

Section I

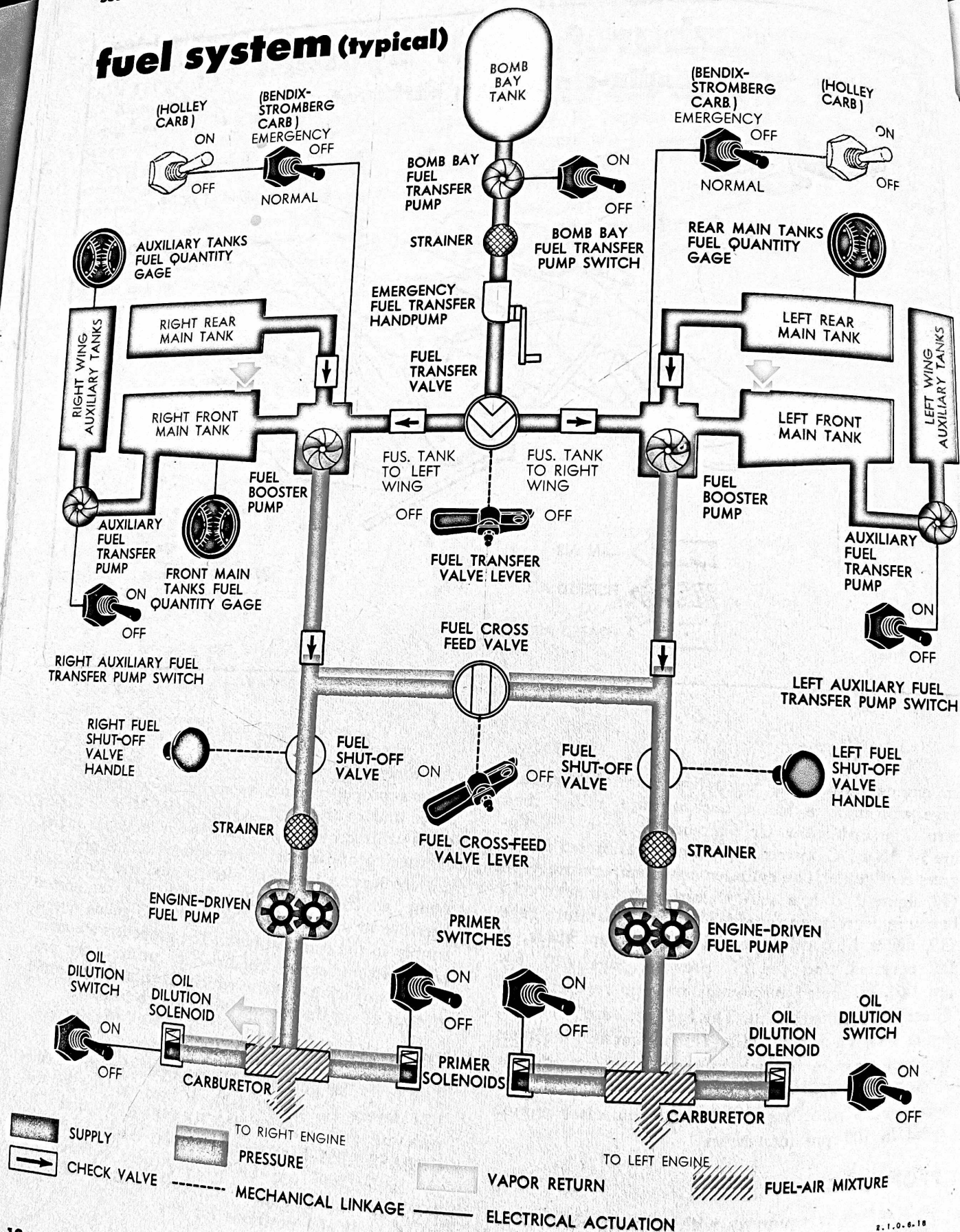
fuel system (typical)

Figure 1-12

levers are held in the desired position by a mixture and propeller control lock (4, figure 1-7), located on the control pedestal.

