

SYMPTOM	CHECKS AND FURTHER SYMPTOMS	PROBABLE CAUSE	REMEDY
No light off (Cont'd)	RPM over 10%. Ignition snap heard; fuel flow below 60%/hr. Fuel inlet pressure positive, fuel pump pressure below 150 psi. Remove T ₂ bellows from side of fuel control. Check height of bellows from bellows side of flange to shaft on end of bellows. At ambient temperature of 77°F the height should be 1.020 to 1.030 inch. If height is normal...	Fuel control acceleration limit control failed or maladjusted.	Reinstall T ₂ bellows in fuel control. Replace control, or adjust limit amplitude as follows: remove head from control, loosen lock screw in acceleration limit arm. Insert small screwdriver through coils of spring beneath MFV arm, and engage one of the slots in the acceleration amplitude adjust screw. Move slot about 10° clockwise to increase flow. Tighten lock screw in arm, and reinstall cover using only 2 screws. Make start. Fuel flow should be about 60%/hr. Let engine accelerate and watch peak turbine temperature. If lightoff and acceleration normal, no excessive temperature, adjustment O.K., reinstall fuel control head. If lightoff poor, acceleration slow and low temperature, read just as before no more than 5° more CW. If accel. temp. hot, too much CW adjustment has been made. (Normal peak temp. is about 750°C on cold engine, about 800°C on hot engine using battery, and 50°C less using ground power.)
	As above, but bellows found to be less than normal height.	Inlet air sensor or T ₂ bellows failed.	Replace T ₂ bellows and inlet air sensor assemblies.
Engine lights off but will not accelerate past 60% speed. No Compressor surge heard.	Very high turbine temperature. Make visual check that engine intake and exhaust plugs have been removed.	Low air flow through engine.	Obvious

SYMPTOM	CHECKS AND FURTHER SYMPTOMS	PROBABLE CAUSE	REMEDY
Continued from Page 10-9	High turbine temperature. Engine coasts quickly/noisily to a stop when shut down.	Internal engine failure	Obvious
	High turbine temperature. Engine coasts normally to a stop when shut down. Power lever in START position.	Electrical load on bus system loading generator during acceleration.	Remove all load from busses and do not load generator during start.
		Compressor air leak from plenum (flange, anti-ice valve, etc.)	Obvious
		Power lever, pitch control or prop oil transfer tube mis-rigged.	Obvious
	Peak turbine temperature normal. Drops as speed rises. Fuel flow 60 0 /hr at lightoff and fails to rise sufficiently with increasing rpm. Fuel inlet pressure remains positive. Leak check P ₃ sensing line from plenum and bellphragm in fuel control. If leak found:	Leak in P ₃ system providing improper fuel flow.	Repair line, or replace fuel control.
	As above, but no leaks found. Fuel inlet pressure remains positive at all times.	Acceleration limiter Schedule improper.	Replace fuel control or adjust acceleration slope. To accomplish the latter, remove head from fuel control, loosen acceleration slope adjust screw nearest MFV shaft 1/8 turn (CCW) and tighten its mate 1/8 turn. Reinstall cover and attempt start. Watch turbine temperature closely. If all OK., congratulations.
	Turbine temperature drops as speed rises. Fuel inlet pressure drops below zero.	Fuel supply obstruction.	Refer to aircraft maintenance manual for supply system information.

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FUEL SYSTEM

The fuel system for each engine forms an essentially separate system. The two systems are interconnected by a cross-feed line with a shut-off valve for emergencies. The eight wing tank arrangement uses two 50 gallon main tanks, located just outboard of the nacelles in the leading edge of the wing to feed their respective engines. The auxiliary tanks consist of two 76 gallon inboard tanks and two 25 gallon rear tanks in the center wing section, and two 42.5 gallon outboard tanks in the outer wing panels. The total fuel capacity is 387 gallons.

Each main tank is equipped with an electric, submerged boost pump, normally used for all engine starts, take-offs, and landings. However, if operation with fuel boost pumps off results in fuel pressures below 30 psi they may be raised to this figure or above by turning, the fuel boost switches to the MAIN position.

