2015/11/30 14:42:53

AWBS Form F

N528NA Basic Weight Pilot & CoPilot 9/1/15

WEIGHT AND BALANCE CLEARANCE FORM F - TACTICAL

LEMAC	0.00
MAC	0.00
Moment Simplifier	100

DATE (YYYY/MM/DD)	2015/09/01	AIRCRAFT	C12	FROM	AS REQUIRED	HOME STATION	LaRC
MISSION	NORMAL/FCF	SERIAL NO.	BJ003	TO	AS REQUIRED	PILOT	

REMARKS (A ✓ in Ref 5 & 6 indicates the item is included in "Less Expendables")

FUEL LOADED AT 6.8 LBS/GALLON
BASIC AIRCRAFT WEIGHT

AIRCRAFT CONFIGURATION AT TIME OF WEIGHING
2 PAX SEATS @ Sta. 171
LIFE RAFT INSTALLED
4 LPU's INSTALLED
GRAB N GO BAG
2 EBD's INSTALLED

REF	ITEM		WEIGHT	MOM/100
1	BASIC AIRCRAFT (From Chart C)		8,538.2	16,292.43
3 (LOAD DISTRIBUTION)	Pilot		400.0	516.00
	Co-Pilot		0.0	0.00
	MAPS CHARTS NAV MATERIAL		10.0	12.90
	Total Corrections		0.0	0.00
4	**Operating Weight**		**8,948.2**	**16,821.33**
6 (BOMBS & MISSILES)				
	Total Payload		**0.0**	**0.00**
7	Internal Fuel	(530 gal)	3,604.0	6,844.00
	External Fuel	(0 gal)	0.0	0.00
	Total Fuel	**(530 gal)**	**3,604.0**	**6,844.00**
9	**Ramp Weight**		**12,552.2**	**23,665.33**
10	**Ramp CG (in)**			**188.54**
11	Taxi/Takeoff Fuel	(-13 gal)	-87.0	-186.50
	Takeoff Corrections		0.0	0.00
12	**Takeoff Weight**		**12,465.2**	**23,476.83**
13	**Takeoff CG GD (in)**			**188.34**
14	Expendable Fuel at Takeoff	(-517 gal)	-3,517.0	-6,655.50
	Less Expendables		0.0	0.00
	Landing Corrections		0.0	0.00
15	Estimated Landing Fuel	(20 gal)	134.0	206.00
16	**Est. Landing Weight**		**9,082.2**	**17,027.33**
17	**Est. Landing CG GD (in)**			**187.48**

CORRECTIONS	WEIGHT	MOM/100
Total Corrections	**0.0**	**0.00**

LIMITATIONS

CONDITION	MIN		ACTUAL		MAX
Ramp Weight vs Limit			12,552.2	<	12,590.0
Takeoff Weight vs Limit			12,465.2	<	12,500.0
Landing Weight vs Limit			9,082.2	<	12,500.0
Zero Fuel Weight vs Limit			8,948.2	<	11,000.0
Ramp CG (Gear Down)	185.00	<	188.54	<	196.40
Takeoff CG (Gear Down)	184.80	<	188.34	<	196.40
Landing CG (Gear Down)	181.00	<	187.48	<	196.40
Zero Fuel CG (Gear Down)	181.00	<	*187.99*	<	196.40

COMPUTED BY SIGNATURE
DERUBBA, SEAN

WEIGHT AND BALANCE AUTHORITY SIGNATURE
HAMMITT, RYAN

PILOT SIGNATURE

2.8 FUEL SYSTEM

The fuel supply system (Figures (B) 2-8/(F/M) 2-9) consists of two identical systems sharing a common fuel management panel and a valve-controlled crossfeed line that passes through the pressure vessel just forward of the main spar. Each system is further divided into a main and an auxiliary system. Provisions for extended range tanks are provided.

The main fuel system consists of a 57 gallon nacelle tank and 5 interconnected fuel tanks in each wing. The 6 tanks hold a total of 195 gallons, of which 193 gallons are usable. The main fuel system holds a total of 390 gallons of fuel, of which 386 gallons are usable. All five interconnected fuel tanks in each wing are filled at the filler access located near the wing tip and drain by gravity into the nacelle tank.

The auxiliary fuel supply system consists of a 79.5 gallon center section tank, of which 79 gallons are usable, and an automatic fuel transfer system to transfer the fuel into the nacelle tank. The auxiliary tanks are filled at a separate filler opening located inboard of the nacelles. When the auxiliary tanks are utilized, that fuel will be used first. During the automatic transfer of auxiliary fuel, the main system nacelle tanks are maintained full until all auxiliary fuel is transferred. When all auxiliary fuel has been transferred, normal gravity transfer of fuel into the nacelle tank will begin.

The aircraft contains provisions for a fuselage- mounted extended range fuel system. The system includes 2 fuel tanks with a combined capacity of 240 gallons.

