2AF MANUAL 50-37

SECOND AIR FORCE

B-29 STANDARD PROCEDURES FOR FLIGHT ENGINEERS

18 JULY 1944

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(DG)

HEADQUARTERS SECOND AIR FORCE
Office of the Commanding General
Colorado Springs, Colorado

REGULATION)
:
50-37)

22 July 1944

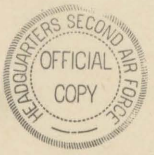
TRAINING

2AF Manual - B-29 Standard Procedures for Flight Engineers

1. 2AF Manual 50-37, "B-29 Standard Procedures for Flight Engineers", provides check lists and procedures which supersede any similar procedures for Flight Engineers.

2. Criticism of this Manual is encouraged and should be directed to this headquarters, Attn: Very Heavy Bombardment Section.

By command of Major General ENT:



ALBERT F. HEGENBERGER,
Brigadier General, General Staff Corps,
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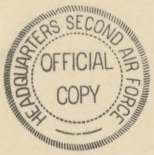
R E S T R I C T E D

HEADQUARTERS SECOND AIR FORCE
Colorado Springs, Colorado
22 July 1944

1. The following B-29 check lists an. procedures supersede any similar procedures for Flight Engineers. All procedures outlined herein represent the unanimous recommendations of Boeing service engineers, engine specialists, and Flight Engineers, with combat and service test experience at B-29 bases. These representatives are convinced that these approved procedures will prolong the life of the airplane, minimize accidents, and eliminate many problems of maintenance.

2. Freelance experimentation in the B-29 type airplane is hazardous and wasteful. This experimentation must stop.

3. It is therefore directed that all B-29 Flight Engineers, and instructor engineers use the following procedures as published. Criticism is encouraged and should be directed to Headquarters Second Air Force. Any changes in procedure must be approved by this headquarters before being used.



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R E S T R I C T E D

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INTRODUCTION

1. The B-29 is a highly complicated, long-range, very heavy bombardment airplane, requiring the full cooperation of the entire crew to obtain the most efficient operation of this highly intricate equipment.

2. It is imperative that the Flight Engineer know his airplane. In order to accomplish this, a complete understanding of the theory, maintenance and operation of all systems of the airplane is of prime importance.

3. The Flight Engineer must be cognizant of all normal and emergency operations as set forth in T.O. 00-25-5 and Memorandum 60-10.

ENGINEER'S ABBREVIATED CHECK LIST

BEFORE STARTING ENGINES

1.	Engineer's preflight	Completed
2.	Forms 1,1A, and F	Completed
3.	Parachute	O. K.
4.	Clothing	O. K.
5.	Life preserver	O. K.
6.	Battery switch	On
7.	Aux. P. P.	Start
8.	Emergency hydraulic pressure	O. K.
9.	Hydraulic fluid	Proper level
10.	Fuel boost pumps	On
11.	Fuel transfer switches	Off
12.	Inverter	On
13.	Mixture Controls	Idle cut-off
14.	Throttles	Set to Start
15.	Engineer's cabin air valve & relief valve	Closed

16.	Cowl Flaps	Open
17.	Intercoolers	Open
18.	Oil cooler flaps	Automatic
19.	Pitot heat	Off
20.	De-icers	Off
21.	Anti-icers	Off
22.	Generators	Off
23.	Fuel quantity gage	Check against dip stick
24.	Oil quantity gage	Proper reading
25.	Emergency system valve	Closed
26.	Oxygen	O. K.
27.	Lights	O. K.
28.	Engineer's report	Ready to start engines

BEFORE TAXIING

1.	Fire extinguishers	Set to engine being started
2.	Master ignition switch	On
3.	Start engines	1, 2, 3, 4
4.	Engine instruments	Check readings

5.	Check vacuum	3.8 - 4.2" Hg.
6.	Bomb bay doors	Closed
7.	Engineer's report	O. K.

BEFORE TAKE-OFF

1.	Generators	Checked
2.	Magnetos	Checked
3.	Mixture controls	Auto-rich
4.	Fuel boost pumps	On
5.	Report	Ready for take-off
6.	Generators	On
7.	At start of take-off roll	Pull cowl flaps from 15 deg. to 7½ deg. at time wheels leave ground.
8.	Intercoolers	Open

AFTER TAKE-OFF

1.	When gear is coming up	Check generators
2.	After flaps and gear are up	Have APP stopped
3.	Cowl flaps	Adjust as required
4.	Fuel boost pumps	Off

BEFORE LANDING

1.	Weights and C. G.	Call in to co-pilot
2.	Mixture controls	Auto-rich
3.	A.P.P.	Start
4.	De-icers	Off
5.	Anti-icers	Off
6.	Fuel boost pumps	On
7.	Intercoolers	Open
8.	Cowl flaps	Open to 7½ deg.
9.	Emergency hydraulic pressure	O. K.
10.	Report	Ready for landing

AFTER LANDING

1.	Cowl flaps	Open
2.	Intercoolers	Open
3.	Generators	Off
4.	Boost pumps	Off
5.	Bomb bay doors	Open
6.	Magnetos	Checked

7.	Engines	Idle cut-off
8.	All switches	Off
9.	Wheel chocks	In place
10.	Brakes	Off
11.	Controls	Locked
12.	Flight log	Complete
13.	Forms 1, 1A	Complete
14.	Give crew chief report of malfunctions	
15.	Assist in location of troubles	

FLIGHT ENGINEER'S AMPLIFIED CHECK LIST

BEFORE STARTING ENGINES

1. Engineer's preflight

a. Flight progress curves for both 4 and 3 engine operation.

b. Alternate airport, considering both distance and weather conditions.

c. Visual inspection

Don't ever assume that maintenance is perfect. Always give the airplane a thorough preflight inspection, checking the following items:

(1) Fuel tanks for servicing and proper installation of tank caps. Check fuel quantity against dip stick.

