

FURLONG  
CV2B STUDY GUIDE

## ELECTRICAL POWER

### I. BATTERY SUBSYSTEM

1. The CV-2 has one 24 volt, 34 ampere hour, nickel cadmium battery.
2. The battery is located behind the seat under the flight compartment.
3. The primary purpose of the battery is for emergency power.
4. The battery may also be used for starting the engines in case of an emergency.
5. The circuits powered directly off the battery, regardless of switch positions are the:
  - A come light
  - B C-4 map light
6. The battery switch, located on the engine start panel, is a two position switch with positions OFF and Battery Master.
7. The battery relay connects the battery to the main bus.
8. ~~The battery relay requires a minimum of 24 volts to close.~~
9. The battery can power all D.C. busses by placing the battery switch to battery master position and the second bus reset switch to the override position.
10. The battery powers the Emergency bus in flight when both generators are inoperative and the battery switch is in the off position and the emergency bus switch is in the emergency position.
11. The battery is accessible through an access opening in the left wall of the flight compartment floor panel well.
12. The battery is charged in flight by the engine generator.

### II. 13. EXTERNAL D.C. POWER

1. The external power receptacle is located on the left side of the fuselage just below the 3rd window from the passenger door.
  - a. It has 2 large load pins.
  - b. It has 1 small control pins.
  - c. It is an anti flashlock type receptacle.
2. The battery switch and the generator switches should be in the OFF position when using external power.
3. After connecting external power check the cockpit voltmeter for a positive voltage indication.

4. External power connects to the Main P.C. bus.
5. External power supplies power for all D.C. busses with no N.A. control switches in the aircraft.
6. External power is used for starting the engines and for ground operation of electrical equipment.

### III. ENGINE-DRIVEN GENERATORS

1. The CV-2 has two engine driven generators, one located on each engine accessory case
2. The regulated output of each generator is 27.7 volts <sup>±0.2</sup> ratio @ 30 300 amps and they are the normal source of D.C. power.
3. The voltage regulators are located behind the copilot on the bottom radio rack.
  - a. They maintain a constant output voltage under any variable conditions.
  - b. They are Carbon pile type
4. The generator relay (mainline contactor) is located in number 1 junction box and it connects the generator to the main bus.
5. The generator control panel is located behind the copilot on the bottom radio rack and it contains six generator controls.
  - A. Voltage Regulator
  - B. Polarized differential relay
  - C. Equalizer Relay
  - D. Field Relay
  - E. Ground Fault Relay
  - F. Crew Voltage Relay
6. The polarized differential relay controls the generator relay. It will not close the generator relay until the generator voltage is from .35 to .70 volts above bus voltage.
7. The equalizer relay connects the two generators together so we can spread the load demand equally between both generators.
8. The field relay operates as a automatic switch and controls the generator field. It will automatically trip the generator off the line in case of an overvoltage or a ground fault.
9. The ground fault relay operates in conjunction with the ground fault transformers to trip the field relay should an open circuit or ground of the generator.

10. The overvoltage relay senses generator output and will trip ~~the~~ generator off the line when a high voltage from 32 to 34 volts accrues.
11. The generator switches are located on the AC DC power panel in front of the CP.
12. The generator switch positions are Off ON and reset.
13. The reset position on the generator switch electrically resets the Field Relay.
14. The voltmeters are located on the AC, DC power panel above the generator switches.
  - a. The voltmeter reads main bus voltage.
  - b. The two voltmeters are connected in series.
  - c. The voltmeters are calibrated from 15 to 33 volts.
15. The ammeters read <sup>(amperage)</sup> current draw for the respective generator.
  - a. The ammeters are calibrated from 0 to 450 amps.
  - b. You should never draw over 300 amps on the ammeters.

#### IV. GENERATOR FAILURE

1. If one generator warning light comes on perform the following checks:
  - a. Generator switch check ON.
  - b. Generator field relay circuit breaker check IN one reset only
  - c. Generator switch Reset then on
  - d. Generator switch OFF ~~then on~~ Fld Mech - press manual reset lever in Gen Cont Panel
  - e. Switch off all unnecessary service
  - f. Secondary bus reset switch in over if secondary bus is needed.
  - g. Ammeter (on operating generator) check for overload not to exceed 300 amps.
2. If both generators fail:
  - a. Generator switches check ON.
  - b. Generator field relay circuit breaker check in. (Manual Reset Lever)
  - c. Generator switches Reset then ON Fld Mech - press lever in Gen Cont Panel
  - d. Emergency bus switch Emergency
  - e. Battery master switch OFF
  - f. Switch off any unnecessary service that takes power from the emergency bus. Conserve battery.