The main tank is replenished from the selected auxiliary tank by an electrically driven vane type fuel transfer pump, located in each main wheel well, which is turned on and off by a float operated switch in the main tank. The switch is set to turn the pump on when the fuel level drops to 30 gallons and off when it reaches 45 gallons when the boost pump switch is positioned in the MAIN or OFF position. With the fuel boost switch in AUX ON position, the transfer pump is turned on regardless of the float operated switch. Fuel transfer indicator lights, on the control pedestal, are turned on and off with the transfer pump. The lights are off when the pump is running. The transfer pump should not be operated for extended periods when connected to an empty tank. When the auxiliary tank in use is emptied, the auxiliary tank selector should be changed to a tank

containing fuel, or, when all auxiliary tanks are empty, to the off position.

Fuel quantity in all auxiliary tanks is indicated by a single gage on the instrument panel, graduated in tenths of total tank capacity. A tank selector switch, near the gage, connects the gage with the liquidometer unit in the desired tank. Fuel quantity in the main tanks is indicated by a dual - indicating, direct reading gage, located adjacent to the auxiliary tank quantity gages on the instrument panel. In addition to the auxiliary tank gage, an empty auxiliary tank will be indicated by a drop in the main tank fuel level below the 30 gallon minimum which the automatic system is set to maintain.

The main tank by-pass valves, operated by levers on the control pedestal, allow the fuel to be pumped directly from a selected auxiliary tank to the engine. With the cross feed valve turned on, this may be from a tank on the opposite side of the airplane. Flow also may be set up from an auxiliary tank to the main tank on the opposite side of the airplane. Flow cannot be set up from a main tank to the opposite side of the airplane. Fuel cannot be pumped into an auxiliary tank by the transfer system as check valves prevent back flow into these tanks.

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FUEL SYSTEM

- | | |
|---|-------------------------|
| 1. The fuel system for each engine forms an essentially _____ system, interconnected by a _____ valve. | |
| 2. The eight tank arrangement uses two _____ gal. main tanks. | separate,
cross-feed |
| 3. The auxiliary tanks consists of two _____ gal. inboard tanks, two _____ gal. outboard tanks, and two _____ gal. rear tanks. | 50 |
| 4. The total fuel capacity is _____ gallons. | 76, 42.5, 25 |
| 5. Each main tank is equipped with an electric, sub-merged _____. | 387 |
| 6. Fuel boost pumps may be turned on by positioning. The fuel boost _____ to the _____ position. | Fuel boost pump |
| 7. The main tank is replenished from the selected auxiliary tank by a _____. | switches
main |
| 8. The fuel transfer pump is turned on and off by a _____ in the main tank. | fuel transfer pump |
| 9. The switch is set to turn the pump on when the fuel level drops to _____ gallons and off when it reaches _____ gallons when the boost pump switches are positioned in the _____ or _____ position. | float operated switch |
| 10. With the fuel boost switch in _____ position, the transfer pump is turned on regardless of the float operated switch. | 30, 45, main, off |
| 11. Fuel transfer indicator lights are turned on and off with the _____. | aux on |

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12. The lights are _____ when the transfer pump is running.

