Wing Flap System

34. The wing flaps are of the split trailing edge type and are actuated through a series of rods, rollers and turn buckles by one hydraulic strut. When the wing flap control valve handle on the hydraulic control panel is placed in the DOWN position, the hydraulic fluid is directed from the pressure manifold through the wing flap relief valve to the forward end of the wing flap actuating strut which operates the wing flap mechanism. As the piston in the cylinder moves to the main return manifold. When the control valve handle is placed in the UP position, the fluid under pressure from the manifold is directed to the rear end of the strut. This forces the piston forward and retracts the flaps. The fluid contained in the forward end of the strut if forced back through the control valve and to the return manifold.

35. The by-pass line and check valve installed around the flap relief-valve is for the purpose of preventing any back pressure from building up in the flap down line due to the resistance to flow of fluid back through the relief valve. The by-pass line provides a free passage for the return fluid when the flaps are being raised, and the check valve prevents any flow through the by-pass line when the flaps are being lowered.

Wing Flap Selector Valve

36. The wing flap selector valve is of the porting plate type (Saval), identical with the landing gear selector valve. No safety locking mechanism is mounted on the flap selector valve.

Wing Flap Operating Strut

37. The wing flap operating strut consists essentially of an aluminum alloy piston head and a chrome molybdenum steel piston rod. Clamped to each end is a support which carries rollers, allowing the strut to move back and forth in its tracks.

Wing Flap Relief Valve

38. The wing flap relief valve in the flap down linelimits the pressure in the forward end of the flap operating strut to 400 pounds per square inch. If an attempt is made to lower the flaps when the airspeed is in excess of 112 mph, the flaps will lower until the air pressure against the flaps exerts a back pressure in the system equivalent to 400 pounds. The relief valve then operates and shuts off the pressure from the hydraulic system and the flaps do not lower farther. If the airspeed is subsequently decreased, reducing the air load on the flaps, the relief valve will release and again allow fluid from the hydraulic system to flow to the operating strut and further depress the flaps.

39. If the flaps are lowered at a low airspeed and then the airspeed increased with the wing flap control valve handle in the NEUTRAL position, the relief valve will operate and allow the flaps to retract by directing the fluid from the forward end of the strut to the return line. The check valve between the return line and the flap up line allows fluid to flow to the rear end of the strut with the possibility of air leaking into the system through the piston rod packing.

Cowl Flap System

40. Cowl flaps are provided on the trailing edge of each engine cowling to facilitate engine cooling. These flaps are hydraulically opened or closed to maintain proper engine cylinder head temperatures. During all ground operation of the engines, the cowl flaps should be open. In the air they should be in the trail position or closed. The flaps should never be opened in the air unless engine cooling difficulties are encountered, when they may be set to the proper opening to maintain the necessary cylinder head temperatures.

41. The hydraulic system for the cowl flaps in divided into two independent sections; one for the left engine and one for the right engine. Hydraulic system pressure is supplied from the brake pressure line. The fluid flows to the ball type control valves which are mounted on a manifold on the right side of the fuselage adjacent to the First Officer's seat. From the control valves, the fluid is carried back through the fuselage to the wind tunnel, and out to the operating struts. Return fluid from the control valve flows into the brake return line. Operation if the cowl flaps is as follows:

(1) To open the cowl flaps, the valve is set in the OPEN position. This directs fluid from the brake pressure line to the proper end of the strut to open the flaps. The return fluid from the double-acting strut is directed back through the valve to the brake return line.

(continued)

41. (2) To close the cowl flaps, the valve is set to the CLOSE position. This reverses the fluid passages and directs the pressure to the opposite end of the strut.

(3) To lock the flaps in any desired position, the valve is set in the OFF position after the flaps are opened to the required setting. In this position, all ports of the valve are blocked off and no fluid can flow either to or from the strut. Thus the piston is locked in place and the cowl flaps cannot move.

(4) The TRAIL position on the control valve connects the two ends of the strut together and allows the cowl flaps to assume a floating position which depends on the balance of the air loads on the two sides of the flaps. The cowl flaps will float slightly open and give increased engine cooling without increasing the airplane resistance.

42. The cowl flap control valve contains an integral pressure relief valve that allows excess fluid to flow to the return line when pressure in the cowl flaps system exceeds 1150 - 50 psi because of either thermal expansion of the hydraulic fluid or excessive air loads on the cowl flaps.

Cowl Flap Control Valves

43. The cowl flap control valve assembly consists of two four-way valves bolted to a bracket which is attached to the right side of the pilot's compartment. The valve employs spring loaded steel balls to close the valve ports. The bolts are opened by steel pins. The pins are depressed in the proper combination by a cam/rotor in the head of the valve, which is operated by the valve handle. A pressure relief valve is incorporated in the valve to allow excess fluid to flow to the return line when pressure in the cowl flap hydraulic system exceeds 1150 - 50 psi.