(2) Oil tanks for servicing and proper installation of caps.

(3) Turbo oil supply

(4) Cowling, condition and proper fastening.

(5) Cowl flaps for proper operation.

(6) General condition of skin and control surfaces.

(7) Conditions of de-icer equipment (if applicable).

(8) Life raft doors for proper installation.

(9) All navigation or running lights.

(10) Remove air scoop seals.

(11) Engine nose sections (cracks, cylinders for condition of cooling fins and baffles, exhaust collector rings for burning).

(12) Remove pitot covers.

(13) Wheel locks removed (from older type planes).

(14) Turbo, check for cracks, binding wheels or oil leaks (in excess).

(15) Under surfaces wings and fuselage.

(16) Bomb bay, bomb racks and cannon plugs.

(17) Propellers and governors for nicks and oil leaks.

(18) Auxiliary oil tank and motor and selector valves in off position.

(19) Fuel transfer system.

(20) Auxiliary power plant for servicing and condition.

(21) Bus selector switch for normal position.

(22) All articles securely fastened.

(23) Emergency flap motor for proper installation.

(24) Bomb bay fuel tanks and selector valves.

(25) All visible cables for breaks and chafing.

(26) Axe, thermos jug, and fire extinguishers.

(27) First aid kits.

(28) Anti-icers tanks and fluid.

(29) Pressure doors closed and hinges for warping.

(30) Pressure regulator caps in up position.

(31) Tool kits installed.

(32) Oxygen equipment and pressure.

(33) Hydraulic tank for servicing.

2. Forms 1, 1A, and F

a. Check form 1 and 1A and advise Airplane Commander of status of airplane. After entering the

airplane, the Flight Engineer should go through the following check list very thoroughly.

b. Fill out loading list and Form F.

After flying quite a few hours, all of us think we are good enough to perform our duties without the aid of a check list, but that is careless; it only takes one mistake to kill an entire crew and to completely destroy a badly needed expensive airplane. The point is: always use your check list - go through it thoroughly.

3. Parachute - check for condition.

4. Clothing - check for proper clothing for mission to be performed.

5. Life preserver - for over-water mission. Check CO_2 bottles for safety and vest for condition.

6. Battery switch - at co-pilot's command, put switch on.

7. Auxiliary power plant - have A.P.P. started, allow to warm up for 2 - 4 minutes, advance throttle, put generator switch to "run," position, put equalizer "on."

8. Emergency hydraulic pressure - check

for 900-1075 PSI.

9. Hydraulic fluid - with parking brakes set and 1000 PSI, check for 2 gallon capacity.

10. Fuel booster pumps - turn pumps on, turn fuel rheostat to first notch crack mixture control and note rise in pressure, return mixture to idle cut-off.

11. Fuel transfer switches - check for "off" position.

12. Inverters - check normal and alternate inverter for 26 - 26½ volts, leave normal inverter "on".

13. Mixture controls - idle cut-off.

14. Throttles - open 1 - 1¼ inches, to obtain 900 - 1200 rpm for starting.

15. Engineer's cabin air valves and pressure relief valve - closed for all ground operations.

16. Cowl flaps - flaps will be full open for all ground operations.

17. Intercoolers - full open for ground operation.

18. Oil cooler flap - check operation by putting doors to full open position, obtain position report from gunners. Close and put in automatic.

19. Pitot heat - leave in "off" position for ground operation.

20. De-icers - check for operation and leave in "off" position for take-off and landing.

21. Anti-icers - check for operation and return to "off" position.

22. Generators - switches off.

23 & 24. Fuel and oil gages - record and check against dip stick.

25. Hydraulic servicing valve - closed.

26. Oxygen - check for proper pressure and operation of A-12 regulator and blinker.

27. Lights - check for operation and spare bulbs.

28. Engineer's report - when check list is completed, inform Pilot you are ready to start engines.

BEFORE TAXIING

1. Fire extinguishers - set selector to engine being started.

2. Master ignition switch - on.

3. Start engines, 1-2-3-4

   a. Turn boost pump on.

b. Energize 12 - 16 seconds.

c. Engage starter.

d. When prop has turned one revolution, turn ignition switch on.

e. Prime as needed to start and smooth out engine at 800-1000 RPM.

f. Move mixture control to auto-rich.

4. Engine instruments - check oil pressure (nose and rear), manifold pressure, RPM and oil temperature.

5. Vacuum - check for (3.8 - 4.2 in. Hg.)

6. Bomb bay doors closed - when co-pilot says, "Generators on coolest engine." Flight Engineer advances throttle on coolest engine to 1400 RPM and turns generators on. Turn generators off and retard throttle when doors are closed.

7. Engineer's report - at Co-pilot's request, during combat station inspection, say, "Engineer OK."

BEFORE TAKE-OFF

1. Generators - while pilot is setting throttles at 1500 RPM, have gun amplydine generator turned "on". While Pilot is checking props, turn on generators of one engine at a time. Check for

voltage and amperage readings.