PROPELLER FEATHERING BUTTONS.

Propeller feathering on each engine is initiated by momentarily depressing the respective red propeller feathering button (1 and 3, figure 1-6) on the control pedestal switch panel. Pressing either button starts the feathering pump for that propeller. After the pump starts, the button will automatically remain down until the propeller is fully feathered. After the propeller is fully feathered and the pump stops, the button will automatically pop up. The feathering action can be stopped at any time by pulling the button up manually. A partially feathered propeller that is still rotating above 800 rpm will then automatically return to its normal pitch setting under control of the propeller governor. When unfeathering, the button must be held down until the rpm reaches 800 and then released to allow normal governor oil pressure to take over.

CAUTION

If a feathering button sticks or becomes otherwise inoperative during the feathering operation, the propeller will feather and unfeather and remain in the high rpm position while the feathering motor continues to run until it burns out. (Refer to PROPELLER BUTTON FAILURE, Section III.)

OIL SYSTEM.

Each engine is provided with an independent oil system which incorporates a self-sealing, 37.5 US gallon nacelle oil tank with a four gallon expansion area, two oil coolers with integral automatic oil temperature controls mounted in the wing outboard of each nacelle, an oil cooler air scoop in each wing leading edge, and an engine-driven oil pump. The oil system also supplies oil for operation of the propeller governor and for propeller feathering. A standpipe installed in each oil tank assures a 1.5 US gallon reserve supply of oil for propeller feathering. The system is provided with solenoid actuated valves which permit dilution of the oil with fuel as an aid in cold-weather starting. (For oil specification and grade, see figure 1-34.)

OIL DILUTION SWITCHES.

The oil dilution solenoids in the nacelles are controlled by two spring-loaded ON-OFF switches (9, figure 1-16), one for each engine, located on the pilot's switch panel. When held in ON position, the switches connect DC power to solenoid valves in the oil dilution lines. (For oil dilution, refer to Section IX.)

FUEL SYSTEM.

Each engine has an independent fuel supply interconnected by a cross-feed line which permits either engine to be supplied with fuel from the opposite engine fuel supply. (See figure 7-2.) Each independent engine fuel supply is composed of a front and rear main tank installed in the wing between the nacelle and the fuselage, an electrical fuel booster pump mounted on an adapter between the tanks, and an engine-driven fuel pump. Each front main tank is interconnected to the rear main tank allowing the fuel to maintain a common level. Fuel in the rear tank feeds through a check valve to the front tank, then to the engine. Auxiliary fuel is carried in three interconnected cells in each wing. The auxiliary fuel must be transferred to the front main tanks by electric transfer pumps before it can be delivered to the engine. A shut-off valve is installed in the fuel supply line between each booster pump and the engine-driven pump on each engine. The fuel system also supplies fuel for operation of the combustion heaters and for engine oil dilution. All normal take-offs, landings and ground operation must be made with each engine receiving fuel from its respective main tanks. (For fuel specification and grade, see figure 1-34.)

Some aircraft are equipped with a bomb bay tank interconnected to the front main tanks through a fuel transfer valve. A bomb bay fuel transfer pump in the bomb bay tank is used to transfer fuel to the front