off

13. Fuel quantity gages are operated by _____ type measuring equipment in _____ tank.

off

14. Fuel quantity in the main tanks is indicated by a _____ direct reading guage.

liquidometer,
each

15. Auxiliary tank guages are calibrated in _____ of the tank's capacity.

dual indicating

16. The main tank _____ are operated by the main fuel tank control levers on the control pedestal.

tenths

17. Fuel flow may be set up from an _____ tank to the main tank on the opposite side of the airplane.

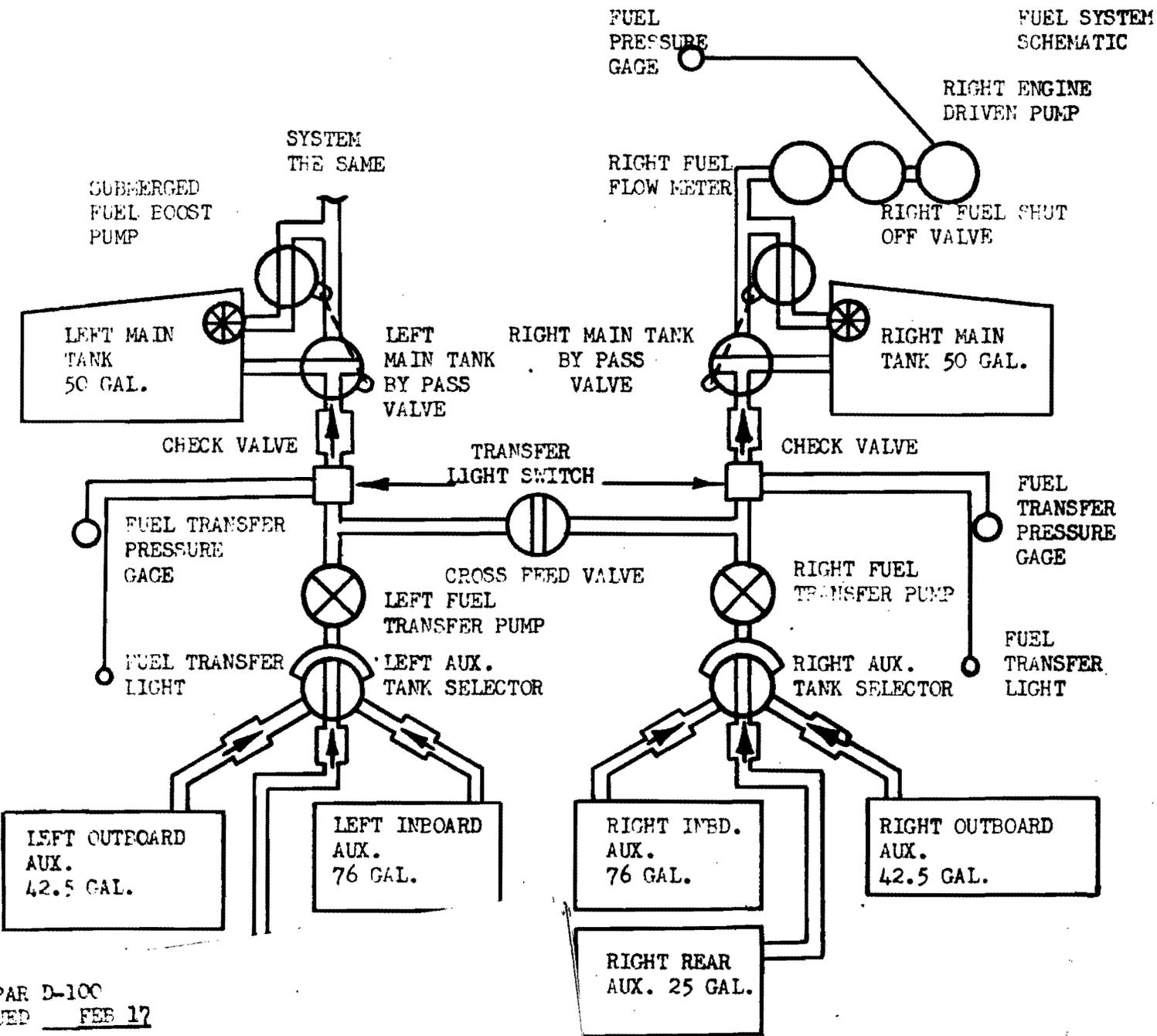
by-pass valves

18. Fuel flow cannot be set up from a _____ to the opposite side of the airplane.

auxiliary

main tank

01-749



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HYDRAULIC SYSTEM

There are two units on the Volpar Turbo Beech which are operated by hydraulic fluid; the brakes and the autopilot. Each of these units has its own hydraulic system.

The brake system reservoir of about 10 ounces of MIL-H-5606 hydraulic fluid is located in the nose wheel well and ensures a supply of fluid to the master valves and lines and also to the nose wheel shimmy damper. Individual brakes on the main wheels are operated by master cylinders on both pilot's and copilot's rudder pedals, which are arranged as toe pedals. A shuttle valve at each brake assembly closes the line to which the lesser pressure is applied, so that only one set of brake pedals may be used at any time;

should one set fail, the shuttle valves will seal it off from the system, so that the remaining set can function. Parking brake valves, controlled by a handle on the control pedestal, close the lines to the pilot's brake pedals. Parking brakes are applied while the pilot's pedals are depressed. Since the valves are in the pilot's brake lines only, the brakes cannot be set from the copilot's side. The parking brakes are released by opening the valves (Pushing the control handle in). The B.F. Goodrich Multiple DISC Brakes are self-adjusting and do not require adjustment to compensate for lining wear.

The autopilot hydraulic system is covered in the Autopilot Section.

