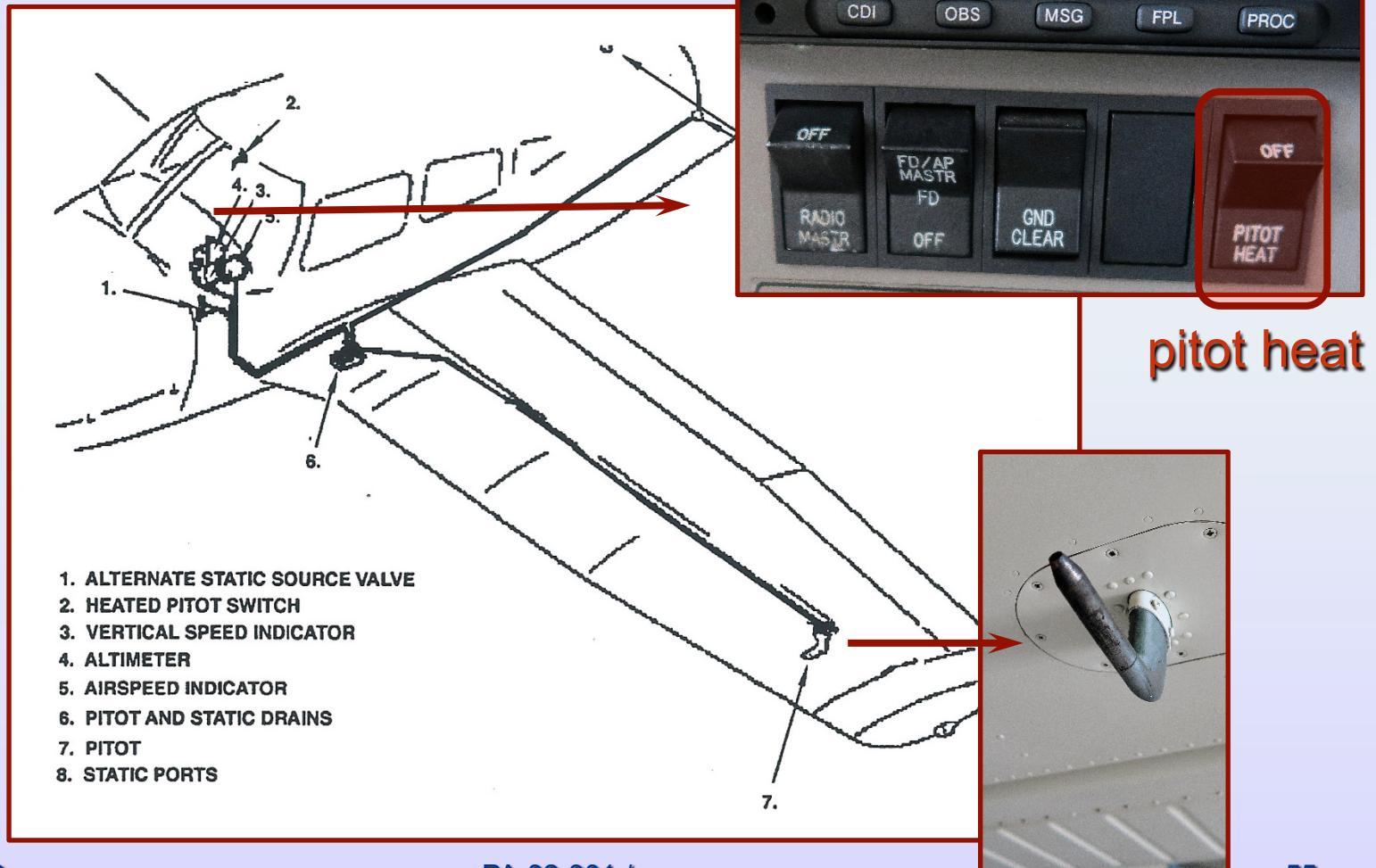


PA-32R-301

Flight instruments:

pitot-static system

3

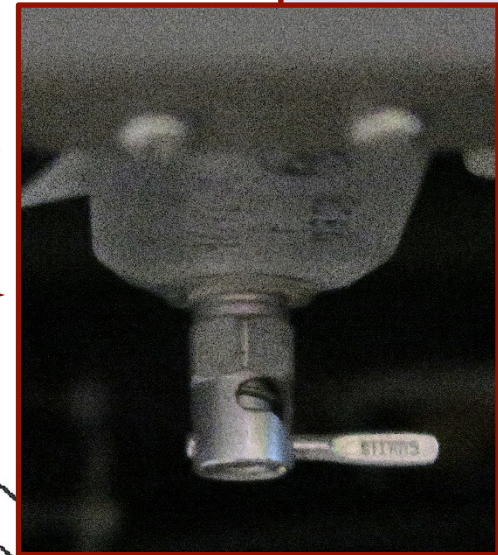
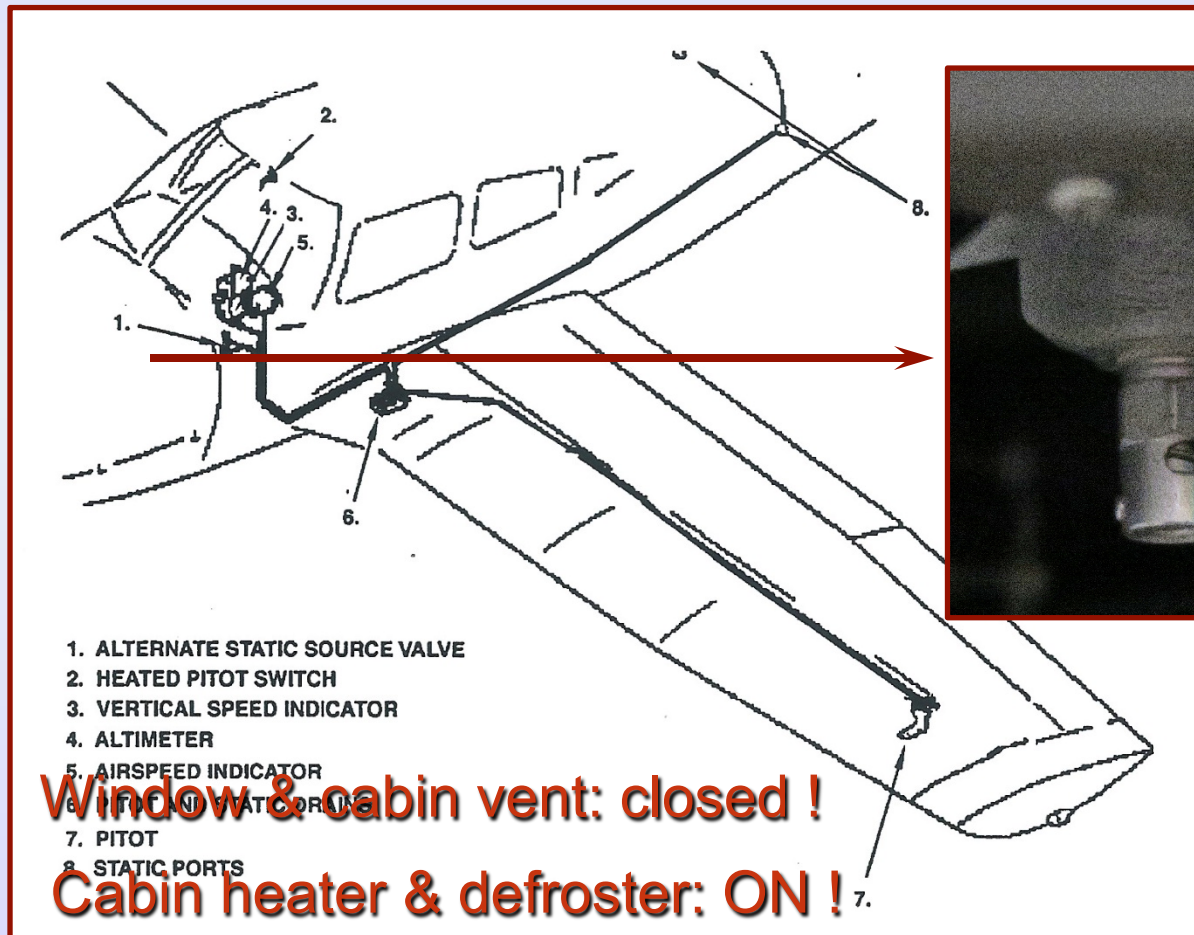


pitot heat

Flight instruments:

pitot-static system

5



Alternate
Static
air



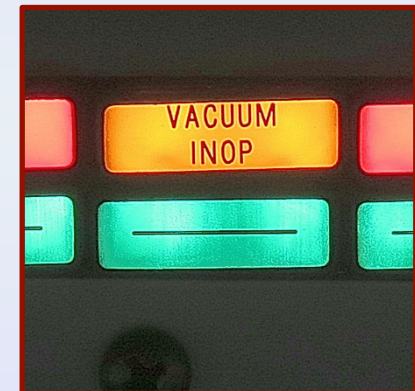
PA-32R-301

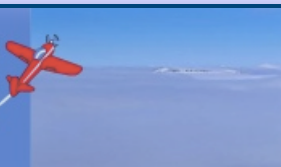
Flight instruments:

vacuum system

6

remember: to operate
the air driven gyros





Flight instruments:



See Section 9 / Supp 2

vacuum system

6

SECTION 2 - LIMITATIONS

- (a) The auxiliary vacuum system is limited to standby function only, do not take off with the engine driven dry air pump inoperative.
- (b) Discontinue flight in Instrument Meteorological Conditions (IMC) if vacuum pressure falls below 4.8 In. Hg.
- (c) The auxiliary pump/motor assembly and elapsed time indicator must be removed from service after 500 hours accumulated operating time or 10 years whichever occurs first.

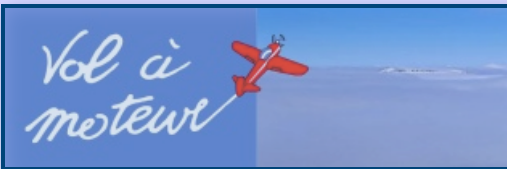
SECTION 3 - EMERGENCY PROCEDURES

- (a) VAC OFF or Vacuum Inop. Warning - Auxiliary Vacuum Switch AUX ON.
- (b) Verify vacuum system suction is within the normal operating range.

CAUTION

Compass error may exceed 10° when auxiliary vacuum system is in operation.

- (c) Monitor electrical load - verify alternator capacity is not being exceeded as indicated by the ammeter. If required turn off non-essential electrical equipment.
- (d) Land at the earliest opportunity to have primary system repaired.



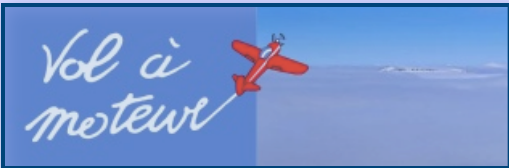
PA-32R-301

Flight instruments:

Horizontal Situation Indicator

7



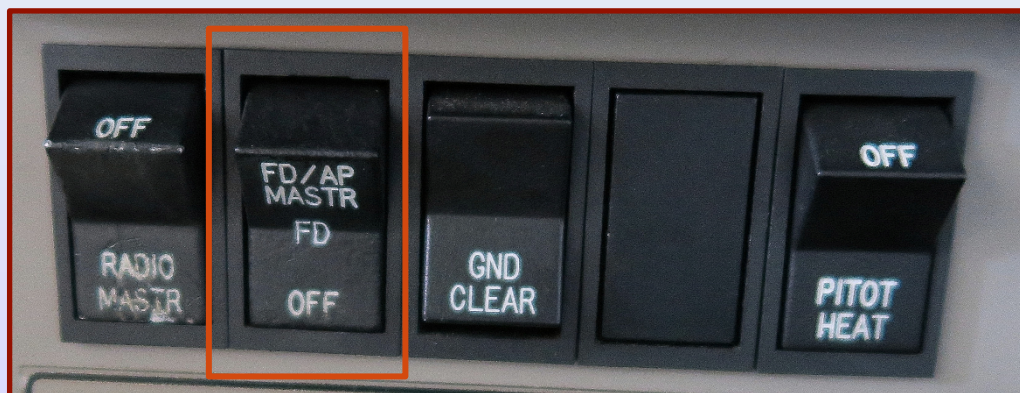


PA-32R-301

Flight instruments:

Autopilot

8



07.06.16

PA-32-301 / pac

60

Flight instruments:

Autopilot

8



Immediately regain control of the aircraft by overpowering the autopilot as necessary and then immediately disconnect the autopilot. Do not re-engage the autopilot until the problem has been identified and corrected.

1. The autopilot may be disconnected by:
 - a. Depressing the "AP Disconnect" Switch on the left horn of the pilot's control wheel.
 - b. Placing the "AP Master Switch" in the "OFF" position.
 - c. Momentarily interrupting aircraft electrical power at the battery master switch.
 - d. Pulling the autopilot circuit breaker.
2. Trim:
 - a. In the event of a trim failure, manually control aircraft and DEPRESS AND HOLD "Trim Interrupt/AP Disconnect Switch" on control wheel.
 - b. Place trim master switch in "OFF" position, pull circuit breaker, release interrupt switch.
 - c. Retrim aircraft. Leave trim system OFF until corrected.





PA-32R-301

Weight & Balance, Performance Calculation

See separate presentation