fuel transfer and cross-feed valve levers

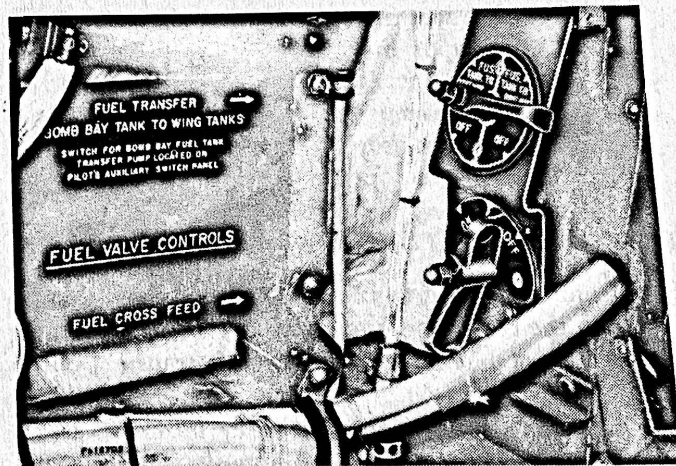


Figure 1-13

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main tanks. In the event of bomb bay fuel transfer pump failures, fuel from the bomb bay tank can be transferred by operation of the emergency fuel transfer handpump (4, figure 4-12). (Refer to Section VII, FUEL SYSTEM MANAGEMENT, for fuel transfer operation.)

Note

For engine operating limits with alternate grade fuel, see figure 5-2.

FUEL BOOSTER PUMPS AND SWITCHES.

Each DC operated fuel booster pump is actuated by a switch on the control pedestal switch panel. The fuel booster pump switches (8, figure 1-6), for aircraft with Holley carburetors, have ON and OFF positions. The booster pumps must be ON during starting, take-off, landing and at any other time that sufficient pressure cannot be maintained by the engine-driven fuel pumps alone. The fuel booster pump switches (8, figure 1-9) on aircraft equipped with Bendix-Stromberg carburetors have EMERGENCY, OFF and NORMAL positions. The EMERGENCY position is used for starting, take-off, landing and in event of engine-driven fuel pump failure; the NORMAL position is used for fuel cross-feeding and at any other time fuel pressure fluctuates within limits.

WARNING

Do not operate a fuel booster pump when the fuel tank is empty as a serious fire or explosion may result.

CAUTION

During hot weather or operation above 9000 feet, fuel vapor may form in the fuel lines and result in fluctuating engine speeds. The fuel booster pumps should be used to force the vapor back into a solution and assure surge-free engine operation.

AUXILIARY FUEL TRANSFER PUMP SWITCHES.

Fuel from each set of auxiliary fuel tanks can be transferred to the corresponding front main tank by operation of the ON-OFF auxiliary fuel transfer pump switches (4, figure 1-6), located on the control pedestal switch panel. There is no emergency means of transferring fuel from the auxiliary fuel tanks, should a fuel transfer pump fail. (For fuel transfer operation, refer to FUEL SYSTEM MANAGEMENT, Section VII.)

fuel quantity data

TANKS	NO.	CAPACITY GAL (EACH)
FRONT MAIN	2	184
REAR MAIN	2	151
WING AUXILIARY (3 CELLS)	2	152
BOMB BAY	1	215
TOTAL CAPACITIES		
MAIN & AUXILIARY		974
MAIN, AUXILIARY & BOMB BAY		1189

NOTE

USABLE FUEL IS SLIGHTLY LESS THAN QUANTITY LISTED

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Figure 1-14

BOMB BAY TANK FUEL TRANSFER PUMP SWITCH.

Aircraft with a bomb bay tank have a bomb bay tank fuel transfer pump switch (figure 1-20), located on the pilot's auxiliary switch panel, with ON-OFF positions. The switch must be ON to transfer fuel from the bomb bay tank.

EMERGENCY FUEL TRANSFER HANDPUMP.

Aircraft equipped with a bomb bay tank have an emergency fuel transfer handpump (4, figure 4-12) under the right student seat. In event of bomb bay fuel transfer pump failure, fuel from the bomb bay tank can be transferred to the front main tanks by operation of the emergency fuel transfer handpump.

FUEL CROSS-FEED VALVE.

A fuel cross-feed line, fitted with a manually operated fuel cross-feed valve, makes it possible to supply fuel to the opposite engine. The cross-feed valve is normally off and is turned on for cross-feed operation only. As there is a fuel pressure drop in the cross-feed line, the booster pump for the tank being cross-fed from must be operating. The cross-feed system can also be used

to balance the fuel load and to improve lateral stability by operating both engines from one set of wing tanks until the desired stability is attained.