Cowl Flap Operating Strut

44. The cowl flap operating strut consists of a chrome molybdenum steel cylinder and an aluminum alloy piston. The cylinder is attached to a support which is mounted on the lower segment of the anti-drag ring and the piston rod is connected to the cowl flap control tie rods.

Hydraulic Windshield Wiper System

45. The acrotorque hydraulic windshield wipers are installed for the purpose of clearing the windshield in the presence of alcohol when the airplane is operating in rain or ice. The central main power unit is mounted in the "V" of the windshield below the compass. Speed control of the unit is accomplished by a needly valve located to the left of the power unit, accessible to both pilots. Arens controls transmit the reciprocating motion of the main power unit to the windshield wiper blades through rack and pinion units. The blades lie adjacent to the window frames when the power unit is not operating.

46. The hydraulic pressure supply and return lines connect into the corresponding cowl flap lines. The pressure operates the power unit which consists of opposed hydraulic pistons connected by a common piston rod with a gear rack built integral, the rack engaging a pinion gear attached to an operating shaft passing to the outside of the unit. Oil consumption is limited to about seven-tenths of a gallon per minute at 800 pounds pressure. An on-off valve is incorporated on the valve body to assure the piston of starting and stopping from the same position each time the unit is operated.

47. (Unassigned)

48. (Unassigned)

Hydraulic Control Panel

49. The complete hydraulic control panel, is mounted on the right side of the companionway just aft of the First Officer.

50. This panel mounts the following hydraulic equipment from top to bottom: Sight Gauge, Filler Pipe, Shut-Off (or By-Pass) Valve, Flap Selector, and Landing Gear Selector.

ELECTRICAL SYSTEM

1. General

The basic DC Electrical System consists essentially of two 12 volts, 89 ampere-hour batteries connected in series and two 28 volts, 50 amp. engine-driven air-cooled generators which supply electrical power to the Main Electrical Bus and Distribution (Circuit Breaker) Panel, located above the forward cargo door. The generators are regulated to 28 volts by air-cooled Carbon Pile Voltage Regulators and the generator circuits are protected by two 175 amp. circuit breakers (Main Distribution Panel). A reverse Current Relay is incorporated in each generator circuit which cuts the generator in at an engine RPM of 900 - 1,000 and out at approximately 700 RPM. The Reverse Current Relays also protect the generators from damage resulting from reverse current surges. The Realy opens whenever a reverse current of 20 amps. or greater exists, thereby preventing escessive reverse current flow from the bus through the generator armature, which would has a rated output of 160 amps. at 1,400 RPM or above.

2. External Power Supply

(1) Provisions is made for plugging in an external electrical supply for operation of the electrical system on the ground. Plugging in the external supply operates a change-over relay which automatically disconnects the aircraft batteries from the Main DC Bus and connects the ground power to the Main Bus. The Master Switch, through a master relay, controls which-ever source of power is connected. Therefore with the external power supply plugged in, the Master Switch should be in the "ON" position. As soon as the external supply is disconnected, the aircraft batteries are auto-matically connected to the aircraft electrical system, and the Master Switch controls the battery circuit.

(2) Under normal conditions, an external power supply should always be plugged in for ground operation (Lights, radio checks, etc. requiring a minimum of 22 volts) and for engine starting to insure that the aircraft batteries are not unnecessarily discharged.

(3) The ground power circuits are protected by a 100 amps. Circuit Breaker.

3. Ground Power Warning Light

(1) This warning light, placarded "BATT. CART WARNING LIGHT", located on the upper left electrical panel, glows whenever the ground power is connected, whether the master switch is "ON" or "OFF". The press to test circuit is connected directly to the battery so that the light may be tested without the ground power connected.

4. Most of our Aircrafts are equiped with AUXILIARY POWER PLANT model HRU-28A and type C-10A, located in the tail compartment of DC-3. These power unit provides electrical current while A/C engines are not running.

(1) GENERAL

(a) The complete HRU-28A Power plant consists of a single-cylinder air-cooled two-cycle gasoline engine, governed for speeds between 3200 and 3700 rpm, directly connected to a direct current generator of 200 watts rating at 28.5 volts, to form an integral unit. Mounted on the generator yoke is an automatic voltage regulator (Government furnished equipment shipped with the power plant for installation in the field), and beneath the yoke a control box containing switches, voltmeter, and radio filters. The entire assembly is mounted on four shock-absorbing foot springs attached to a channel-iron base having thumb screws for attachment to the two-wheel rubber-tired dolly.