HYDRAULIC

- | | |
|---|--|
| 1. There are two units on the Volpar Turbo Beech which are operated by Hydraulic Fluid; the _____ and the _____. | |
| 2. Each of these units had its _____. | brakes, autopilot |
| 3. The brake system reservoir capacity is about _____. | own Hydraulic System |
| 4. The reservoir is located in the _____ and ensures a supply of fluid to the _____ and lines and also to the nose wheel _____. | 10 ounces |
| 5. Individual brakes on the main wheels are operated by _____ in both pilot's and copilot's _____. | Nose wheel well, master valves, shimmy damper. |
| 6. A _____ at each brake assembly closes the line to which _____ pressure is applied, so that only one set of brake pedals may be used at any time. | Master cylinders, rudder pedals. |

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7. Parking brake valves, controlled by a _____ on the _____, close the lines to the pilot's brake pedals.

shuttle valve,
lesser

8. Parking brakes are applied while the _____ are depressed.

handle,
control pedestal

9. The parking brakes are released by _____ the control handle _____.

pilot's pedals

10. The brakes are B.F. Goodrich _____ type and are _____ to compensate for lining wear.

pushing,
in

Multiple DISC,
self-adjusting

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COOLING SYSTEM

An air conditioner of the refrigerating, self contained type 15 installed at the left side forward cabin with the control on the pilots sub-panel. The unit is made by brittan industries, and operates on 24-28 VDC and requires a constant 78 amps when refrigerating. Outside air, from an intake opening located in the bottom of the fuselage, is drawn in by a fan and forced across the condenser coil for cooling the compressor unit. cabin return air is drawn in by the three circulating fans in the upper portion of the air conditioner. Cooled air is blown to the cabin from the opening on the top of air conditioner by the three circulating fans. External

power or one of the engine generators should be on the line at all times since a drain of more than 68 amps on the battery will cause overheating and deterioration of the battery.

The ventilation system supplies cold air for the cabin and pilot's compartment as desired, cold air is taken in through an opening in the leading edge of each wing, flowing through a check valve directly into the system. The air passes AFT through the cabin air distribution duct to the passenger outlet valves, these outlets are regulated by twisting the outlet nozzles at the individual passenger locations.

COOLING

- | | |
|---|--------------------------|
| 1. The air conditioner unit is made by _____. | |
| 2. It is located in the cabin AFT of _____ of the _____ side. | brittan industries |
| 3. It operates on _____ VDC and draws _____ amperes. | Bulkhead No. 5, left |
| 4. The maximum drain recommended for the battery is _____ amperes, which is not enough for the air conditioner. | 24-28, 78 |
| 5. The air conditioner is more effective when the aircraft is _____. | 68 |
| 6. The air conditioner may be turned on with _____ to precool the cabin before flight. | in flight |
| 7. When external power is connected, the engines _____ be started while the air conditioner is operating. | external power connected |

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8. If no ground power is available, the air conditioner must remain _____ until the generators are _____.

can

9. The ventilation system supplies cold air for the _____ and _____ as desired.

off,
on the line

10. Cold air is taken in through an opening in the _____ of each wing.

cabin,
pilot's compartment

11. The air passes AFT through the cabin air distribution duct to the passenger _____.

leading edge

12. These outlets are regulated by _____ the _____ at the individual passenger locations.

outlet valves

twisting,
outlet nozzles

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AUTOPILOT SYSTEM

The autopilot is a Jack & Heitz Model A-3A, which has three interrelated systems: the vacuum powered gyro control unit, located on the center of the instrument panel; the hydraulically powered servo unit, located under the floor in the fuselage; and a follow-up system between the gyro control and the servo.

The function of the gyro control is to hold the aircraft on a desired course by governing the action of the servo unit, the gyro control box incorporates a directional gyro and an artificial horizon, giving control around all three axis, each gyro has indexes which are matched to the desired azimuth and attitude valves. The hydraulic valve, located at the right side of the pilots control pedestal, is turned to on to supply power to the servo. Three horizontal discs at the base of the control box adjust the volume of air applied to the controls, thereby adjusting the "sensitivity" or speed of action of the autopilot.

A direct-pressure-operated vacuum gage, installed on the autopilot control panel, indicates the vacuum pressure of the autopilot system in inches of Hg. vacuum pressure indication is taken directly from the vacuum manifold. The normal vacuum pressure limits are 3.75 to 4.25 inches Hg.