2.8.1 Fuel Pumps

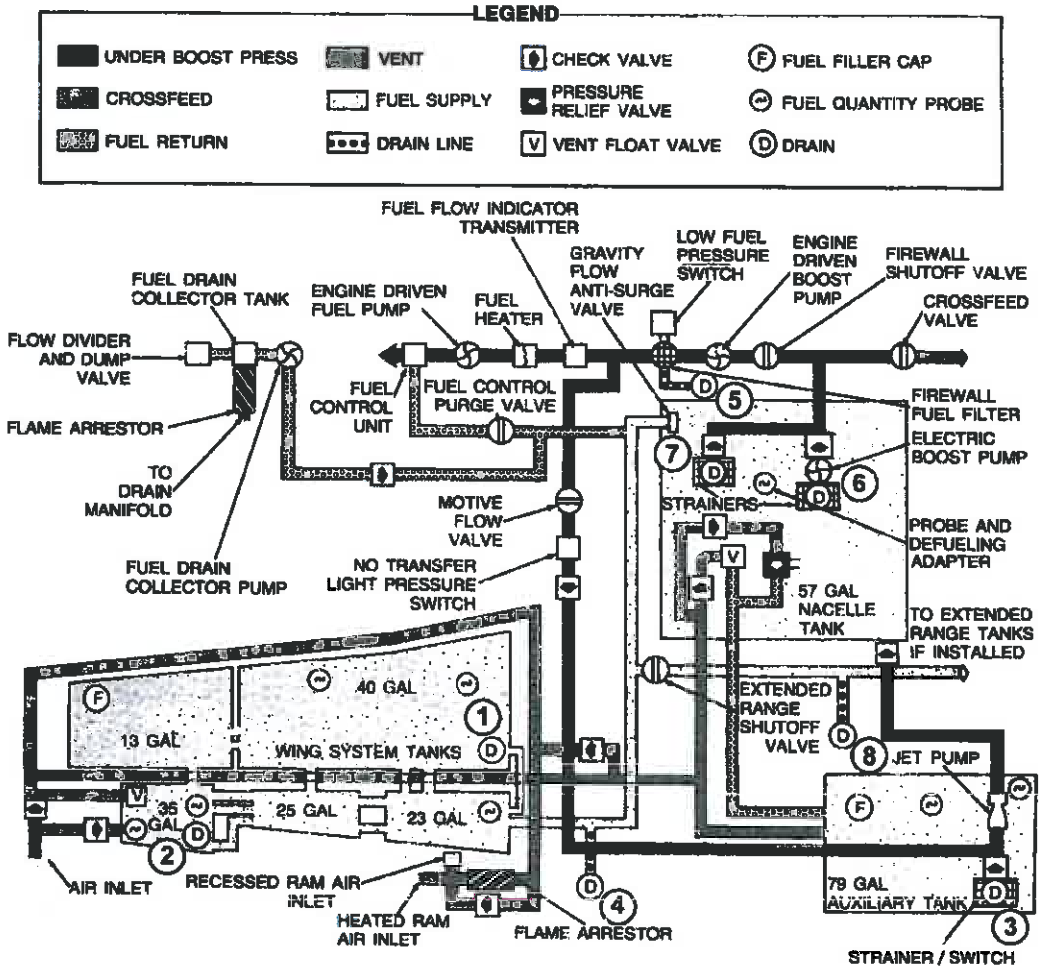
Fuel is delivered under pressure to the engine-driven primary (high-pressure) pump by either of two boost pumps. The engine-driven boost pump is bolted to and driven from the aft accessory section of the engine. In addition to supplying boosted fuel pressure, this pump also furnishes the motive fuel flow for fuel transfer from the auxiliary to the nacelle tank. The engine-driven primary pump provides sufficient fuel for start, takeoff, all flight operations except those on aviation gasoline above 20,000 feet, and crossfeed. Failure of the engine-driven boost pump is indicated by steady illumination of the red FUEL PRESS annunciator light. The light will extinguish when the standby boost pump is activated and fuel pressure is restored.

An electrically driven standby boost pump is located in the bottom of the nacelle tank and has three functions. It is a backup pump used if the primary boost pump fails, when operating on aviation gasoline above 20,000 feet, and during crossfeed.

The electrical power to operate the standby boost pumps is controlled by lever-lock-type toggle switches on the fuel management panel placarded STANDBY PUMP — ON — OFF. The standby boost pumps receive electrical power from two independent sources. (B/F) One source of power is from either the No. 3 or No. 4 feeder buses; this source is protected by a circuit breaker on the fuel management panel. (M) The standby boost pumps receive electrical power from the #1 and #2 feeder buses. The power from these buses is only available if the battery switch is ON. (B/M) Another source of electrical power is directly from the battery through the hot battery bus. This source is available regardless of the battery master switch position. Both electrical source circuits are protected by diodes to prevent the failure of one circuit from disabling the other.

2.8.2 Fuel Drains

Eight drains (Figures 7-1 and 3-4) are provided to check for and drain each wing fuel system of moisture and sediment. The eighth drain is located in the extended range provisions for use when ferry tanks are installed and utilized.



NOTE

- RIGHT SYSTEM IS IDENTICAL TO LEFT EXCEPT THE LATER CONTAINS THE CROSSFEED VALVE.
- FUEL WILL NOT GRAVITATE THROUGH THE CROSSFEED SYSTEM.
- A FUEL CAPACITANCE GAUGING SYSTEM UTILIZES A FUEL QUANTITY GAUGE FOR EACH WING FUEL SYSTEM. THIS GAUGE CAN BE SWITCHED TO DESIGNATE THE AMOUNT OF FUEL IN THE AUXILIARY TANK OR IN THE MAIN SYSTEM.
- TOTAL USABLE FUEL 544 GALLONS.
- THE FUEL DRAIN NUMBERS CORRESPOND TO THE NUMBER SHOWN IN THE FUEL DRAINS DESCRIPTION IN FIGURE 3-4.