(b) In starting, the battery current is utilized to motorize the generator which then acts as a starting motor for the engine. A reverse-current cut-out is mounted in the control box to prevent the battery from discharging through the generator when the plant is not in use. A starting rope with grip is furnished for emergency manual starting.

(2) PRINCIPLES OF OPERATION

(a) ENGINE.
The two cycle used on this power plan completes a cycle in one revolution, or one down stroke and one up stroke of the piston. A charge of gasoline vapor and air is drawn through a rotary intake valve into the crankcase on the up stroke of the piston. This same stroke also compresses a charge already in the cylinder. The compressed charge is then ignited and the down stroke of the piston is the power stroke. This same stroke also compresses the charge in the crankcase. At the bottom of the stroke the piston passes below the intake ports on one side and the exhaust ports on the other side. The compressed gases from the crankcase rush into the cylinder and push the burned gases our through the exhaust ports. This completes the cycle of intake, compression, explosion and exhaust.

(b) GOVERNOR.
This engine has a combination rotary intake valve and governor to control the admission of the charge from the carburetor to the crankcase. When the engine runs above the desired speed, centrifugal force causes the governor weight to partially close the intake opening and thus reduce the flow of gasoline vapors to the cylinder. If the engine drops below speed, the governor spring pulls the weight away from the intake opening and increases the speed.

(c) CARBURETOR.
The engine is equipped with a Homelite adjustable-jet carburetor. Fuel is fed to the carburetor from the fuel tank by crankcase pressure. This pressure forces the fuel up the feed line inside the carburetor to the venturi where it is vaporized and drawn into the engine. For starting, a priming pump, which is part of the carburetor, shoots gas directly pump, which is part of the carburetor, shoots gas directly into the intake ports in the cylinder.

(d) LUBRICATION.
The entire engine is lubricated by oil mixed with the gasoline. Each new charge going into the cylinder sprays a fresh film of oil over all moving parts and insures complete lubrication.

5. (Unassigned)

6. Circuit Breaker Protection

(1) Individual electrical circuits are protected from overload by Circuit Breakers. (All circuit breakers, with the exception of the generator line breakers, are of "non trip-free" type. If an overload occurs the circuit breaker "breaks" to the "open" position; it can be held closed in an emergency to "remake" the circuit.)

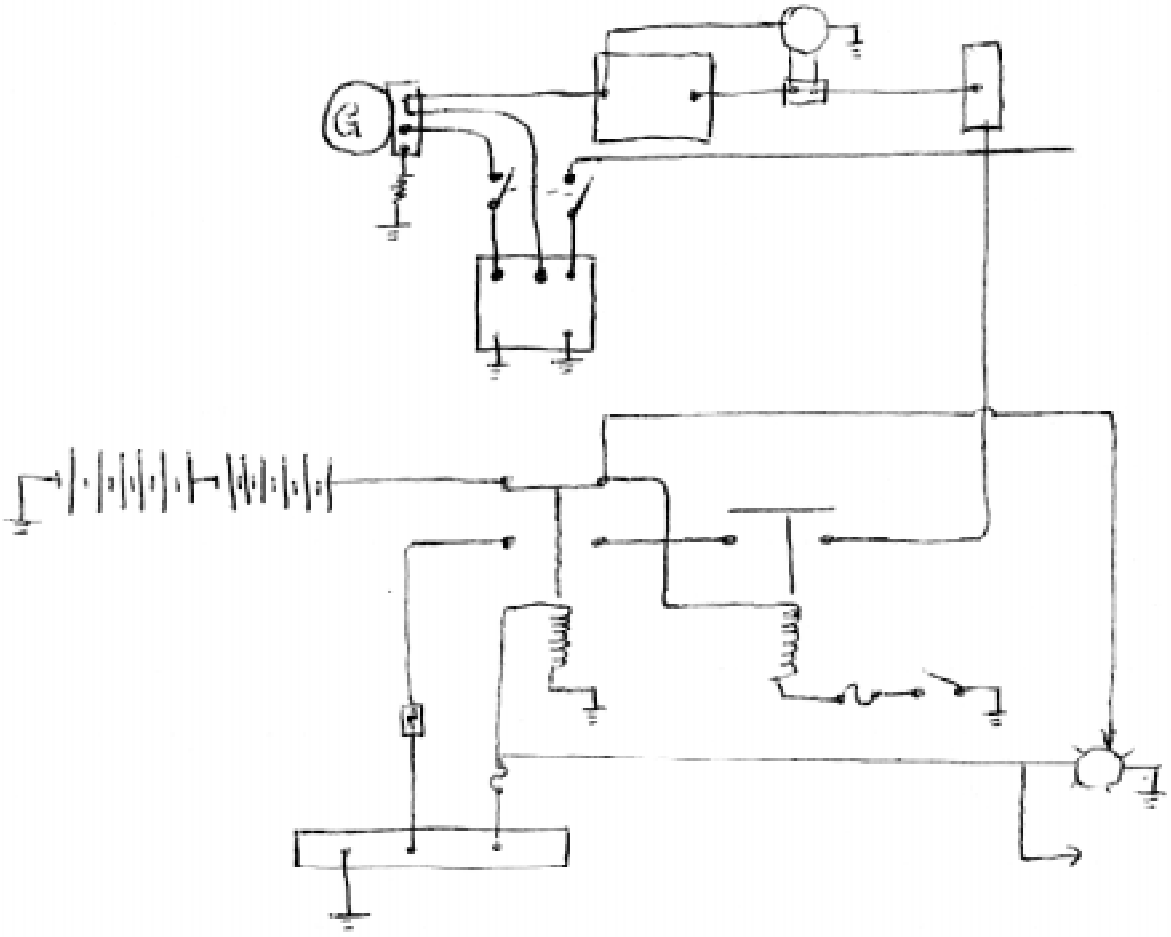
(2) The "trip-free" generator line circuit breakers cannot be reset until the electrical overload has been eleminated and bimetallic element, incorporated in the breaker, has had time to cool.