2. Magnetos - advance each throttle to 2000 RPM, check magnetos for RPM drop calling out to Pilot (right, both, left, both), 100 RPM maximum drop. Watch for any engine roughness.

   WARNING: Never dump throttles open as this leads to fires and back-firing.

3. Mixture controls - auto-rich. Note: Mixture controls will be in auto-rich for ground operation, take-off, climb, landing and cruise above 2100 RPM and 31" MP.

4. Fuel boost pumps - on - adjust to obtain 17 PSI plus or minus 2 PSI at take-off.

5. Report - when ready to take-off, Engineer will report to Pilot, "Ready for take-off, standing by on generators and cowl flaps."

   NOTE: If cylinder head temperature exceeds 220 deg. before take-off, idle at 700 RPM to cool, with plane headed into the wind.

6. Generators - when throttles are advanced to 1200 - 1500 RPM, put generators "on".

7. Cowl flaps - at start of take-off roll, set 15°, then milk cowl flaps slowly closed to obtain 7½ deg. at time wheels leave ground. CAUTION: During first third of take-off roll, carefully observe power and report any irregularities to the pilot.

8. Intercoolers - will be open on take-off and landing. With turbos off, intercoolers will be closed. At altitude or when turbos are partly on, adjust to lowest C.A.T. If icing is prevalent, obtain 25 - 38 deg. C.A.T.

AFTER TAKE-OFF

1. Generators - check for amperage draw while gear and flaps are coming up.

2. Cowl flaps - adjust to maintain CHT within limits (maximum opening 10 deg. - Maximum CHT 260 deg. for take-off, 248 deg. for climb).

3. Boost pumps - when power has been reduced, and 1,000 ft have been obtained, turn boost pumps off, one at a time and observe fuel pressure.

4. Intercoolers - when turbos are turned off, close intercoolers.

CRUISE

1. When climbing, get above desired altitude, hold climb power until a speed of 210 MPH is reached. Nose the airplane down slightly, open cowl flaps to 10 deg. and maintain 210 MPH with pre-determined cruise power to cool cylinder heads. When reaching cruising altitude, level plane out and close cowl flaps to 3 deg. When airplane is on the step, adjust cowl flaps to keep cylinder

head temperatures as low as possible, not higher than maximum - see section on operation data.

2. Intercoolers

   Turbos on, adjust as required to maintain lowest C.A.T. If icing is encountered, maintain 25 - 38 deg. C.

   Turbos off, intercoolers closed.

3. Mixture control - above 2100 RPM and 31" in auto-rich. At 2100, 31" and below, auto lean will be used.

   WARNING: No manual leaning from either auto lean or auto rich is to be attempted.

4. Flight log - at any major power change, or at weight change (2 hour intervals). Make entries in flight log and compute cruise control data.

   NOTE: On 3-engine operation add 11 - 15% fuel for auto lean, 22 - 25% for auto rich, to compensate for prop drag, airplane yaw and trim and added cowl flap drag.

BEFORE LANDING

1. Weight and C.G. - Engineer will compute weight and C.G. (% MAC) and give to Co-Pilot.

2. Mixture control - put mixture in auto-rich.

3. Auxiliary power plant - start and warm up, put generator to run position and equalizer on.

4. De-icers off.

5. Anti-icers off.

6. Fuel boost pumps on.

7. Intercoolers - open for landing when turbo is put on.

8. Cowl flaps - when airspeed is slowed 175 - 180 to lower gear, set cowl flaps to 7½ deg. to obtain 150 - 160 deg. cylinder head temperature for landing .

9. Hydraulic pressure - inform Co-Pilot emergency pressure is 900 - 1075.

10. Report - inform Pilot, check list complete, ready for landing.

AFTER LANDING

1 & 2. Cowl flaps and intercoolers - upon landing, cowl flaps and intercoolers will be moved to full open position.

3. Generators - turn generators off.

4. Boost pumps - turn boost pumps off.

5. Bomb bay doors open - When Co-Pilot says, "Generators on coolest engine", Flight

Engineer sets throttle at 1400 RPM and turns generators on. When doors are open and Copilot says "Generators Off," Flight Engineer turns off generators and retards throttle.

6. Magnetos - set throttle to 2000 RPM one at a time and check magnetos.

7. Cut engines

a. Run engines at 700 RPM until cylinder head temperatures cool (190 deg. C., if possible). While engines are cooling at 700 RPM, flip master ignition switch to the "off" position momentarily to see that all magnetos are grounded out.

b. Increases throttle settings to 1200 RPM and runs all engines for at least 30 sec. at this speed.

c. Moves the mixture controls to idle cut-off.

d. Cuts switches after propellers stop turning.

e. Order Tail Gunner to stop put-put.

8. Switches - all switches off.

9. Wheel chocks in place.

10. Brakes off.

11. Controls locked.

12. Flight log complete.

13. Forms 1 and 1A - complete forms 1 and 1A and give to Pilot for approval.

14 & 15. Trouble shooting - Report all malfunctions to crew chief and help him locate the trouble.

EMERGENCY PROCEDURES

Landing Gear.

1. Check fuse in Pilot's aisle stand. (If this fuse is burned out, both the normal landing gear switch and the landing gear transfer switch are inoperative.) Replace fuse once only and try normal gear switch again.