Figure 2-8. (B) Fuel System

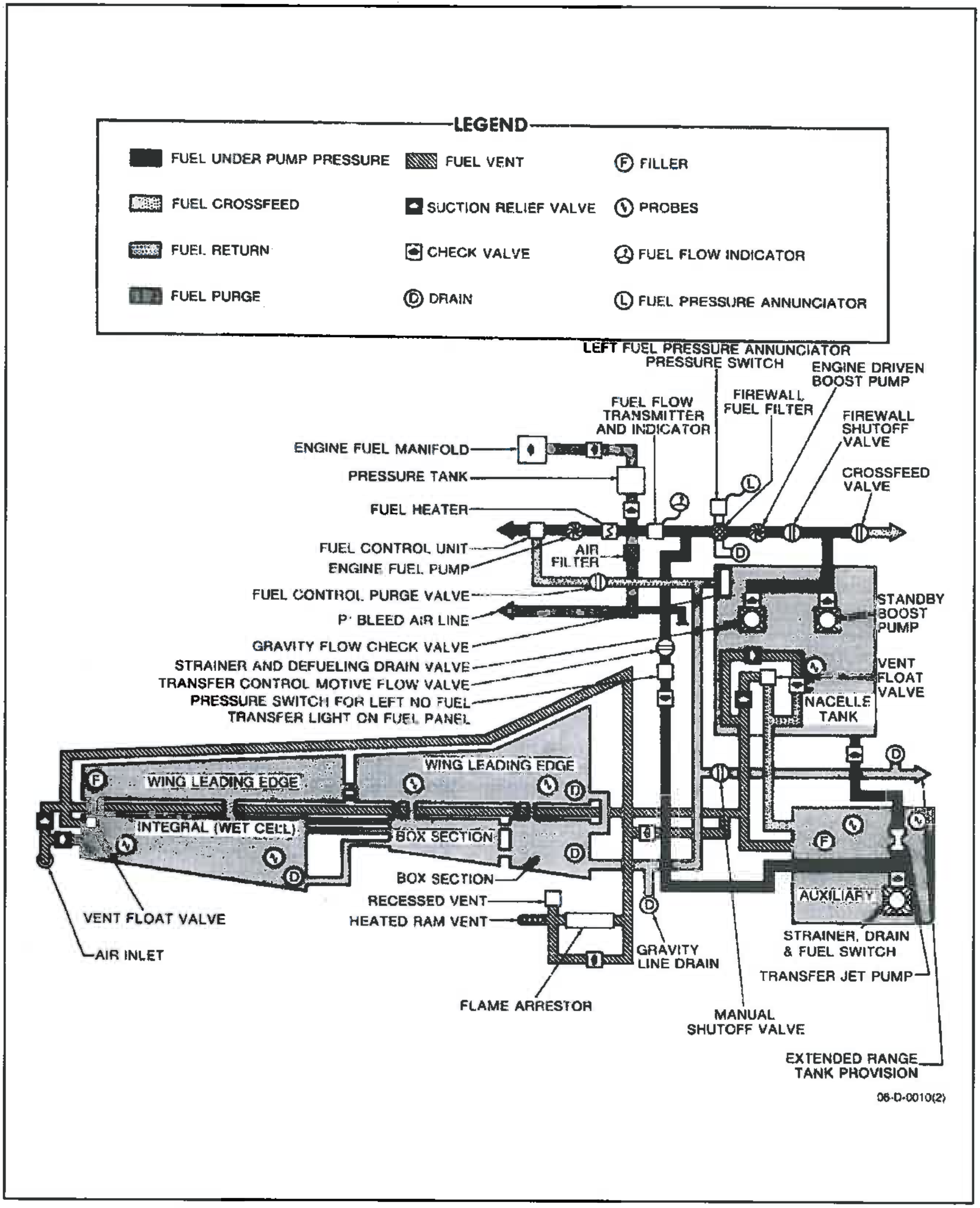


Figure 2-9. (F/M) Fuel System

2.8.3 Fuel Vents

The fuel system is vented to the atmosphere to maintain a satisfactory pressure condition during static or flight conditions. The wing tanks are vented cell to cell and to the atmosphere through a vent line that extends aft to the recessed and heated ram vents. The primary purpose of the vent is to provide a proper balance of pressure within each tank to prevent collapse or excessive expansion of the cells and to ensure proper fuel transfer. Each wing has a recessed (to prevent icing) ram vent coupled to a protruding heated ram vent as a backup. These vents are located under each wing adjacent to the aft portion of the nacelle. The heated section of each vent is controlled by two two-position toggle switches located in the ICE section of the pilot subpanel and placarded FUEL VENT — LEFT — RIGHT.

2.8.4 Auxiliary Fuel Transfer System

The auxiliary fuel transfer system transfers fuel from the auxiliary fuel tank to the nacelle tank. Fuel is transferred by means of a jet pump located in the auxiliary tank sump. The jet pump is operated by motive fuel flow obtained from the engine fuel system, downstream from the engine-driven boost pump, and routed through a motive flow valve to operate the jet pump. When the motive flow valve is deenergized, motive fuel flow is shut off and transfer is prevented. When electrical power is applied to the motive flow valve, the valve opens and applies motive flow to the jet pump to transfer fuel.

Note

Auxiliary fuel transfer will be unavailable in the event of a total loss of electrical power.

The auxiliary fuel transfer system is pilot controlled by two switches located on the fuel management panel and placarded (B/F) AUX TRANSFER — OVERRIDE — AUTO/(M) AUX XFER OVRD — AUTO. With the switch in the AUTO position, the motive flow valve will open and fuel transfer will begin approximately 40 seconds after a fuel pressure switch senses pressure in the engine fuel line (to prevent fuel depletion during engine start). Transfer will continue until the fuel in the auxiliary tank is depleted. The empty auxiliary tank is secured by a float switch that causes the motive flow valve to close and shut off motive flow.

Note

The motive flow valve on the side being fed is automatically closed when CROSSFEED FLOW is selected to prevent fuel transfer from the auxiliary tank in the side being fed.

The OVERRIDE position of the auxiliary transfer control switch bypasses the 40-second time delay and automatic control circuitry and energizes the motive flow valve directly to provide a manual backup to the automatic system.

(B/F) Left and right NO TRANSFER lights (located on the fuel management panel)/(M) #1 and #2 NO FUEL XFER annunciator caution lights are provided to indicate when fuel is not being transferred. The appropriate light will illuminate when there is fuel in the auxiliary fuel tank and no motive fuel pressure is applied to the jet pump.

2.8.5 Fuel Management Panel

(B/F) Control of the fuel system is directed from the Fuel Management Panel (Figure 2-10). This panel is located on the pilot left sidewall and contains the switches for the firewall shutoff valves, standby boost pumps, auxiliary transfer override, crossfeed flow, fuelquantity select, no fuel transfer lights, and fuel quantity indicators. Full forward movement of the pilot seat with left armrest down obstructs the left firewall shutoff valve switch.

(M) Control of the fuel system is directed from the Fuel Management Panel (Figure 2-11), located in the cockpit overhead. This panel contains the switches for the standby boost pumps, auxiliary transfer override, crossfeed flow, fuel quantity select, and the fuel quantity indicators.