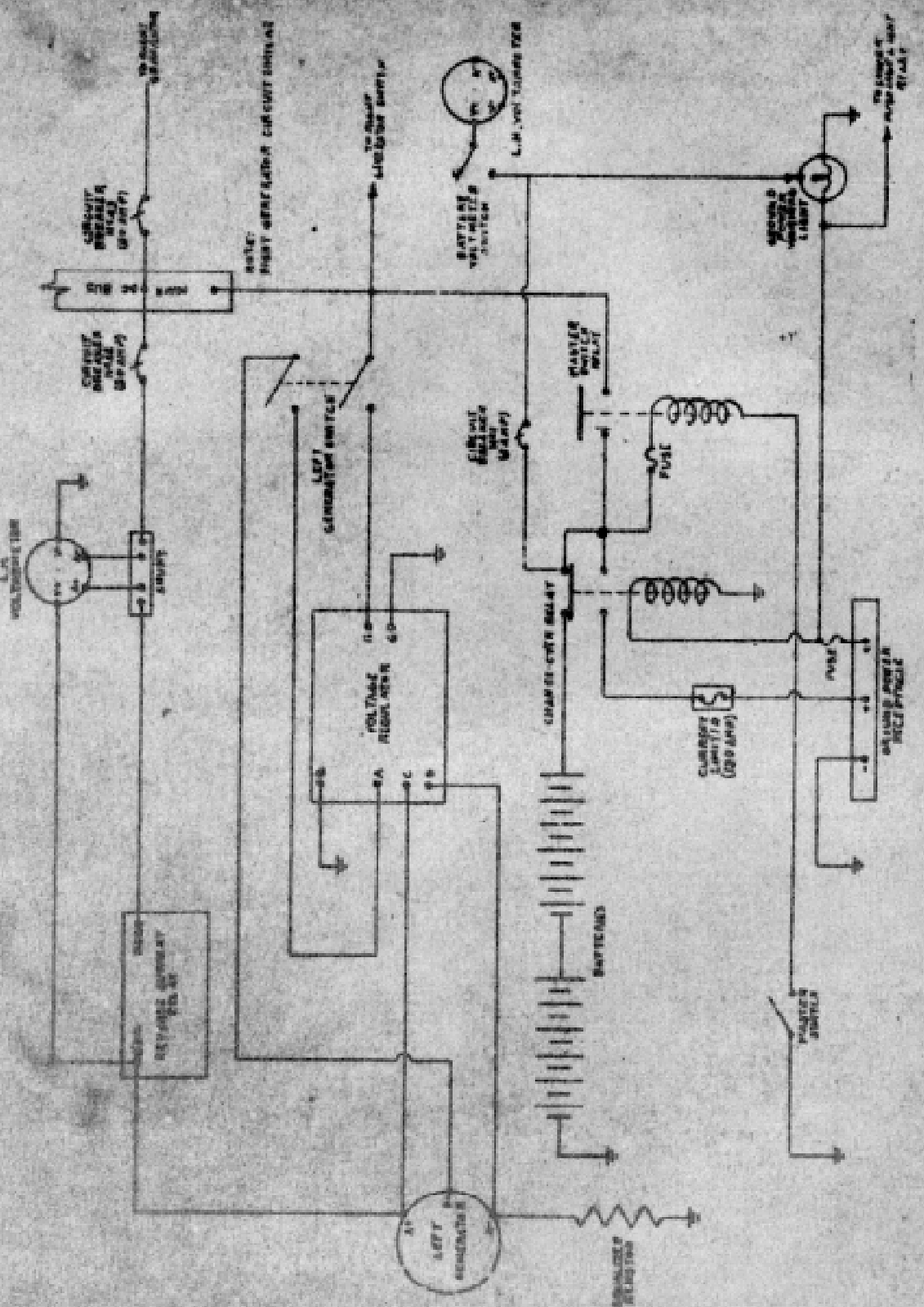
7. Generators

(1) The generators cut in at 900 - 1,000 RPM to take over the aircraft electrical load and to supply the charging current to bring the aircraft battery up to a fully charged condition (approx. 26 volts). The extra current which the generators have to supply, over and above the normal aircraft electrical load, depends upon how much the battery is run down - this is the reason that the aircraft battery should always be fully charged at dispatch, particularly at night when the electrical load is heavy (e.g. landing, cockpit and cabin lights, etc.) If the battery is run down the generators have to supply a heavy charging current and if it becomes necessary to feather a propeller, the heavy electrical feathering loads combined with the normal aircraft electrical and excessive battery charging loads may overload the generators and cause the generator circuit breakers to trip. If the propeller does feather, heavy aircraft electrical load, plus the heavy charging current to a "run-down" battery, may trip the operative generator circuit breaker.

(2) The engines should be operated as much as possible at 900 RPM or above so that the generators are cutin to take the electrical load leaving the battery as a reserve of power to take the electrical load for the short intervals when it is necessary to reduce the RPM below 900 RPM (e.g. during braking, close parking, etc.) and also to act as a reserve of electrical power and as a voltage stabilizer during feathering and unfeathering operations.

LH primary power circuit.





PRIMARY POWER SUPPLY CIRCUITS
DC-3

(3) With both engines operating and the Generator Switches "ON", the generators will share the electrical load equally and should normally be balanced within 10 amps.. Each of the Carbon Pile Voltage Regulators has an equalizer winding to assist in keeping the generator balance thus preventing one generator from tending to "hog" the electrical load. If one generator is carrying an excessively high load it is often possible to balance the electrical load by switching off the high generator momentarily. Excessive unbalance, which cannot be corrected in this way, indicates that the system requires servicing but does not require action on the part of the pilot unless the unbalance results in a generator charging rate in excess of 60 amps. or the system voltage exceeds 28.5 volts. In this case, the electrical load should be reduced so that one generator can carry the load and the high generator switched "OFF" if necessary..

8. Voltammeters