2. If fuse is O.K., return normal gear switch to neutral.

3. Leave landing gear transfer switch, (pilot's control stand) on normal and put bus selector switch (battery solenoid shield) on emergency with put-put on the line.

4. Then to open main gear doors pull emergency landing gear release handle out all the way and hold until doors are open. The emergency gear motors, which extend and lock the landing gear, should be operated one at a time by three emergency landing gear switches - on aft wall of nose wheel well for nose gear, and on forward wall of forward bomb bay on either side of pressure door for main gear. As each emergency landing gear switch is moved to the down position, move normal gear switch to down position so that both normal and emergency motors will work together to lower gear. WARNING: If normal gear motor solenoid should be stuck in up position when using emergency procedure to lower gear, gear may extend part way then retract part way then extend part way, continuing this cycle until one motor burns out. To prevent burning out motor, instruct blister gunners to report any movement of the gear immediately. If gear should extend part way, then retract part way, turn generator switches off. Put bus selector

switch on "emergency." Lower gear with emergency switch and land. WARNING: All switches must be left in the above position until airplane has been put on jacks and solenoid replaced. A gear retraction test will be made before plane is removed from jacks. Some emergency installations include solenoid mounted above rear spar of center wing section for main gear, on aft wall of nose wheel well for nose gear. If any solenoid fails to close when using emergency landing gear switch, throw a jumper across the solenoid or close it manually.

WARNING: When using both normal and emergency gear switches, see that both are up or both down to avoid working motors against each other.

If the put-put (or battery and put-put together) is the only source of electrical power, moving the bus selector switch to emergency takes all the electric current from the normal bus. Interphone, down and locked lights, radio equipment, inverter, and all other normal equipment will be inoperative. But if engine driven generators are the only source of electrical power (both battery and put-put dead), landing gear transfer switch may be moved to emergency without taking power away from any unit except the normal landing gear switch.

5. As a last resort, to lower gear, move landing gear transfer switch to emergency. Then operate emergency gear motors as explained in number 4 above. Always transfer power first (with landing gear switch or bus selector switch), then throw emergency landing gear switch.

If main gear doors fail to open on either normal or emergency system, emergency motors will in some cases drive the gear through the

doors. To avoid jamming the doors, make sure doors have had time to open all the way before operating emergency gear motors.

Tail skid does not operate on emergency system.

6. Emergency raising of gear is done in the same manner, except that main gear doors cannot be closed. Emergency motors are actuated by the three separate emergency landing gear switches. Do not raise the gear on the emergency system if conditions are otherwise normal. Come in for a landing and see what is wrong.

WARNING: Do not practice emergency landing gear procedures. Test the equipment by means of retraction tests on the ground. Memorize the above procedures thoroughly.

CAUTION: There are no limit switches in this emergency system, therefore hold the switch in the "on" position only long enough to extend the gear. Obtain visual check from Gunners.

FLAPS

1. Flap switch neutral.

2. Put switch on top of emergency motor "down" or "up" as desired. Motor is normally stowed in flap socket in center wing section, and plugged into emergency bus.

3. Lower or raise flaps as desired with landing gear transfer switch (pilot's control stand), or bus selector switch (battery solenoid shield) on "emergency." If the bus selector switch is used, put-put must be "on the line" and Tail Gunner operating the bus selector switch must return switch to normal as soon as informed (by Blister Gunners) that flaps are set as desired.

WARNING: Do not run the motor beyond

upper and lower flaps limits. This would burn out the motor, as it has no limit switch. For emergency flap operation, don't depend on the hand crank stowed forward of the rear entrance door. This crank is for starting the engines and will not fit the flap socket.

4. As a last resort, put the normal flap switch "up" or "down" as desired with the landing gear transfer switch on "normal". Then put bus selector switch on "emergency". The switch on top of emergency motor must be in the same corresponding position as the normal flap switch, or normal and emergency motors will work against each other.

OVER SPEEDING TURBOS

1. The following is recommended on take-off or in flight for an electronic controlled turbo:

   a. Throttle back on engine.

   b. Change amplifier on turbo.

   c. If this does not remedy the trouble, then leave the amplifier cannon plug disconnected.

NOTE: In event of runaway propeller or turbo, never feather an engine unless absolutely necessary.

BOMB BAY DOORS

EMERGENCY ELECTRIC OPERATION OF DOORS.

1. Install portable motor (normally stowed in center wing section) in forward or aft bomb bay door socket (center of starboard catwalk) and connect plug in outlet just above socket. Motor switch neutral.

2. Landing gear transfer switch or bus selector switch on "emergency". If bus selector switch is used, put-put must be "on the line".

3. Portable motor switch (on top of motor) to "up" for opening doors, to "down" for closing doors.

   WARNING: This motor has no limit switch. Operation beyond the full open or full closed position will burn out the motor. The engine hand crank will not operate the bomb bay doors (see flaps, above).

EMERGENCY MECHANICAL BOMB RELEASE

1. Pull release cable by winding Bombardier's hand wheel 2½ turns clockwise or by pulling emergency release handle (one on Pilot's control stand, another on forward wall of pressurized compartment, near floor, on port side). The first part of this pull releases the doors, allowing them to open. The second part of the pull operates the bomb release

levers, releasing bombs unarmed. Total length of pull about 30".