Note

Fuel cannot be transferred from one set of wing tanks to the other.

FUEL CROSS-FEED VALVE LEVER.

The fuel cross-feed valve lever (figure 1-13) has ON and OFF positions, and is located on the right side of the aft wall in the students' compartment. The lever should be OFF at all times except during cross-feed operation.

FUEL TRANSFER VALVE LEVER.

A fuel transfer valve lever (figure 1-13) on some aircraft is located on the right side of the aft wall of the students' compartment. The valve lever positions are OFF, FUS. TANK TO LEFT WING, FUS. TANK TO RIGHT WING and OFF. Fuel from the bomb bay tank will not feed simultaneously to both front main tanks.

FUEL SHUT-OFF VALVES AND HANDLES.

A fuel shut-off valve is provided in the fuel line between the booster pumps and the engine-driven pumps on each engine. The shut-off valves are normally open, but may be closed in an emergency by pulling out, and reopened by pushing in the shut-off valve handles (5, figure 1-16 and 1, figure 1-17) on the pilot's and copilot's switch panels.

FUEL QUANTITY GAGES.

Three dual-indicating, DC operated fuel quantity gages (21, 22, and 27, figure 1-5), one for the front main tanks, one for the rear main tanks and one for the auxiliary tanks, are mounted on the main instrument panel. Each gage indication is given in US gallons. Tank quantities cannot be ground-checked by the gages unless the battery switches are ON or the engines operating.

ELECTRICAL POWER SUPPLY SYSTEM.

Electrical power is supplied by a 28-volt DC system (figure 1-15) that receives power from two 300-ampere engine-driven generators. Two 24-volt batteries, one in each nacelle, wired in parallel, serve as a power storage source and furnish current to the system when the generators are inoperative or when the generator output is insufficient to close the reverse current relay. A 325-ampere current limiter is connected in series with each generator to prevent an overload. The electrical system also incorporates overvoltage protection equipment (overvoltage relay and generator field control relay) to prevent overvoltage from damaging the

system. Voltage is supplied to the generator junction boxes (7, figure 4-10 and 9, figure 4-11), which are inter-connected to supply voltage to the electrical system, should either generator or battery fail. Direct current is used to operate all aircraft electrically operated equipment with the exception of the AC operated radio compass and the remote indicating compass (flux gate compass on some aircraft). (Refer to Section III for emergency in-flight trouble shooting of the DC electrical power supply system.)

Note

The following instruments will continue to operate in the event of a complete electrical failure: magnetic compass, manifold pressure gage, tachometer, cylinder head temperature gage, fuel pressure gage, and oil pressure gage.

INVERTER.

Alternating current for the compasses (radio compass and remote indicating compass) is supplied by a rotary-type inverter (1, figure 4-13) in the waist compartment at the top of the airplane. The inverter is controlled by an ON-OFF switch (10, figure 1-17), located on the copilot's switch panel.

INVERTER SWITCH AND WARNING LIGHT.

The inverter is energized by a single ON-OFF switch (10, figure 1-17) on the copilot's switch panel. The switch should be ON at all times except during an emergency, during engine starting and during engine operation below generator "cut-in" speed. An inverter warning light (4, figure 1-17), adjacent to the inverter switch, will illuminate whenever the inverter switch is in the OFF position and power is being supplied to the bus.

AC AND DC OPERATED EQUIPMENT.

(See figure 1-15.)

BATTERY SWITCHES.

Two ON-OFF battery switches (10, figure 1-16) are mounted on the pilot's switch panel. The battery switches should be OFF when external power is used.

GENERATOR SWITCHES.

Two guarded ON-OFF-RESET generator switches (8, figure 1-17) are mounted on the copilot's switch panel. During all normal engine operations, the switches should be left ON. The generator switch should be turned OFF when the respective generator power failure light illuminates. To connect the generator in the system again, position the generator switch to RESET, then to ON. If the warning light comes on, return the switch to OFF and check the remaining generator for voltage overload.