(1) A voltammeter, comprising a combination voltmeter and ammeter, is installed for each of the two generator circuits. The two generator circuits. The two voltammeters are installed on the Upper Right Electrical Panel and each has a push button at the lower left hand corner for the purpose of obtaining a reading on the "volts" scale.

The normal needle indication represents the current in amperes being delivered by each generator. This total current is known as the generator load and represents the total current is charging the battery, supplying the various aircraft electrical systems or doing both. The charging load to the battery can be disconnected by turning the aircraft Master Switch - "OFF" and the total amount that both voltammeter needles fall back represents the charging current which the battery was drawing. If the battery is in good condition, the normal charging rate, after starting the engines and with the generators cut-in will be approximately 10-20 amps. total. If the battery is badly discharged the charging current may be as high as 60-100 amps.. A high charging rate may also indicate a shorted cell in the battery. It must, however, be remembered that a good battery, even if in a temporary discharged condition, (possibly due to prolonged engine idling below generator cut-in RPM)., will charge up very quickly by keeping the engine RPM high enough to cut-in the generators. When the battery becomes fully charged, the charging current to the battery will automatically be reduced, but even fully charged will draw a charging current of approximately 10 amps.. On scheduled operational flights, switching the Master Switch "OFF" and noting the amount on the voltammeters that the current "falls off" is a practical method of obtaining an indication of battery condition. Battery condition may also be estimated by noting how well the voltage holds up when a load is applied, with generator switches "OFF".

(2) With the external power supply disconnected, and (Master Switch On) a generator above cut-in speed and the corresponding Generator Switch "ON", depressing and push button adjacent to the voltammeter will give a reading of the voltage being delivered to the main electrical bus by that generator; the other Generator Switch must be "OFF" during this reading.

9. Battery Voltmeter Operation

Battery voltage readings are obtained by simultaneously depressing the "BATTS VOLTS" switch and left hand voltammeter push button. The voltmeter may be used to check the following conditions:

(1) Master Switch "OFF" and ground power not plugged in - reads battery volts, no load.
(2) Master Switch "ON" and ground power not plugged in - reads battery volts with load.
(3) Master Switch "OFF" and ground power connected - reads ground power volts.
(4) Master Switch "ON" and ground power connected - reads ground power with load.