## V. D.C. Bus System

1. The D.C. Bus system consists of four busses:

- |    |                  |            |
|----|------------------|------------|
| A. | <u>Main</u>      | <u>bus</u> |
| B. | <u>Secondary</u> | <u>bus</u> |
| C. | <u>Emergency</u> | <u>bus</u> |
| D. | <u>Battery</u>   | <u>bus</u> |

2. THE battery bus supplies power for:

- A. Domelight
- B. C-4 map light

3. The battery bus receives its power directly from the battery

4. The main D.C. bus supplies power to electrical equipment that is necessary for Normal flight oper.

5. The main D.C. bus is supplied power by:

- |    |                 |                  |
|----|-----------------|------------------|
| A. | <u>battery</u>  |                  |
| B. | <u>external</u> | <u>power</u>     |
| C. | <u>engine</u>   | <u>generator</u> |

6. The secondary is supplied power by the main bus normally when both engine generators are operating.

7. The secondary bus can be powered by the battery if the Sec Bus Reset Switch is placed to the override position.

8. The secondary bus reset switch is located on the Circuit Breaker Panel behind the pilot and copilot.

9. The secondary bus supplies power to the electrical equipment considered secondary to flight safety.

10. The secondary bus reset switch has two positions, off and override, it is guaranteed to the off position.

11. The emergency bus supplies power to the electrical equipment considered essential to flight safety.

12. The emergency bus receives its power normally from the main bus.

13. During an emergency (both generators inop) the emergency bus will receive its power from the battery.

14. The emergency bus can be isolated from the main bus by placing the battery switch in the OFF position and placing the emergency bus switch to the EMERGENCY position.

15. The emergency bus can be isolated from the main bus by placing the battery switch in the OFF position and placing the emergency bus switch to the EMERGENCY position.

15. The emergency bus switch is located on the CIRCUIT BREAKER PANEL

16. The emergency bus switch has two positions Normal and emergency. It is guarded and should be safetied with breakaway wire to the Normal position.

17. Current limiters and thermal, push to reset type circuit breakers are used to protect the D.C. electrical equipment.  
325 amp current limiters protect generator

#### VI. POWER SYSTEM

1. There are 2 three phase inverters located behind the Copilot under the flight compartment floor.

a. The output of these invertors is:

1. 250 volt amps
2. 115 volt  $\pm$  4.5 volts
3. 400 cycles per second  $\pm$  20 cycles

b. The inverters are main and stby inverters.

c. The inverter switch is located on the AC, DC control panel in front of the Copilot.

d. The inverter switch has three positions

1. main
2. off
3. standby

\* e. The RED indicator light indicates no AC power on the A.C. bus.

f. The AMBER indicator light indicates that the standby inverter is operating.

g. The lights are located in front of the copilot on the AC DC control panel.

h. If the main in ertor should fail the standby inverter takes over automatically.

i. The automatic change over relay will change over on low voltage only. (90 volts)

j. The automatic change over relay will change from main to standby and back to main.

k. On aircraft without reversible props the main inverter receives its D.C. power from the secondary bus and when a generator is lost the main inverter will fail and the standby will take over.

l. The stsndby inverter receives its power from the emergency bus.

m. On aircraft with reversible props both inverters receive their power from the emergency bus.

2. There are two instrument transformers that step down the 115 volts AC to 26 volts AC for operation of the pressure type instruments, they are:

- A. Manifold pressure
  - B. Fuel pressure
  - C. Oil pressure
  - D. Gyro compass and transmitter
  - E. Indicator for hydraulic and brake pressure
- 26VAC bus

3. These transformers are the Main and Standby transformers.

4. The selector switch is located on the circuit breaker panel and has two positions.

- A. Main
- B. Standby

5. A 26 volt AC failure light is located in front of the cockpit and below his flight instruments.

6. The light will glow when the 26 volt step down transformer has failed.

#### VII. INVERTER FAILURE

1. If the main inverter should fail:

- A. On aircraft without reversible props, make sure both engines are operating at more than 600 RPM
- B. Check inverter circuit breakers
- C. Check DC circuit breakers for inverter
- D. Inverter switch select off then return to main.
- E. If standby light remains out leave switch at main.
- F. If standby light stays on select switch to standby position.