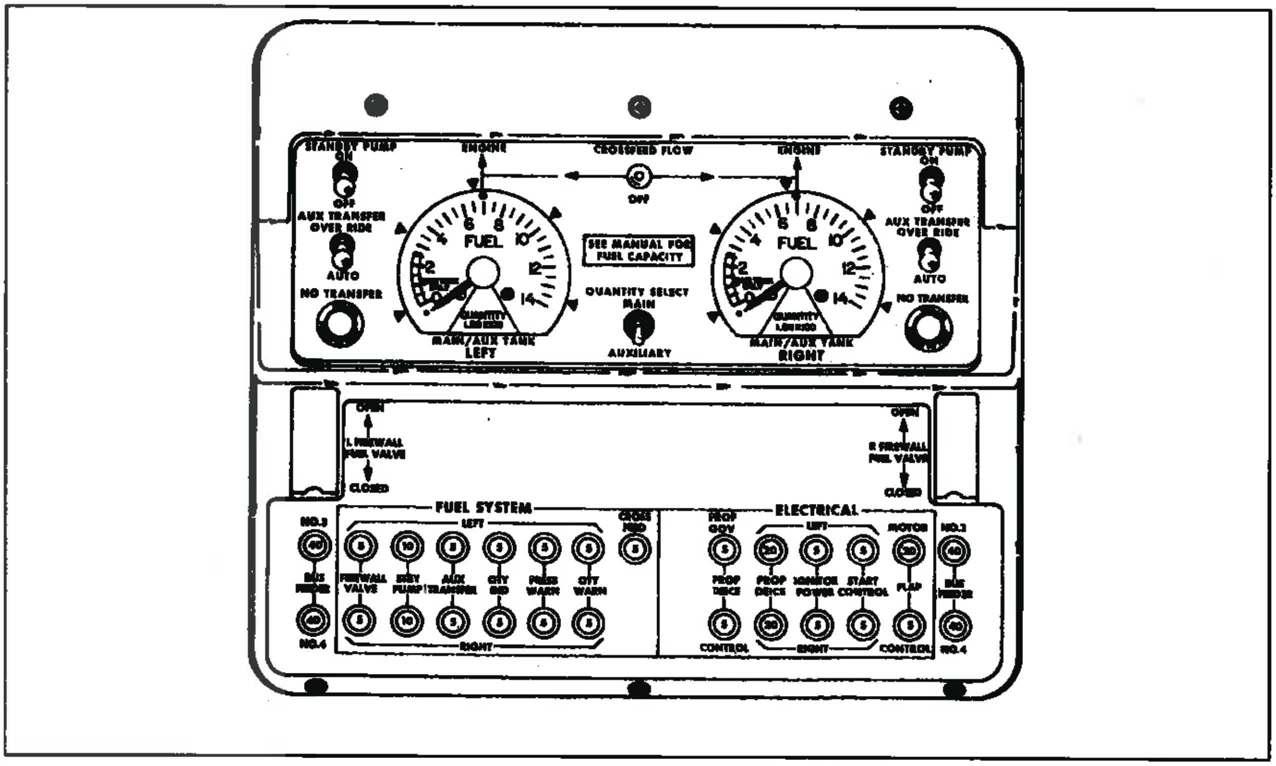


Figure 2-10. (B/F) Fuel Management Panel

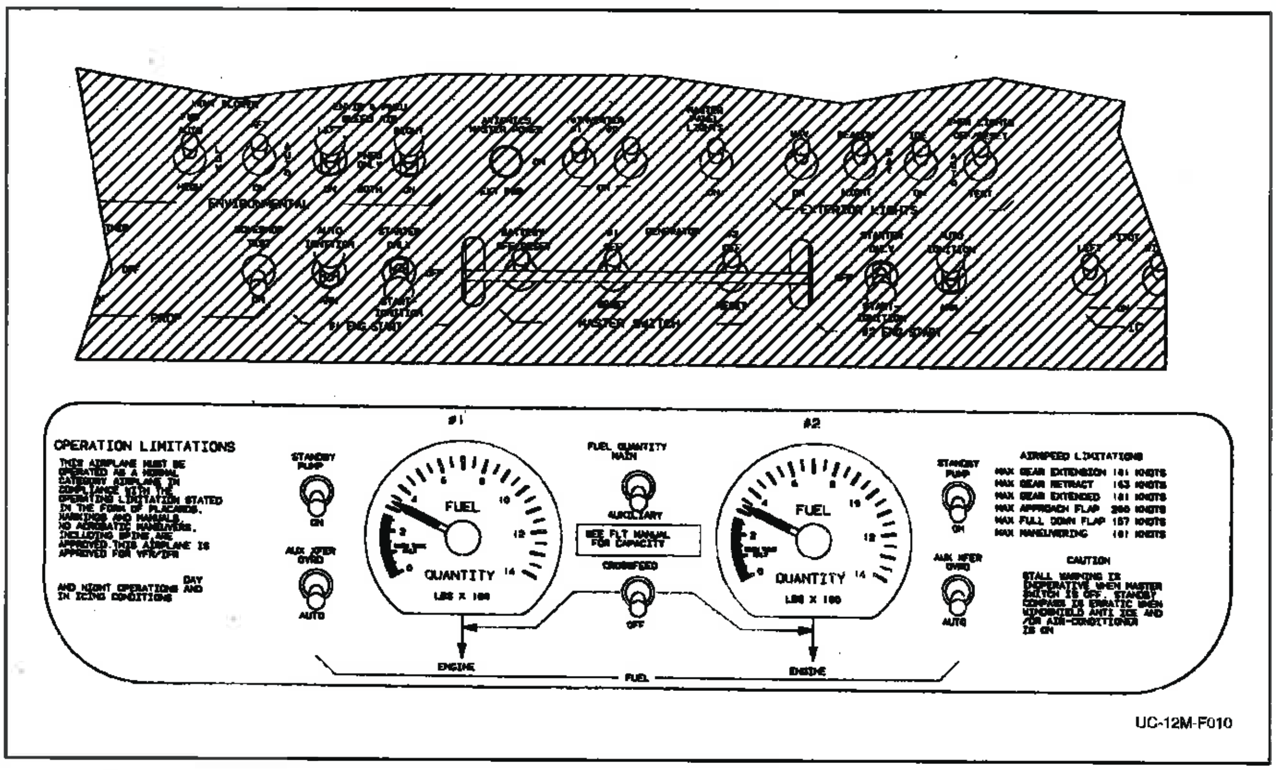


Figure 2-11. (M) Fuel Management Panel

2.8.5.1 Fuel Crossfeed

During normal fuel system operation, the fuel systems on each side are isolated and each engine is supplied fuel under boosted pressure from its own system. Crossfeed does not transfer fuel from one system to the other; it allows one engine to receive fuel from the opposite side. The crossfeed system is placarded with a diagram on the fuel management panel. When crossfeed is desired, place both standby boost pump switches in the OFF position and lift and place the lever-lock switch placarded CROSSFEED FLOW from the center OFF position left or right depending on the desired fuel flow direction. This action opens the crossfeed valve, energizes the standby pump on the side from which crossfeed fuel is desired, deenergizes the motive flow valve to the closed position on the side being fed, and illuminates the green FUEL CROSSFEED annunciator light. Illumination only means the crossfeed valve is energized and does not verify fuel crossfeed flow. During crossfeed operation, fuel delivered will be supplied from the side with the operative boost pump only; thus, opposite wing loads will become unbalanced.

Note

Crossfeed is intended to allow continued single-engine operations, not to correct minor fuel imbalance in flight. Crossfeed to support dual-engine operations is not recommended.

2.8.5.2 NO TRANSFER Indicator Lights

A pressure switch senses the loss of motive flow fuel pressure when there is fuel remaining in the auxiliary tank and will illuminate the respective **(B/F)** NO TRANSFER light on the fuel management panel (Figure 2-10)/**(M)** #1 or #2 NO FUEL XFER caution annunciator (Figure 2-36). The loss of pressure could be the result of a failure of the motive flow valve or the associated control circuitry. A manual override is available if the automatic transfer malfunctions as indicated by the **(B/F)** NO TRANSFER/**(M)** NO FUEL XFER light illumination. It is activated by placing the AUX TRANSFER switch on the fuel management panel to the OVER RIDE position.

2.8.5.3 Standby Boost Pump Switches

(B/F) Two switches on the fuel management panel, placarded STANDBY PUMP — ON — OFF, (Figure 2-10) control submerged boost pumps in the corresponding nacelle tanks. Each is a two-position lever-lock-type toggle switch. At each ON — OFF position, the toggle lever is restrained to prevent inadvertent movement. To reposition the switch, a distinct action is required. The toggle lever must be pulled out, moved to the desired position, and released. During normal operation of the aircraft, these switches are in the OFF position.