Under all conditions, battery voltage readings with the Master Switch "ON" are system voltage readings, and it is only when the aircraft battery is the sole source of power that this coincides with the battery voltage.

10. Electrical Circuits and Switch Breakers

(1) The following constitutes the electrical system circuits and the number and rating of the circuit breakers:

Circuit Breaker No.	Rating Amp.	Wire No.	Circuit
1	5	800	Flare circuits
2	5	224	U/C Horn
3	5	250	U/C Lights Warning
4	5	110	Wing de-icer.
5	10	405	Engine primer and oil dilution
6	15	104	Left hand fuel booster pump
7	15	107	Right hand fuel booster pump
8	5	203-163	Navigation and passing light
9	10	325	Fuel. Oil and anti-icer quantity
10	5	924	Fire detector
11	5	144	Oil pressure
12	10	267	Oil hydraulic and fuel shut-off.
13	5	190	Anti collision rotating beacon
14	10	115	Anti-icer pump.
15	5	435-206	Compass and ordonnance light.
16	5	960	Belt-Steward and pilot call-door (warning
17	15	135	Forward Pilot heater
18	15	131	After (cockpit) Pilot heater
19	10	149-139	Instruments and cockpit lights
20	10	153	Cabin-Dome lights.
21	5	185	Landing lights relay left hand.
22	5	195	Landing lights relay right hand.
23	35	189	Left hand landing light.
24	35	198	Right hand landing light.
25	5	470-152	Dome and reading light relay
26	10	52	Starter circuit
27	15	208	Wing - Flood lights.
28	15	469	Reading light.
29	10	627	Remote compass.
30	10	76	Left hand feathering relay
31	10	83	Right hand feathering relay
32	5	302	Oil-fuel and vacuum warning lights
33	5	360	Temp. Instrument
34	5	10-16	Batts. master switch
35	5	700	Auxiliary power unit.
36	10	712	Heating system. (automatic control)
37	35	710	Heating system master blower.
38	15	711	Heating system combustion blower.
39	70	701	Auxiliary power unit.
40	70	23	Left hand generator
41	70	39	Right hand generator
42	100	battery cart.	Battery cart.
43			Spare for parallel battery cart.

11. Left Overhead Control Panel

(1) This panel is located above the left windshield and mounts the following switches and warning lights:

Upper Row	Lower Row
(Positions are indicated from left to right)	
(a) Battery Cart Warning Light	(a) Radio Master Switch
(b) Compass Lights Rheostat	(b) Battery Master Switch
(c) Left Prop. Feath. Switch	(c) No Smoking Sign Switch
(d) Instrument Lights Rheostat	(d) Seat Belts Sign Switch
(e) Anti-Collision Beacon Switch	(e) L.H. Landing Light Switch
	(f) R.H. Landing Light Switch
	(g) L.H. Pilot Heater Switch
	(h) R.H. Pilot Heater Switch
	(i) Passing Light Switch
	(j) Navigation Lights Switch
	(k) Cabin Dome Lights Switch
	(l) Cabin Side Lights Switch
	(m) Cockpit Light Switch

12. Right Overhead Control Panel

(1) This panel is located above the right windshield and mounts the following switches, warning lights and instruments:

Upper Row	Lower Row
(Positions are indicated from left to right)	
(a) Remote Compass Switch	(a) Starter Energizing Switch
(b) Right Prop. Feath. Switch	(b) Starter Meshing Switch
(c) Door Warning Light	(c) Left Eng. Oil Dil. Switch
(d) Electrical Panel Light	" " Primer Switch
	(d) Right Eng. Oil Dil. Switch
	" " Primer Switch
	(e) Left Eng. Fuel Booster Pump Switch
	(f) Right Eng. Fuel Booster Pump Switch
	(g) Steward Call Button
	(h) Anti-icer pump Switch
	(i) Left Generator Voltammeter
	(j) Right Generator Voltammeter

13. Fire Extinguisher Control Panel

(1) The fire extinguisher control panel is located in the cockpit floor between the Captain's and First Officer's seats. It is protected by a hinged cover and incorporated a two-way center Off selector valve to direct the CO 2 charge to either engine
(2) The handle to operate the fire extinguisher is located left of the selector valve.
(3) To operate engine fire extinguisher
a) Turn selector valve to affected engine
b) Pull fire extinguisher handle.

NOTE: On some of our DC-3 this Panel houses the switches to operate hydraulic oil, and fuel shut-off valves.

14. HEATER CONTROL PANEL

The Heater Control Panel is located on the left wall besides the control column, it incorporates:

(1) An On-Off switch.
(2) Three indicating lights:
a) Top light is labeled "FLIGHT OPERATION"
b) Middle light is labeled "HEATER OVERHEAT"
c) Bottom light is labeled "GROUND OPERATION"

15. AUXILIARY POWER UNIT CONTROL PANEL

This Control Panel is an extension of the Heater Control Panel and incorporates:
(1) A spring loaded center "OFF" switch; labeled "START, OFF, RUN".
(2) A warning light, that shows when the Unit is in operation.