2. Stand by inverter failure:

- A. If the standby inverter is in operation and the standby light goes out, the A.C. failure light should come on to indicate complete A.C. power supply failure.
- B. To check this malfunction, check inverter circuit breaker.
- C. Check D.C. power circuit breakers for inverter.
- D. Inverter switch off then main
- E. If the A.C. failure light comes on select inverter switch off.

## VIII SAFETY CIRCUITS

1. Some circuits on the CV-2 are controlled by the landing gear weight switches, these circuits are:

■ Nose Gear Switch:

1. Control for up solenoid on landing gear
2. Nose wheel steering solenoid
3. Ramp 15° limit switch
4. Accessory compartment vent doors

B. Left Main gear switch:

1. Control for up solenoid on landing gear
2. Connected in series to other gears

C. Right Main Gear Switch

1. Control for up solenoid on landing gear
2. Connected in series to other gears.

## IX. AIRCRAFT LIGHTING

1. Exterior Lighting

A. Consists of:

1. Navigation lights WING + TAIL LIGHT
2. Wing inspection lights
3. Anti-collision lights
4. Landing lights
5. Taxi lights
6. Formation lights

B. The taxi light and the landing light switches are located on the overhead panel.

C. All other exterior light switches are located on the electrical switch panel.

D. The landing lights are mounted in the leading edge of each wing.

E. The wing inspection lights are mounted on the outboard side of each top engine cowl.

F. The navigation light switch is marked as wing and tail lights and they have no Flash position.

G. Should the Anti-collision light be on at all times in flight? No, not in cloud

H. CAUTION\*\* do not operate the landing lights over one minute on the ground



2. Interior lights:

A. Consists Of:

1. Emergency lights - crash lights, separate battery
2. Cargo loading light
3. Rear entrance light
4. Utility light
5. Flight compartment floor hatch light
6. Emergency hydraulic selector panel lights.
7. Flight compartment dome light
8. Cabin dome lights
9. Passenger warning signal lights
10. Troop jump lights

B. The emergency lights are independent from the aircraft electrical system.

1. A 6.6 volt nickel cadmium battery located in the cargo roof supplies power for the six exit lights.
2. The system is tested by a toggle switch marked exit lights, it is guarded and is located on the switch panel below the circuit breaker panel. - checks lights
3. In case of a crash the lights are controlled by a non-inertia switch located in the battery case.
4. The six lights are located:
  - a. One at the flight compartment roof hatch.
  - b. Cabin emergency door
  - c. One at both passenger doors.
  - d. One at both sides of cargo doors.

C. The cargo loading light is located at the rear of the cargo compartment mounted in a recess in the cabin roof, it is controlled by a switch located on the light and has a red and white lens. It also has an extension-15' cord attached to it so it can be used as a walk around light.

D. The rear entrance light is mounted in the roof between the two entrance doors, it is controlled by a toggle switch on the rear control panel just over the left pass door.

E. There are four utility lights located:

1. Over the pilots head - battery bus
2. Over the copilots head
3. One on radio rack behind copilot
4. One on forward cargo door panel.

F. These utility lights are controlled by a rheostat located on the light itself.

2. floor hatch, the left or right passenger doors, the cargo door or the ramp doors are not closed and locked.

B. The alarm bell is located on the right side of the fuselage, forward of the center wing section. The switch for the alarm bell is located on the delivery control panel on A/C serial #63-9722 and subsequent on A/C serial #60-3763 through 839721 the switch is located on the circuit breaker panel.

C. Troop Jump Lights:

1. The troop jump lights are located on the aft frame of each passenger door. There is a red caution and a green jump light at each position.

2. There are two switches to control these lights located on the troop jump panel below the fuel control panel in front of the pilot.

3. One switch is for bright and dim the other switch controls the red or green light.

4. There is a push to test indicator light one of each color located beside the switches. To indicate to the pilot which light is burning.