2. After release with wheel, rewind system by turning wheel counterclockwise 2½ turns.

3. Doors may be closed after emergency release by putting bomb door handle in full open position and holding until retracting screw engages door mechanism. Then move handle to close.

FIRE

The B-29 is equipped with a CO_2 system fed by two high-pressure CO_2 bottles mounted in the nose wheel well. Lines from each bottle run to all four engine nacelles. The Flight Engineer can direct the CO_2 charge to the desired engine by turning the selector knob on his instrument panel, and pulling the CO_2 release handle (or both handles, if desired) for the bottle he wishes to use.

Besides the nacelle extinguisher system, each airplane is equipped with three hand extinguishers, two CO_2 and one carbon tetrachloride, for extinguishing cabin fires. One CO_2 extinguisher is located on the inboard side of the Flight Engineer's control stand, the other is in the aft pressurized compartment, aft of the auxiliary equipment panel. The carbon tetrachloride extinguisher is located beside the rear entrance door.

CABIN FIRES DURING FLIGHT

In all cabin fires during flight, IMMEDIATELY PULL THE EMERGENCY PRESSURE RELIEF HANDLE IF THE CABIN IS PRESSURIZED. If the fire is in a rear compartment, use the portable carbon tetrachloride extinguisher first, and if necessary, the CO_2 extinguisher. If the fire is in the forward compartment, use the CO_2 extinguisher mounted beside the Flight Engineer's control stand.

If the cabin fire is caused by an electrical short circuit, the procedure is the same, except that the Flight Engineer must turn all electrical power off with the battery and generator switches.

If the cabin becomes excessively smoky or gaseous after using the fire extinguishers, open the bomb bay doors for ventilation. If the fire is extremely bad, and there is danger of an explosion from fuel tanks, sound a series of short rings on the alarm bell so the crew can prepare to abandon the airplane.

NACELLE OR ENGINE FIRE ON THE GROUND

If the fire is known to be a torching turbo, put it out by increasing throttle setting momentarily. For other engine or nacelle fires on the ground, use the following procedures:

1. Move mixture control to idle cut-off on all four engines.

2. Close fuel shut off valve on all four engines.

3. Turn off booster pump switches for all four engines.

4. Close throttle.

5. Open cowl flaps.

6. Set nacelle fire extinguisher to proper engine. Pull first one, and then, if necessary, the other fire extinguisher control handle. Flight Engineer will check with the scanners on condition of fire before pulling second control handle.

   NOTE: The engine fire extinguisher is for fires in the accessory section and is not effective against fires in the engine itself. If fire is still burning:

7. Turn all ignition switches off.

8. Turn battery switch off.

9. Stop auxiliary power plant.

10. Send crew members for additional ground fire fighting equipment.

NACELLE FIRE IN FLIGHT

Crew member spotting the fire uses "call" position on jackbox and says, "Fire on No. ---engine." (If possible crew member will

identify fire as to type and location). From this point, at the Pilot's discretion, the following procedure should be used:

1. Pilot feathers propeller and says to Flight Engineer, "Use engine fire procedure".

2. Flight Engineer puts mixture on feathered engine in idle cut-off, shuts fuel valve and boost pump off as pilot increases air speed in an attempt to blow out the fire.

3. Set cowl flaps to not more than 15° and close throttle.

4. Set nacelle fire extinguisher to proper engine, pull first one, and then if necessary, the other fire extinguisher control handle.

5. Flight Engineer closes cabin air valves and Radio Operator closes forward pressure door. If smoke has entered the cabin, Co-pilot opens his window. In case of excessive smoke or fire in the cabin, follow cabin fire procedure (see above).

6. If fire is out of control, have Bombardier open bomb bay doors, and abandon the airplane. (See bail out procedure below). On

take-off, Pilot will, if unable to put out the fire, make emergency landing, following crash landing procedure if necessary.

BAIL OUT

Crew members will not leave the ship until the order is given by the Pilot, who will use interphone or the alarm bell. A series of short rings means, "Prepare to abandon ship". If this is followed by one continuous ring, crew members will bail out.

When preparing to abandon ship, Pilot will let down below 10,000 feet if possible, release cabin pressure, turn on landing lights, (if at night), and lower gear. Bombardier will open bomb bay doors, salvo bombs, and leave doors open. Co-pilot will (if ship is over water) pull life raft release handles (forward pressurized compartment to either side of tunnel) and throw overboard the life raft stowed in forward compartment and order Tail Gunner to throw overboard life raft stowed in rear unpressurized compartment.

1. Radio Operator will broadcast a position report. Crew members will destroy all confidential and secret equipment, prepare wounded members for bail-out, then jump out through the following exits:

   a. Radio Operator, Navigator,

Bombardier, Flight Engineer, Co-pilot and Pilot, in that order, through the nose wheel well (secondary exit through forward bomb bay).

b. Right Gunner, Left Gunner, Top Gunner, through aft bomb bay.

c. Tail Gunner through rear entrance door.

When bailing out, brace your feet aginst the airplane and dive head first, toward the ground. If at altitude, fall "free" (without pulling ripcord) until reaching 10,000 feet, but if you feel yourself losing consciousness, whatever your altitude, pull ripcord. In any case, check your bailout bottle before leaving ship. Don't use top escape hatches for bail-out, because of danger in hitting props or vertical fin.