16. Circuits

(1) Lights, Standard Accessory Units, Warning, and call Circuits, etc., all such circuits are operated from the main bus through appropriate circuit breakers and individual switches.

(2) Engine Fire Detector Circuits:

(a) Each engine is equipped with a fire detector system which includes four Edison type thermal switches mounted on the forward face of the firewall and five Edison type thermal switches mounted behing the preheater shroud. The nine thermal switches are wired in series and if the temperature of any one of these rises to 375° F or more, the switch contacts close to complete the warning circuit. The warning light assembly for each engine consists of one red light for each engine and a test button located on the engine instrument panel.

HEATING AND VENTILATION SYSTEM

Description

1. Heating and ventilation of the DC-3 aircraft is accomplished by introducing atmospheric air into the aircraft by means of external air scoops. This air is heated as required, through the medium of a gasoline burning 200,000 B.T.U. QBA developed package heater unit, (Engineered and Patented by Lucien Lavigueur) and is distributed by means of ducts to the flight compartment, cabin and toilet compartments. The cabin temperature is automatically controlled, the flight compartment temperature manually controlled. Unheated atmospheric air is also made available in the flight, cabin and toilet compartments for auxiliary ventilation. Air is exhausted from the flight compartment through a grill in the cabin-flight compartment door into the cabin. The cabin air is exhausted into the atmosphere by means of three outlets located in the cabin. The heating and ventilation system is designed to change the air within the aircraft approximately once every minute.

Main Heating and Ventilation Air Scoop

2. The main heating and ventilation scoop is located at fuselage station 166 at a point on the right hand side of the aircraft, approximately two feet above the cabin windows; this scoop provides ventilation and combustion air to the package heater. An outlet at the rear of the scoop also provides a means of exhausting combustion air from the heater.

Cabin Cold Air Scoops

3. The one cabin cold air scoop is located on the right side of the fuselage immediately above the main heating and ventilation scoop at fuselage station 166. The scoop supplies unheated air to the cabin cold air ducts which are located immediately below the package rack on either side of the aircraft.

Flight Compartment Cold Air Scoop

4. A flight compartment cold air scoop located on the lower right hand side of the fuselage at fuselage station 156 supplies unheated air to the flight compartment cold air duct.

Toilet Compartment Cold Air Scoop

5. The toilet compartment cold air scoop is located on the left hand side of the aircraft approximately at fuselage station 544, immediately above the rear baggage compartment door. The scoop supplies unheated air to the toilet compartment cold air duct for auxiliary ventilation purposes.

Cabin Hot Air Ducts

6. There are two main cabin heating ducts extending the length of the cabin at floor level. Each duct is located at the junction of the fuselage wall and the cabin floor. Conditioned air from the heater flows into the cabin ducts and into the cabin through 14 heat outlets. There are seven outlets in both the left and right heat ducts; one located at each row of cabin charts. Each heat outlet is equipped with an adjustable "Orifice" which is "preset" to maintain satisfactory cabin temperature distribution and a deflector to direct the hot or cold air discharge under the seats and into the aisle instead of on the passengers' feet. There is an additional heat outlet at the end of each main heat duct, designed to throw heat towards the aft of the cabin and, in the case of the left-hand duct, dispel any cold drafts at the bottom of the cabin entrance door. A branch duct runs from the aft end of the left hand cabin duct to an outlet located in the lavatory wall facing the Harrington buffet. This outlet provides heat to the buffet area and is not adjustable.

Cabin Cold Air Ducts

7. There are two cabin cold air ducts, one located on each side of the cabin, immediately above the level of the windows and below the package rack. Unheated air received from the cabin cold air scoop passes into a plenum chamber located on the forward side of the bulkhead station 177 ½, immediately above and to the right of the cabin-companionway door. Air from the plenum chamber supplies the cabin cold air ducts.

8. The cabin ducts extend from the front of the cabin to the rear row of cabin seats. There are seven adjustable outlets on each duct; one located at each row of seats. These outlets are used when additional ventilation is required in the form of unheated air, as in the case of an airsick passenger. Adjustment of the air flow can be made at each outlet by the passenger.

Flight Compartment Hot Air Ducts

9. A three-inch diameter flight compartment hot air duct runs from the outlet of the Package unit under the companionway floor. The duct branches; one branch running to an outlet under the left pilot chair and the other running to an outlet under the right pilot chair.