(M) Two switches, placarded STANDBY PUMP — ON, located on the overhead Fuel Management Panel (Figure 2-11), control a submerged boost pump in the corresponding nacelle tanks. During normal operations, these pumps are off and the switches are in the STANDBY PUMP position.

2.8.5.4 Firewall Valves

A fuel line shutoff valve mounted on each engine firewall is incorporated in the fuel system. **(B/F)** Two guarded switches on the fuel management panel, placarded L & R FIREWALL FUEL VALVE OPEN — CLOSED, are provided to give the pilot electrical fuel shutoff capability at each engine firewall. Each switch is a two-position unit controlling the corresponding firewall shutoff valve located aft of the firewall. In the CLOSED position, fuel flow to the affected engine is terminated, thereby isolating that engine fuel supply, although the isolated fuel may be supplied to the opposite engine by crossfeed. A hinged red guard engages each firewall valve switch toggle when the switch is in the OPEN position. This guard prevents inadvertent movement of the switch to the CLOSED position. The guard must be manually disengaged from the switch toggle to move the switch to the CLOSED position.

(M) The firewall shutoff valves close automatically when the fire extinguisher T-handles on the instrument panel are pulled out. The firewall shutoff valves receive electrical power from the main buses and from the hot battery bus, which is connected directly to the battery.

The valves are protected by 5-ampere circuit breakers placarded FIREWALL VALVE located (B/F) on the fuel management panel (M) in the FUEL section of the overhead circuit breaker panel.

CAUTION

Do not use the fuel firewall shutoff valve to shut down an engine except in an emergency. The engine-driven (high-pressure) fuel pump obtains essential lubrication from fuel flow. When an engine is operating, this pump may be damaged if the firewall valve is closed before the condition lever is moved to the FUEL CUTOFF position.

Note

A 15 to 45 second delay before engine flameout can be expected when using the firewall shutoff valve to secure an engine.

2.8.5.5 Fuel Quantity Indicators

Two fuel quantity indicators mounted on the fuel management panel (Figures (B) 2-10/(M) 2-11) indicate AUXILIARY tanks or MAIN tanks fuel quantity in 50 pound increments. A two-position toggle switch placarded (B/F) QUANTITY SELECT-MAIN-AUXILIARY/(M) FUEL QUANTITY MAIN-AUXILIARY is located between the indicators. It is spring loaded from AUXILIARY to MAIN and can momentarily be positioned in the AUXILIARY position to provide an indication of fuel remaining in the auxiliary system. The MAIN position shows fuel quantity in the main tanks only. In addition to the fuel quantity indicators, caution annunciators placarded (B/F) L or R (M) #1 or #2 NAC LOW illuminate when there is approximately 247 pounds (30 minutes) of usable fuel at sea level normal cruise power per engine remaining.

2.9 ELECTRICAL POWER SUPPLY AND DISTRIBUTION SYSTEM

The aircraft employs 28 Vdc and 115 and 26 Vac electrical power. The dc electrical supply (Figures (B) 2-12/(F) 2-13/(M) 2-14) forms the basic power system energizing most aircraft circuits. Ac power for certain engine instruments and for avionics is obtained from dc power through two inverters (Figures (B) 2-15/(F) 2-16/(M) 2-17). Dc power is supplied by a 24 volt, 42 ampere hour valve regulated sealed lead acid battery mounted in the right wing center section and two 250 ampere starter-generators connected in parallel. The generator buses are interconnected by two current limiters. The entire electrical system operates as a single bus, with power being supplied by the battery and both generators. (B/F) Four dual fed buses (M) six dual fed buses distribute electrical power supplied from either generator main bus through circuit breakers with a diode. The equipment on the dual fed buses is arranged so that all items with duplicate functions (such as left and right landing lights) are connected to different buses (Figures (B) 2-12/(F) 2-13/(M) 2-14).

2.9.1 Battery Bus (Hot)

The hot battery bus is connected directly to the battery and located under the right wing, outboard of the battery. It provides power to various circuits. These circuits are operative regardless of battery master switch position and/or (M) key lock switch position. Refer to Figure 2-14.

2.9.2 Main Bus

Power to the (B) MAIN AIRCRAFT BUS, (F) MAIN BUS, (M) STARTER BUS from the battery is routed through the battery relay that is controlled by the (B/F) BATT switch located on the pedestal extension; (M) BATTERY and keylock switches located on the overhead control panel.

Power to the bus system from the generators is routed through reverse-current protection circuitry that prevents the generators from absorbing power from the buses when generator voltage is less than bus voltage.

2015/11/30 14:39:23

12,500 LBS

N529NA BASIC P CP 8/28/15

AWBS Form F

WEIGHT AND BALANCE CLEARANCE FORM F - TRANSPORT

LEMAC	0.00
MAC	0.00
Moment Simplifier	100

DATE (YYYY/MM/DD)	2015/08/28	AIRCRAFT	B200 KING-AIR	FROM	
MISSION	General	SERIAL NO.	BB1091 N529NA	TO	
				HOME STATION	LaRC
				PILOT	ASSIGNED PILOT

REMARKS (A ✓ in Ref 13 indicates the item is included in "Less Expendables")

No Projects Installed

2PAX Seats @ Sta 171 LT & RT,
2 EBD's(10.4Lbs) @ Sta. 161
Life Raft(34Lbs) @ Sta. 325
Utility Bucket(3.6Lbs) @ Sta. 325
LPU(4) + Bag(1) (10.4Lbs) @ Sta.325
Engine Covers(2) + Bag(1) (8.6Lbs) @ Sta. 325
First Aid Kit(2Lbs) @ Sta. 161

FUEL LOADED at 6.8 LBS/GAL

REF	ITEM		WEIGHT	MOM/100
1	BASIC AIRCRAFT (From Chart C)		8,496.5	16,091.69
3	Crew		400.0	516.12
4	Crew Bags		0.0	0.00
5				
6				
7				
8	MAPS CHARTS NAV MATERIAL		10.0	12.90
	Total Corrections		0.0	0.00
9	Operating Weight		8,906.5	16,620.71
10	Internal Fuel	(540 gal)	3,672.0	6,984.00
	External Fuel	(0 gal)	0.0	0.00
	Total Fuel	**(540 gal)**	**3,672.0**	**6,984.00**
12	Total Aircraft Weight		12,578.5	23,604.71
13 PAYLOAD				
	Total Payload		**0.0**	**0.00**
16	**Ramp Weight**		**12,578.5**	**23,604.71**
17	**Ramp CG (in)**			**187.66**
18	Taxi/Takeoff Fuel	(-13 gal)	-87.1	-137.30
	Takeoff Corrections		0.0	0.00
19	**Takeoff Weight**		**12,491.4**	**23,467.41**
20	**Takeoff CG GD (in)**			**187.87**
21	Expendable Fuel at Takeoff	(-527 gal)	-3,584.9	-6,846.70
	Zero Fuel Weight		**8,906.5**	**16,620.71**
	Zero Fuel CG GD (in)			**186.61**
22	Less Expendables		0.0	0.00
	Landing Corrections		0.0	0.00
23	Estimated Landing Fuel	(20 gal)	134.0	206.00
24	**Est. Landing Weight**		**9,040.5**	**16,826.71**
25	**Est. Landing CG GD (in)**			**186.13**