EMERGENCY LANDING

Just prior to landing at the command from the Pilot, the Flight Engineer will perform the following duties:

1. Stop auxiliary power plant.

2. Turn booster pumps "OFF".

3. Close fuel shut off valves.

4. Move Mixture Control to idle cut off.

5. Turn Master ignition switch and Battery switch "OFF".

6. Be prepared to set fire extinguisher to any engine necessary.

CARBURETOR ICING

If icing is encountered do the following:

1. Close intercooler.

2. Set rated power until ice is eliminated.

3. If necessary leave 2" boost on to prevent ice.

4. Maintain proper C.A.T.

PROPELLER FEATHERING

1. Throttle closed.

2. Pilot will push feathering button and tell Flight Engineer to prepare for feathering.

3. Fuel off (fuel valve, fuel boost, mixture).

4. Auxiliary equipment (generators, cabin air valve, vacuum pump) off or transferred to another engine.

5. Cowl flaps and oil cooler shutters closed.

6. Ignition off when prop stops turning.

UNFEATHERING

1. Prop -- low RPM.

2. Pilot will push feathering button and hold until prop reaches 600 RPM and not more than 1000 RPM.

3. Fuel valve and fuel boost on -- mixture auto rich.

4. Warm to 150 deg. C. at 1200 RPM, then advance RPM and throttle.

RUNAWAY PROPELLER

1. Throttle back.

2. Keep RPM down by using feathering button intermittently and feather propeller completely as soon as a safe altitude is reached.

NOTE: Normal overspeeding of the propellers up to 3150 RPM, caused by a power surge, should not be confused with a runaway propeller. An overspeeding propeller will normally be returned by the governor to the set speed within a few seconds. Sometimes, after the feathering button has been used to return the prop to normal RPM, the governor will control the prop, if the Pilot is careful not to apply sudden power to the engine.

EMERGENCY BRAKE PROCEDURE

1. In case of normal brake failure on B-29 airplanes, there is a complete separate emergency system. First, check fluid in reservoir. If found up to proper level, then proceed as follows:

   a. Turn emergency accumulator filler valve to "open" position.

   b. Push switch to emergency position and hold until pressure of 1000 - 1200 PSI is obtained.

   c. Close emergency system filler.

NOTE: In using emergency brake, do not fully release brake handles until plane has stopped, as this will only exhaust your pressure reserve. Use a steady continuous braking action.

OVERWATER DITCHING PROCEDURE

1. Give weight and C.G. to Pilot.

2. Check with Bombardier to see that all bombs and bomb bay tanks are jettisoned.

3. See that all escape hatches are opened to prevent binding or jamming upon contact with the water.

4. See that gear is up and all bomb bay doors, nacelle doors are closed.

5. Get all personal equipment for ditching together.

6. Stand by to cut engines when so ordered by the Airplane Commande..

7. Assume your ditching position when ordered by the Airplane Commander.

CABIN PRESSURE

Compressed air for supercharging the fuselage compartments is supplied by the inboard turbos of the inboard engines. After compressed air passes from the impeller into the carburetor air duct, some of the compressed air is directed through the cabin air duct, through the aftercooler, and into the cabin through the cabin air valve. This happens only when the cabin air valve is open.

When the cabin air conditioning system is used, the aftercooler flap is closed to provide heat, opened to provide cooling. With the aftercooler flap closed, hot air from around the exhaust collector ring is directed through the aftercooler to heat the cabin air. With the aftercooler flap open, cool air is directed through the aftercooler, overcoming the heat of compression and reducing the temperature of air going into the cabin.

Air is released from the cabin by two automatic regulators in the rear pressurized compartment, which maintain the following cabin pressures:

0 to 8,000 ft. -- Pressure differential of 1 in.

8,000 to 30,000 ft. -- Cabin altitude 8,000 feet.

30,000 to 40,000 ft. -- Cabin altitude increases from 8,000 ft. to 12,000 ft.

PRESSURIZING PROCEDURE

Under normal conditions, begin pressurizing at 8,000 ft. Close all windows, pressure doors, and the cabin pressure relief valve (under left side of engineer's seat). Open the cabin air valves on the engineer's control stand.

NOTE: Be sure that knurled knobs on top of cabin pressure regulators, located at forward end of rear pressure compartment, are unscrewed, as these regulators will not operate if knobs are screwed down. When leveling out for cruising, Pilot sets up predetermined power. If cabin air flow is then too low with cabin air valves full open, Pilot will increase turbo boost slightly and retard throttles to desired manifold pressure.

Cabin air flow desired is the minimum flow which will maintain cabin altitude (see above table), but never more than 1000 cubic feet per minute, and not more than 600 cubic feet per minute at altitudes above 33,000.

For maximum engine efficiency, set turbos to the lowest point which will maintain desired cabin air flow. If cabin pressure regulators are not working properly, screw down the knurled knobs on the cabin pressure regulators, then regulate cabin pressure with cabin air valves and cabin pressure relief valve.

When operating above 30,000 feet the Flight Engineer should not allow cabin pressure differential to exceed 13.34 in. of Hg. Close

cabin air valves enough to prevent higher differentials.

On all pressurized flights above 10,000 ft, Pilot will order crew members to have oxygen masks ready for instant use. Mask should always be attached to left side of helmet. If the cabin is suddenly depressurized, crew members can use oxygen immediately and prevent suffering from oxygen lack. A sudden increase in cabin altitude should not be harmful unless flying above 30,000 ft, in which case, some crew members might experience a temporary painful reaction from the "bends".