A pressure operated autopilot oil pressure gage, mounted on the right sub-panel, indicates the system oil pressure, normal operating pressure of the autopilot system is 120 \pm 10 psi.

Caging knobs for the autopilot gyro instruments are installed on the autopilot control panel. The limit of the gyro turn unit is 55° from vertical in bank, glide, or climb. The limit of the attitude gyro unit is 50° from vertical in bank, glide, or climb. Any maneuver that exceeds these limits will result in gyro spill or tumble causing the instruments to give incorrect indication. Pushing the gyro turn caging knob to the in position, and turning the attitude caging knob clockwise to the cage position will mechanically set the gyro gimbal rings of each unit to their proper positions. After resetting the gyro units for proper heading and indication, the gyro turn caging knob may be pulled to full out, and the attitude caging knob may be turned counter clockwise to the uncage position for gyro operation of both units.

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VACUUM SYSTEM

The Vacuum system provides negative pressure for the attitude indicator and the directional indicators.

GENERAL

The vacuum system provides the negative pressure required to operate the turn-and-bank, gyro horizon, directional gyro and autopilot. In this aircraft the negative pressure is provided by an air ejector, Bendix Model 19E17-5, style A, which is of a Venturi construction.

The principle of a Venturi (see Figure 1) is that the higher the airspeed is, the lower the airpressure will be. Therefore, when the compressed air from the engine turbine section passes through

the Venturi tube and gets out overboard, the airspeed in A and B area is much lower than that in C area which is made bottle-neck shape, in other words, the airpressure in C area is much lower than that in A and B area. A negative pressure - suction is thus provided for the entire system.

The system also consists of a regulator, Bendix Model 38E59-6, Style A, and two (2) check valves (see Figure 2). Both the regulator and the airejector are installed in the right engine nacelle.