CORRECTIONS	WEIGHT	MOM/100
Total Corrections	**0.0**	**0.00**

LIMITATIONS

CONDITION	DELTA	ACTUAL		LIMIT
Ramp Weight (ref 16)	11.5	12,578.5	<	12,590.0
Takeoff Weight (ref 19)	**8.6**	**12,491.4**	**<**	**12,500.0**
Landing Weight (ref 24)	3,459.5	9,040.5	<	12,500.0
Zero Fuel Weight (ref 21)	2,093.5	8,906.5	<	11,000.0
Load vs Max Allowable Load		0.0	<	8.6
Remaining Allowable Load		*8.6*		

CONDITION	MIN		ACTUAL		MAX
Ramp CG (Gear Down)	184.50	<	187.66	<	196.40
Takeoff CG (Gear Down)	184.30	<	187.87	<	196.40
Landing CG (Gear Down)	181.00	<	186.13	<	196.40

COMPUTED BY SIGNATURE
DeRubba Sean

WEIGHT AND BALANCE AUTHORITY SIGNATURE
Ryan Hammitt

PILOT SIGNATURE

PRIMARY LOW PITCH STOP

Low pitch propeller position is determined by the primary low pitch stop which is a mechanically actuated hydraulic stop. Beta and reverse blade angles are controlled by the power levers in the Beta and reverse range.

PROPELLER GOVERNORS

Two governors, a constant speed governor and an overspeed governor, control the propeller rpm. The constant speed governor, mounted on top of the gear reduction housing, controls the propeller through its entire range. The propeller control lever operates the propeller by means of this governor. If the constant speed governor should malfunction by requesting more than 2000 rpm, the overspeed governor cuts in at 2080 rpm and dumps oil from the propeller to keep the rpm from exceeding approximately 2080 rpm. A solenoid actuated by the PROP GOV TEST switch located on the pilot's subpanel, is provided for resetting the overspeed governor to approximately 1830 to 1910 rpm for test purposes.

If the propeller sticks or moves too slowly during a transient condition causing the propeller governor to act too slowly to prevent an overspeed condition, the power turbine governor, contained within the constant speed governor housing, acts as a fuel topping governor. When the propeller reaches 2120 rpm, the fuel topping governor limits the fuel flow to the gas generator, reducing N_1 rpm, which in turn prevents the propeller rpm from exceeding approximately 2200 rpm. During operation in the reverse range, the fuel topping governor is reset to approximately 95% propeller rpm before the propeller reaches a negative pitch angle. This ensures that the engine power is limited to maintain a propeller rpm somewhat less than that of the constant speed governor setting. The constant speed governor therefore will always sense an underspeed condition and direct oil pressure to the propeller servo piston to permit operation in Beta and reverse ranges.

AUTOFEATHER SYSTEM

The automatic feathering system provides a means of immediately dumping oil from the propeller servo to enable the feathering spring and counterweights to start the feathering action of the blades in the event of an engine failure. Although the system is armed by a switch on the pilot's subpanel, placarded AUTOFEATHER - ARM - OFF - TEST, the completion of the arming phase occurs when both power levers are advanced above 90% N_1 at which time both the right and left indicator lights on the caution/advisory annunciator panel indicate a fully armed system. The annunciator panel lights are green, placarded L AUTOFEATHER and R AUTOFEATHER. The system will remain inoperative as long as either power lever is retarded below 90% N_1 position. The system is designed for use only during takeoff and landing and should be turned off when establishing cruise climb. During takeoff or landing, if torquemeter oil pressure on either engine drops below a prescribed setting, the oil is dumped from the servo, the feathering spring starts the blades toward feather, and the autofeather system on the other engine is disarmed. Disarming of the autofeather portion of the operative engine is further indicated when the annunciator indicator light for that engine extinguishes.

FUEL SYSTEM

The fuel system consists of two separate systems connected by a valve-controlled crossfeed line. The fuel system for each engine is further divided into a main and auxiliary fuel system. The main system consists of a nacelle tank, two wing leading edge tanks, two box section bladder tanks, and an integral (wet cell) tank, all interconnected to flow into the nacelle tank by gravity. This system of tanks is filled from the filler located near the wing tip.

The auxiliary fuel system consists of a center section tank with its own filler opening, and an automatic fuel transfer system to transfer the fuel into the main fuel system.

When the auxiliary tanks are filled, they will be used first. During transfer of auxiliary fuel, which is automatically controlled, the nacelle tanks are maintained full. A swing check valve in the gravity feed line from the outboard wing prevents reverse fuel flow. Upon exhaustion of the auxiliary fuel, normal gravity transfer of the main wing fuel into the nacelle tanks will begin.

An anti-siphon valve is installed in each filler port which prevents loss of fuel or collapse of a fuel cell bladder in the event of improper securing or loss of the filler cap.

The two systems are vented through a recessed ram vent coupled to a protruding heated ram vent on the underside of the wing adjacent to the nacelle. One vent is recessed to prevent icing and the protruding vent, added as a backup, is heated to prevent icing.

All fuel is filtered with a firewall-mounted 20-micron filter. These filters incorporate an internal bypass which opens to permit uninterrupted fuel supply to the engine in the event of filter icing or blockage. In addition, a screen strainer is located at each tank outlet before the fuel reaches the boost and transfer pumps. The main engine driven fuel pump has an integral strainer to protect the pump.

A "differential pressure" fuel purge system is provided and is located in the aft compartment of each nacelle. The system purges the fuel that is left in the fuel manifolds at engine shutdown by forcing the fuel into the nozzles so that it is consumed in the combustion chamber.

FUEL PUMPS

The engine driven fuel pump (high pressure) is mounted on the accessory case in conjunction with the fuel control unit. Failure of this pump results in an immediate flameout. The primary boost pump (low pressure) is also engine driven and is mounted on a drive pad on the aft accessory section of the engine. This pump operates when the gas generator (N_1) is turning and provides sufficient fuel for start, takeoff, all flight conditions (except operation with hot aviation gasoline above 20,000 feet altitude) and operation with crossfeed.