If power is set for long range or maximum endurance cruising, it may be necessary to run the inboard engines at 200 RPM higher than the outboard engines, to provide the additional boost necessary to supercharge the cabin. In this case, transfer fuel to inboard engines since they will be using more fuel. Set outboard engines at RPM which will maintain proper air speed.

When pressurizing at high altitudes, open cabin air valves slowly, adjusting these valves to a 1000 foot per minute rate of descent. Differential pressure may sometimes seal up a leak, suddenly, during pressurizing procedure. This might push cabin rate of descent far beyond 1000 FPM. So while pressurizing, until cabin altitude is stabilized, watch cabin rate of descent closely and be prepared to adjust

cabin air valves if rate of descent changes quickly.

DEPRESSURIZING PROCEDURE

The cabin may be depressurized by closing the engineer's cabin air valves and opening the cabin pressure relief valve, if necessary. In emergencies, the cabin can be quickly depressurized by pulling either of two emergency cabin pressure release handles (Pilot's control stand, and starboard sidewall of rear pressure compartment near forward bulkhead).

Always depressurize when expecting enemy action, when ship is on fire or when preparing to abandon ship.

OXYGEN

The B-29 Demand Oxygen System is supplied by eighteen, type G-1, low-pressure, shatterproof oxygen cylinders. The entire system is filled from one filler valve, located on the outside of the fuselage just forward of the wing root on the left side.

Each of the 14 oxygen stations is supplied from two distinct distribution lines. Loss of one line or its associated cylinders still leaves each station with an alternate source of oxygen. The entire system is equalized by the use of crossfeeds controlled by automatic check valves. In the event of partial destruction of the system, all stations still functioning have equal access to the remaining oxygen supply.

Each oxygen station consists of the following equipment -- A-14 demand mask, A-12 demand regulator, pressure gage, flow indicator, pressure

warning light, low-pressure supply cylinders, and filler and distribution manifolding.

The length of time that the oxygen supply will last varies with the individual requirements of your crew, their activity, the temperature, and the equipment. However, with 400 to 425 lbs. of pressure and the Auto-Mix ON, there is more than ten hours supply of oxygen for a crew of eleven men flying at 15,000 feet. The system is least economical at altitudes between 20,000 and 30,000 feet. Portable oxygen bottles are provided which may be refilled from the main oxygen system. These bottles last from five to eight minutes depending upon the activity of the user and the altitude. These bottles are not equipped with automatic mix features and give only pure oxygen upon demand.

When a crew member is suffering from oxygen lack, open the emergency valve on his regulator, but leave valve open only as long as necessary, as it will empty the system quickly. Leave auto-mix "On" at all times to conserve the oxygen supply. Oxygen warning lights go on when system pressure drops below 100 lbs.

AIR CONDITIONING PROCEDURE

Two 3-position, toggle switches, to the left of the Engineer's panel, control position of the aftercooler flaps, thereby heating or cooling the cabin. To air condition the cabin, air valves must be open to furnish air flow, but cabin need not be sealed or pressurized.

With toggle switches set at "closed", aftercooler flaps are closed to provide maximum cabin heat. With switches set "open", aftercooler flaps are full open to provide maximum cooling. With switches on "automatic", aftercooler flaps are set by thermostat control to maintain cabin air temperature of 70° F.

ELECTRONIC TURBO CONTROL

1. The source of the turbo electrical supply is the inverters. Each airplane inverter is capable of putting out the 115 volt, 400 cycle current required to operate the system.

2. Next is the turbo boost selector. The selector is the Pilot's control device by which he regulates the operation of the turbo control system. It contains one master potentiometer and four small calibrator potentiometers, which require adjustment only to compensate for small differences in engine or turbo performances. Once the system is calibrated, the Pilot can control the turbo boost simultaneously, by operating the large master potentiometer.

PRESSURETROL

The pressuretrol is the sensing element which measures electrically the pressure of the air supplied by the turbo to the carburetor. This unit controls the automatic operation of the system to maintain whatever pressure the Pilot has selected, regardless of the changes in atmospheric pressure caused by variation of altitude.

TURBO GOVERNOR

The turbo governor is a dual safety device driven by flexible shaft, geared to the turbo supercharger. One part of the mechanism is called the overspeed control and prevents the turbo from exceeding its safe operating RPM limit. The other part, the accelerometer, anticipates the pressure increase from turbo acceleration and provides a signal to the amplifier, to open the waste gate preventing overshooting of the manifold pressure.

AMPLIFIER

The amplifier is an intermediate unit between the control units and the waste gate motors. It receives a positive or a negative signal, according to the changes in manifold pressure and turbo speed, and sends the proper signal to the waste gate motor, to either open or close the waste gates as required.

WASTE GATE MOTOR

When this motor operates in response to the amplifier current and control signals, it also operates a balancing potentiometer, producing a signal opposed to the original control signal. When the two signals completely neutralize each other, the waste gate motor stops. Therefore, the amount of waste gate operation is controlled by the size or amount of the original signal.

LOCATION OF EQUIPMENT

1. The pressuretrol is located on the upper left side of the engine nacelle, just above the access plate.

2. The turbo governor is located in the right side of each engine directly in the rear of the turbo drive shaft. Only one governor is used to control both turbos.