AS AIR PASSES THROUGH THE THROAT OF THE VENTURI, THERE IS AN INCREASE IN VELOCITY AND A DROP IN PRESSURE

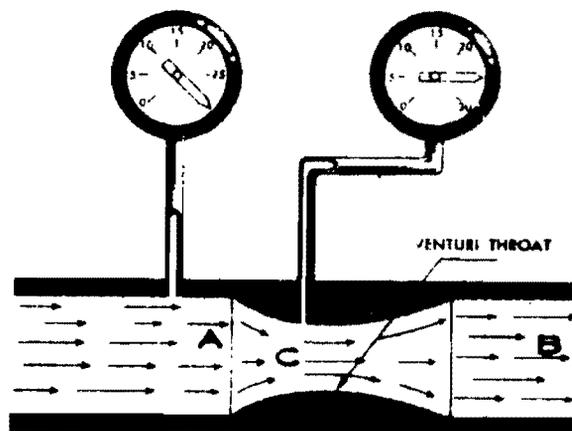


Figure 1 - Simple Venturi

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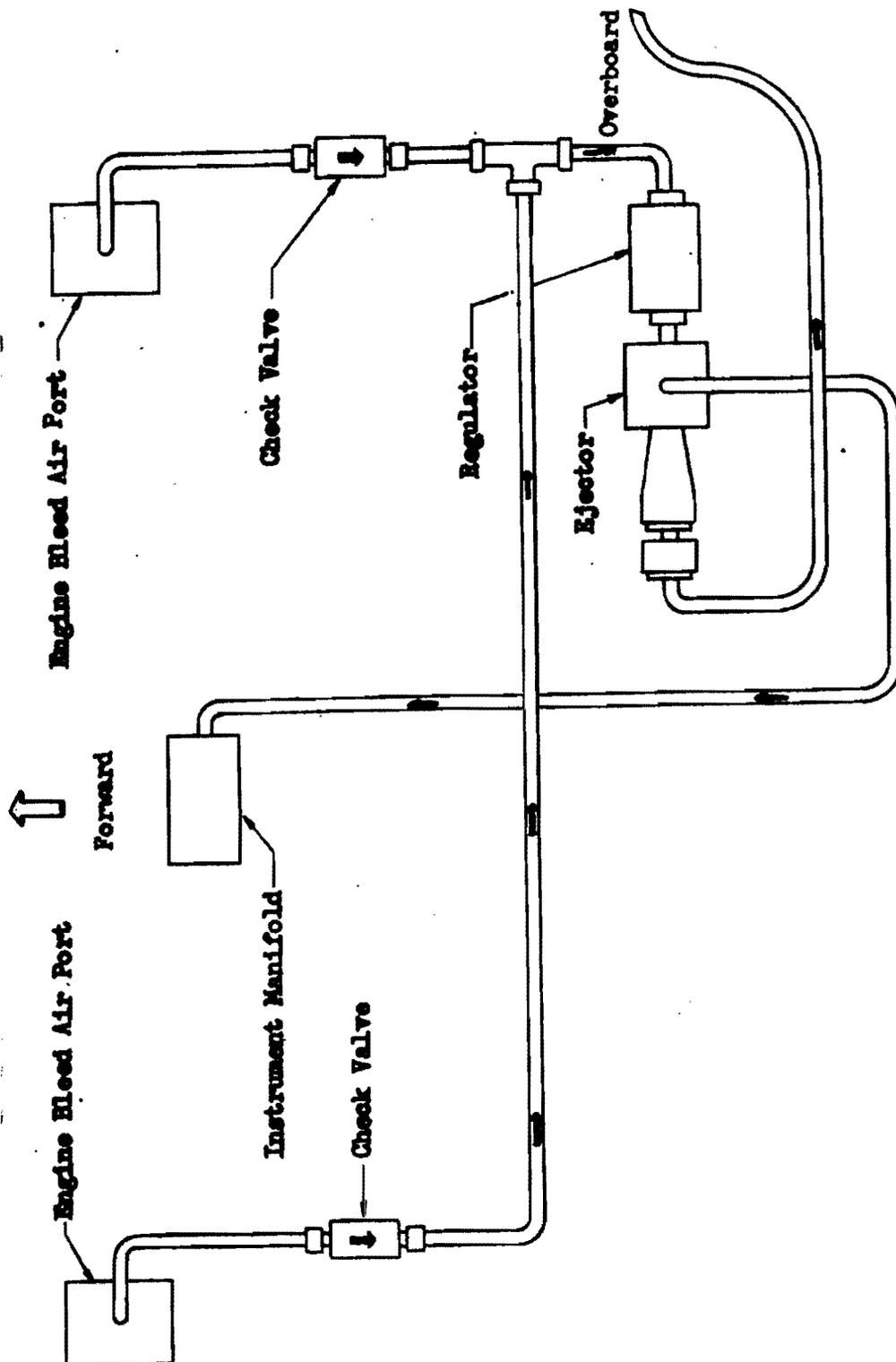


Figure 2 - Vacuum System Installation

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AUTOPILOT

- | | |
|--|--|
| 1. The autopilot is a Jack & Heintz Model _____. | |
| 2. There are three interrelated systems; an air _____ system to operate the gyroscopic control unit, a hydraulic _____ mechanism, and a mechanical _____ system. | A-3A |
| 3. The function of the _____ is to hold the aircraft on a desired course by governing the action of the _____. | vacuum,
servo,
follow-up. |
| 4. The gyro control box incorporates a _____ and an _____, giving control around all three axis. | gyro control,
servo unit |
| 5. The hydraulic valve, located at the right side of the pilots control pedestal, is turned to _____ to supply power to the _____. | directional gyro,
artificial horizon. |
| 6. Three horizontal discs at the base of the control box adjust the volume of _____ applied to the controls, thereby adjusting the _____ of the autopilot. | on,
servo |
| 7. A direct pressure operated vacuum gage, installed on the _____, indicates the vacuum pressure of the autopilot system in _____. | air,
sensitivity |
| 8. The normal vacuum limits are _____ to _____ inches Hg. | autopilot control
panel,
inches of Hg. |
| 9. Normal operating pressure of the autopilot system is _____. | 3.75,
4.25 |
| 10. Caging knobs for the autopilot gyro instruments are installed on the _____. | 120 (\pm 10) psi |
| 11. The limit of the gyro turn unit is _____ from vertical in bank, glide, or climb. | autopilot control
panel |

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12. The limit of the attitude gyro unit is _____
from vertical in bank, glide, or climb.

55°

13. Any maneuver that exceeds these limits will
result in gyro _____ causing the instruments
to give incorrect indication.

50°

14. The vacuum system provides negative pressure
for the _____ and the _____.

spill or tumble

attitude indicator
directional
indicator

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FIRE DETECTOR SYSTEM

The volpar turbo beech is equipped with a system of Fenwall Detectors located within each nacelle, forward of the fire-wall. One detector is located above the engine, just aft of the gearbox two more detectors are mounted on the forward side of the firewall and another within the cylindrical firewall around the combustion section of the engine, all units are set to give warning at 450°F except the one within the cylindrical firewall, which is set for 725°F.