In the event of a primary boost pump failure, the respective red FUEL PRESS light in the annunciator panel will illuminate. This light illuminates when pressure decreases below 10 ± 1 psi. The light will be extinguished by switching on the standby fuel pump on that side, thus increasing pressure above 11 ± 2 psi.

CAUTION

Engine operation with the fuel pressure light on is limited to 10 hours between overhaul, or replacement, of the engine driven fuel pump.

When using aviation gasoline during climbs above 20,000 feet, the first indication of insufficient fuel pressure will be an intermittent flicker of the FUEL PRESS lights. A wide fluctuation of the fuel flow indicator may also be noted. These conditions can be eliminated by turning on a standby pump.

An electrically driven standby boost pump (low pressure), located in the bottom of each nacelle tank, performs three functions; it is a backup pump for use in the event of a primary fuel boost pump failure, it is for use with hot aviation gasoline above 20,000 feet, and it is used during crossfeed operations. In the event of an inoperative standby pump, crossfeed can only be accomplished from the side of the operative pump.

SERIALS BB-734, BB-793, BB-829, BB-854 thru BB-870, BB-874 thru BB-891, BB-894, BB-896 thru BB-911, BB-913 thru BB-1095, and BB-1097; BL-37 thru BL-57:

Electrical power to operate the standby boost pumps is controlled by lever lock toggle switches, placarded STANDBY PUMP - ON - OFF, located on the fuel control panel and is supplied power from two independent sources. One source of power for either the right or the left standby pump is provided through the number 3 or number 4 feeder bus and is protected by a 10-ampere circuit breaker located on the fuel control panel. This power is only available when the master switch is turned on. Another source of power comes directly from the battery through the hot battery bus and is protected by dual 5-ampere fuses located in the right wing center section. The fuse panel may be serviced through an access door on the bottom side of the wing outboard of the battery. This power source makes power available for the pumps at all times, regardless of the battery master switch position. These circuits are protected by diodes to prevent the failure of one circuit from disabling the other circuit. During shutdown, make certain both standby pump switches are off to prevent battery discharge.

SERIALS BB-1096, BB-1098 and After; BL-58 and After:

Electrical power to operate the standby boost pumps is controlled by lever lock toggle switches, placarded STANDBY PUMP - ON - OFF, located on the fuel control panel. It is supplied power from the number 3 or number 4 feeder bus, and is protected by a 10-ampere circuit breaker located on the fuel control panel. This power is only available when the master switch is turned on. These circuits are protected by diodes to prevent the failure of one circuit from disabling the other circuit.

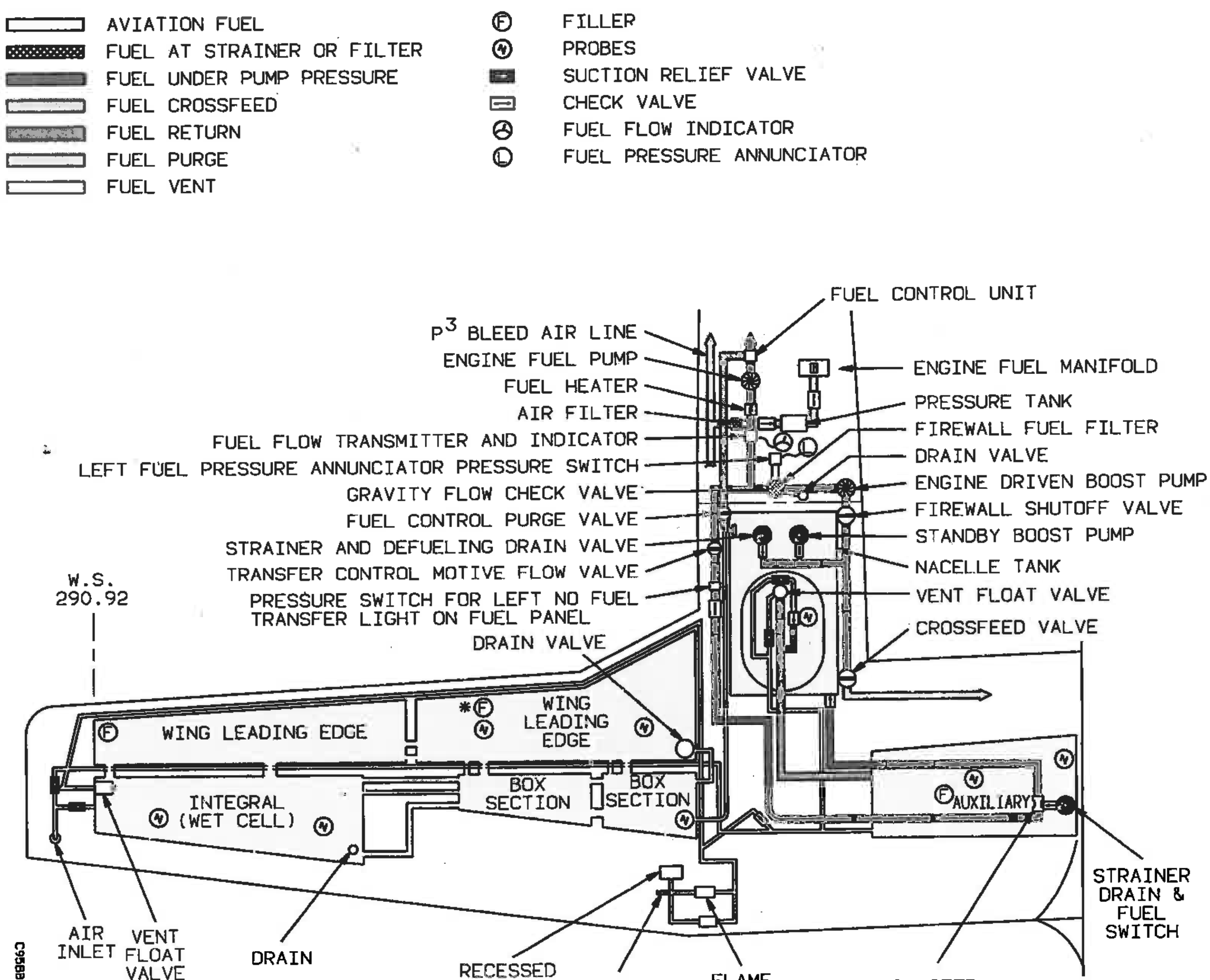
AUXILIARY FUEL TRANSFER SYSTEM

The auxiliary tank fuel transfer system automatically transfers the fuel from the auxiliary tank to the nacelle tank without pilot action. Motive flow to a jet pump mounted in the auxiliary tank sump is obtained from the engine fuel plumbing system downstream from the engine driven boost pump and and routed through the transfer control motive flow valve. The motive flow valve is energized to the open position by the control system to transfer auxiliary fuel to the nacelle tank to be consumed by the engine during the initial portion of the flight. When an engine is started, pressure at the engine driven boost pump closes a pressure switch which, after a 30 to 50 second time delay to avoid depletion of fuel pressure during starting, energizes the motive flow valve. When the auxiliary fuel is depleted, a low level float switch de-energizes the motive flow valve after a 30 to 60 second time delay provided to prevent cycling of the motive flow valve due to sloshing fuel.