Flight Compartment Cold Air Ducts

10. A three-inch diameter cold air duct receives unheated air from the flight compartment cold air scoop. It joins the flight compartment hot air duct at a point immediately before the branching of the hot air duct to either pilot seat. Butterfly valves are provided in both these cold and hot air ducts at a point before they join. A push-pull knob located behind co-pilot seat, controls hot and cold air in the cokkpit. The flow of air which emerges from outlets under the Pilot's and Co-Pilot's seats may thus be varied from full hot to full cold as required.

Flight Compartment Windshield Defroster Duct

11. A branch duct supplies hot air to both the left and right front flight compartment windshields. This duct receives air from the main flight compartment hot air duct before the junction of the flight compartment hot air cold air ducts. A butterfly type valve located at each defroster outlet controls the application of heat to the windshields.

Main Heating and Ventilating Air Scoop - Janitrol Heater Ducts

12. There are three separate ducts between the main heating and ventilating air scoop and the heater. These are used for carrying ventilating and combustion air to the heater and exhaust from tee heater.

Scoop Heater Ventilating Air Duct

13. A circular duct six inches in diameter, transfers unheater air from the main heating and ventilating scoop to the heater package unit where it is diverted to pass over the heater element or bypass the heater element by means of valves positioned by the automatic temperature controller. The air is mixed in a plenum chamber at the base of the heater, whence it flows into the cabin ventilating air ducts and into the flight compartment hot air duct. A funnel is located in the plenum chamber, immediately below the heater element to ensure that air is supplied to the flight compartment at a high temperature for windshield de-icing.

Scoop-Heater Combustion Air Duct

14. A flexible circular duct two and one half inches in diameter transfers unheated air from the main heating and ventilating air scoop to the combustion chamber of the heater within the heater package unit.

Scoop-Heater Exhaust Duct

15. A stainless steel duct transfers exhaust from the combustion chamber of the heater to an outlet in therear of the main heating and ventilating air scoop. The exhaust is ejected into the atmosphere from the rear of the scoop.

Toilet Compartment Hot Air Duct

16. A branch duct running from the rear of the right-hand main cabin hot air duct supplies hot air to the toilet compartment. The toilet compartment hot air outlet is located on the wash-basin frame approximately eight inches from the floor. At bottom of left cabin wall.

17. (Unassigned)

18. (Unassigned)

Toilet Compartment Cold Air Duct

19. A cold air duct supplies cold air from the toilet compartment cold air scoop to an outlet located in the toilet compartment on the rear wall, approximately thirty inches from the floor. The cold air outlet is of the push-pull type and the air can be shut off or turned on as required.

Cabin Air Exhaust System

20. Air is exhausted from the cabin at three points, by means of adjustable exhaust outlets. Two outlets are located on the cabin ceiling at the front and the rear of the cabin. The third outlet is located on the rear cabin bulkhead, immediately above the Harrington Buffet Refrigerator Compartment.

Flight Compartment Exhaust System

21. Air is exhausted from the flight compartment into the cabin through an adjustable grill, located in the cabin-companionway door.

Toilet Compartment Air Exhaust System

22. Air is exhausted from the toilet compartment through an outlet located on the toilet compartment wall approximately two inches from the floor level, and thence through a duct teed into the rear cabin exhaust duct.

Cabin Hot Air Controls

23. Under normal operation, the flow of hot air into the cabin is automatically controlled through the medium of a Honeywell thermo-static temperature control system. Various temperatures may be selected by means of a dial control which is part of the Honeywell Cabinstat located on the forward cabin bulkhead at the right hand side of the cabin-companionway door. A thermometer on the Cabinstat facilitates selection of a comfortable temperature level.

Cabin Auxiliary Ventilation System Control

24. A supply of cold air for auxiliary ventilation purposes is provided in the cabin, as previously indicated. Separate controls located on the cold air ventilation ducts provide individual control at each row of passenger chairs. The controls consist of a knob which is turned in the clock-wise direction, to shut off air flow. The controls are within easy reach of the passengers.

Cabin Exhaust Outlet Controls

25. The three cabin exhaust outlets are controlled by means of a sliding shutter, located on each outlet. The shutters are locked in positions discovered by trial to give the best cabin heat distribution during winter operation.

26. (Unassigned)

Flight Compartment Conditioned Air "Temperature" Control

27. The control for regulating the volume and temperature of the flight compartment heating air is located on the wall behind co-pilot seat, approximately 12 inches from the floor. The flow of hot or cold air is controlled by pushing or pulling this knob.

Toilet Compartment Hot Air Control

28. There is no means of controlling the supply of hot air to the toilet compartment.

Toilet Compartment Cold Air Control

29. There is no means of controlling cold air in the toilet compartment

Toilet Compartment Exhaust Air Control

30. There is no control of air exhausted from thetoilet compartment.