Each system contains a warning light on the center instrument panel. The light is turned on when one or more of the detectors reaches its set temperature. A double throw, momentary, test switch is located adjacent to the left warning light, allowing each system to be checked individually. Both systems receive power through the same 5 amp circuit breaker.

Each nacelle contains an extinguishing system, consisting of a 1.37 lb. capacity container of freon 1301, fireproof discharge tubes, and an electrical release

system. The extinguishing agent is released above the engine just aft of the gearbox, and within the cylindrical fire wall encompassing the hot section of the engine.

The guarded release switches are located, one for each system, at the aft center of the control pedestal. When actuating the system, the switch should be held on for 5 seconds. When fired, the entire contents of the extinguisher is released, both release systems receive power from the same 10 amp circuit breaker.

At pre-flight inspection, contents of the bottles may be checked by observing the gage on the bottle.

There are two portable CO2 bottles, one located under the pilots seat and one at the left rear cabin. When used, the nozzles should be pointed at the base of a flame and care should be taken not to hold the nozzle to avoid freezing the hand.

FIRE PROTECTION SYSTEM

1. The fire detection system consists of _____ fenwall detectors located in each _____.
2. One detector is located _____ the engine, just aft of the gearbox.
3. Two more detectors are mounted on the _____.
4. Another detector is mounted within the cylindrical firewall around the _____ section of the engine.
5. All units are set to give warning at _____ except the one within the cylindrical firewall, which is set for _____.

four,
nacelle

above

firewall.

combustion

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6. Each system contains a _____ on the center instrument panel.	450°F 725°F
7. The light is turned on when _____ of the detectors reaches its set temperature.	warning light
8. A double throw, momentary, _____ is located adjacent to the left warning light, allowing each system to be checked individually.	one or more
9. Each nacelle contains an _____, consisting of a 1.37 lb. capacity container of _____.	test switch
10. The extinguishing agent is released above the engine just aft of the _____, and within the cylindrical firewall encompassing the _____ of the engine.	extinguishing system, freon 1301
11. The release switches are located at the aft center of the _____.	gearbox, hot section
12. When actuating the system, the switch should be held on for _____.	control pedestal
13. When fired, the _____ contents of the extinguisher is released.	5 seconds
14. At pre-flight inspection, contents of the bottles may be checked by observing the _____ on the _____.	entire
15. There are _____ portable CO2 extinguishers located _____ and at the _____.	gauge, bottle
16. CO2 fire extinguishers should be pointed at the _____ of the flame.	two, under the pilot seat, left rear cabin
17. Care should be taken not to hold _____ to avoid freezing the hand.	base
	the nozzle

VMC 84 IAS
BSEROC 108 IAS
SEV2BA 93 IAS
M.O.S 204 IAS
MDMS 131 IAS
MLGE 138 IAS
LLE 97 IAS

AIR START 96 TO 138 IAS

200 AMP Generator 552 Dips ^{28"}
42 TO 45%

551
3 450° HEAT SENSORS ONE IN HOT SECTION ^{725"}

575 SHP MAX Power For 5 MIN OF THE EGT LIMIT

FL2P operating; 103 TO 121 power ON 76-103 Power OFF

10,286 MAX GROSS

41,730 RPM

9,772 MAX Ldg WT

9,000 MAX ZERO FUEL

ZG LIMITS APT Limit 121.5 Forward 7,440 or Less 107" ABOVE 114.08

Bleed Air From Right Engine For Vacuum source

LEP oil Tur-10 Add 5th Mobil oil Jet 2 MAX .02 OIL per hour

X-W 26 KTS AT 90°

3.25°
MIN DRAG

35 GALLON FOR FLIST oper. switch TO RETURN

85 TO 96% is Data mode of prop operation

Feather 86 1/2 %
Reverse -10°

Mag Torque System check

overspeed gear jet 102 TO 104%

1000 AMP start cut 34AMP For BJT For NTS check

20% NO FUEL FLOW or IGN HIT STOP switch

MAX EGT FOR START 815° For ONLY 5 seconds

IF AT 715° There is NO decrease in EGT HIT STOP switch
When RPM with 50% hold cold and bleed switch in on
position TO 85%