In the event of a failure of the motive flow valve or the associated control circuitry, the loss of motive flow pressure when there is still fuel remaining in the auxiliary fuel tank is sensed by a pressure switch and float switch, respectively, which illuminates a light placarded NO TRANSFER on the fuel control panel. During engine start, the pilot should note that the NO TRANSFER lights extinguish 30 to 50 seconds after engine start. A manual override is incorporated as a backup for the automatic transfer system. This is initiated by placing the AUX TRANSFER switch, located in the fuel control panel to the OVERRIDE position.

USE OF AVIATION GASOLINE

If aviation gasoline must be used as an emergency fuel, it will be necessary to determine how many hours the airplane is operated on gasoline. Since the gasoline is being mixed with the regular fuel, it is expedient to record the number of gallons of gasoline taken aboard for each engine. Each engine is permitted 150 hours of operation on aviation gasoline between overhauls. This means that if one engine has an average fuel consumption of 50 gallons per hour, for example, it is allowed 7500 gallons of aviation gasoline between overhauls. (Two engines; 15,000 gallons between overhauls.)



* SERIALS BB-1376 AND AFTER AND PRIOR SERIALS WITH KIT 101-9058.

FUEL SYSTEM SCHEMATIC

CROSSFEED

During emergency single-engine operation, it may become necessary to supply fuel to the operative engine from the fuel system on the opposite side. The simplified crossfeed system is placarded for fuel selection with a diagram on the upper fuel control panel. Place the standby fuel pump switches in the OFF position when crossfeeding. A lever-lock switch, placarded CROSSFEED FLOW, is moved from the center OFF position to the left or to the right, depending on direction of fuel flow. This opens the crossfeed valve, energizing the standby pump on the side from which cross-feed is desired, and de-energizes the motive flow valve in the fuel system on the side being fed. When the crossfeed mode is energized, a green FUEL CROSSFEED light on the caution/advisory panel will illuminate.

FIREWALL SHUTOFF

The system incorporates two firewall shutoff valves controlled by two switches, one on each side of the fuel system circuit breaker panel, located on the fuel control panel. These switches, respectively LEFT and RIGHT, are placarded FIREWALL SHUTOFF VALVE - OPEN - CLOSED. A red guard over each switch is an aid in preventing inadvertent operation. The firewall shutoff valves receive electrical power from the main buses and also from the hot battery bus which is connected directly to the battery.

FUEL ROUTING IN ENGINE COMPARTMENT

Just forward of the firewall shutoff valve is the primary engine driven boost pump. From the primary boost pump, the fuel is routed to the main fuel filter, the fuel flow indicator transmitter, through a fuel heater that utilizes heat from the engine oil to warm the fuel, through the engine driven fuel pump, then to the fuel control unit. From there it is directed through the dual fuel manifold to the fuel outlet nozzles and into the annular combustion chamber. Fuel is also taken from just downstream of the main fuel filter to supply the jet transfer pump motive flow.

FUEL DRAINS

During each preflight, the fuel sumps on the tanks, pumps and filters should be bled to check for fuel contamination. There are five sump drains and one filter drain in each wing. They are located as follows:

DRAINS	LOCATION
Leading Edge Tank	Outboard of nacelle underside of wing
Integral Tank	Underside of wing forward of aileron
Firewall Fuel Filter	Underside of cowling forward of firewall
Sump Strainer	Bottom center of nacelle forward of wheel well
Gravity Feed Line	Aft of wheel well
Auxiliary Tank	At wing root just forward of the flap

FUEL PURGE SYSTEM

Engine compressor discharge air (P_3 air) pressurizes a small purge tank. During engine shutdown, fuel manifold pressure subsides, thus allowing the engine fuel manifold poppett valve to open. The purge tank pressure forces fuel out of the engine fuel manifold lines, through the nozzles, and into the combustion chamber. As the fuel is burned, a momentary surge in (N_1) gas generator rpm should be observed. The entire operation is automatic and requires no input from the crew.

During engine starting, fuel manifold pressure closes the fuel manifold poppett valve, allowing P_3 air to pressurize the purge tank.

FUEL GAGING SYSTEM

The airplane is equipped with a capacitance type fuel quantity indication system. A maximum indication error of 3% full scale may be encountered in the system. The system is designed for the use of Jet A, Jet A1, JP-5 and JP-8 aviation kerosene, and compensates for changes in fuel density due to temperature changes. If other fuels are used, the system will not indicate correctly. See OTHER NORMAL PROCEDURES in Section IV for instructions when using Jet B, JP-4, or aviation gasoline.

The LEFT fuel quantity indicator on the fuel control panel indicates the amount of fuel remaining in the left-side main fuel system tanks when the fuel QUANTITY SELECT switch in the MAIN (upper) position, and the amount of fuel remaining in the left-side auxiliary fuel tank when the fuel QUANTITY SELECT switch is in the AUXILIARY (lower) position. The RIGHT fuel quantity indicator indicates the same information for the right-side fuel systems, depending upon the position of the FUEL QUANTITY switch. The gages are marked in pounds.

ELECTRICAL SYSTEM

The airplane electrical system is a 28-VDC (nominal) system with the negative lead of each power source grounded to the main airplane structure. DC electrical power is provided by one 34-ampere-hour, air cooled, 20-cell, nickel-cadmium battery, and two 250-ampere starter/generators connected in parallel. The system is capable of supplying power to all subsystems that are necessary for normal operation of the airplane. A hot battery bus is provided for emergency operation of certain essential equipment and the cabin entry threshold light circuit. Power to the main bus from the battery is routed through the battery relay which is controlled by a switch placarded BAT - ON - OFF, located on the pilot's subpanel. Power to the bus system from the generators is routed through reverse-current-protection circuitry. Reverse current protection prevents the generators from absorbing power from the bus when the generator voltage is less than the bus voltage. The generators are controlled by switches, placarded GEN 1 and GEN 2, located on the pilot's subpanel.