3. The amplifiers are located just behind the Pilot in the Navigator's compartment.

4. One waste gate motor is used to operate two waste gates, and is located directly above the turbos.

GENERATOR SYSTEM

1. The B-29 contains a number of electrical systems, and the proper operation of these systems depends directly upon the generators for the proper amount of voltage and the amperage required to operate the various units in the airplane.

2. The importance of keeping the generator system functioning properly cannot be overemphasized. The normal system consists of six R-1, 300 amp. generators and the auxiliary system consists of one P-2, 200 amp generator.

PARALLELING OF THE SYSTEM

1. With generator switches "off" using a pre-

cision voltmeter, adjust the voltage regulator to 28.0 volts.

2. Turn generators "on" (put 3 or 4 gun amplydine generators on, to pull approximately 90-150 mphs) synchronize amperage by adjusting voltage regulators to read within 5-10 amps, to prevent one or two generators from carrying all the load.

3. Re-check voltage (for 28-28½ volts at bus).

NOTE: Auxiliary power plant must be running (generator "on" and equalizer switch "on") at time of synchronization.

INVERTER SYSTEM

1. The system consists of two 400-cycle 115-volt inverters (normal and alternate).

2. Inverter relay, which supplies current to the inverters, also distributes voltage from the inverter (26-115 volts) for the various A.C. systems.

ADJUSTMENT

Adjustment is made at the inverter governor (at the end of the armature) by varying the RPM of the inverter, set voltage to read (26-26.5) at AC voltmeter on Engineer's panel.

AUXILIARY POWER PLANT

The primary purpose of this system is to supply power when the normal generators are inoperative

and should be used sparingly.

STARTING

1. Battery switch "on".

2. Auxiliary Power Plant ignition switch "on".

3. Equalizer switch "off".

4. Generator switch "start" position.

5. After auxiliary power plant is running, return generator switch to "normal" position. Let auxiliary power plant and generator warm up and put generator line switch "on" and equalizer "on".

STOPPING

1. Equalizer switch "off".

2. Generator switch "off".

3. Ignition switch "off".

The auxiliary power plant has its own separate fuel and oil supply and must be serviced in accordance with T.O. instructions.

NOTE: This unit consists of one Lawrence, (Ruyxel-Burkhart) or Andover 10 H.P. Combustion type engine: 1 P-2, 200 amp. generator. 1 Carbon pile voltage regulator and 1 reverse current relay.

FUEL SYSTEM

Each engine receives its fuel supply separately. Each system consists of the following items:

1. Seven inter-connected self-sealing cells, with a capacity of 1367.5 US gallons (outboards); and 1436.5 US gallons (inboards). Fuel is fed to the fuel pump through flexible, self-sealing hose.

2. A G-10 type fuel pump, (with relief valve incorporated) supplies fuel to the carburetor (15-19 P.S.I.).

3. An electric booster pump type B-7A: the purpose of this pump being to supply fuel for starting the engines, for vapor elimination at altitudes, and for engine operation in case of normal fuel pump failure.

NOTE: If fuel boost pump is used in case of normal pump failure, do not operate Turbo. Since fuel boost pressure will not increase with carburetor deck pressure, dangerously lean mixture will be encountered, causing detonation and possible engine failure.

FUEL TRANSFER SYSTEM

Fuel is transferred from one tank to another by means of two electrically driven, reversible pumps (Romec vane type), mounted under the center wing section between the bomb bays and controlled by switches mounted on engineer's panel. The tanks are interconnected by

self-sealing hose, selection of transfer between tanks is made by two cable controlled selector valves, which may be adjusted by control levers on engineer's panel.

NOTE: Fuel must be transferred across the centerline of the airplane. If it is desired to transfer from one adjacent tank to another, it is necessary to transfer to the opposite side of the airplane and then back to the tank desired. Fuel may be transferred at the rate of 1500 gallons per hour at sea level. Fuel must be transferred from bomb bay tanks to main wing tanks for use. (Front bomb bay to No. 1 and No. 2 - Rear bomb bay to No. 3 and No. 4).

OIL SYSTEM

1. Each engine has its own oil system, supplied from an 80-gallon capacity, self-sealing, hopper type tanks. Oil is gravity-fed to the pump. The engine incorporates the scavenger pumps, cuno filter, and relief valve.

2. An oil cooler is located in the "out" line, between each oil tank and engine. The flow of air through the cooler radiator may be automatically controlled by the temperature regulator, or may be manually controlled by means of switches on the engineer's panel.

3. An oil dilution solenoid is incorporated and is connected into the "Y" drain.

It is controlled by switches on the engineer's panel.

NOTE: Oil dilution will be done at the end of the last flight of the day if anticipated temperature requires such action. (Dilute in accordance with T.O. instructions for cold weather operation).

PROPELLER CONTROL SYSTEM

1. The prop controls are located on the Pilot's aisle stand and are used to control RPM and emergency controls for feathering.

2. Operating the prop pitch control switch energizes the electric motor in the governor and will increase or decrease speeder spring tension as required.

3. Limit switches are incorporated to prevent over-control and are in turn hooked up to prop pitch lights on Co-pilot's panel which indicate full high or low RPM position of the governor.

FEATHERING

When feathering button is depressed, the feathering pump motor is energized, sending a supply of oil under high pressure through the governor and distributor valve to the proper side of the prop dome, depending on whether feathering and unfeathering action is desired.

NOTE: When test feathering a prop on the ground, carefully observe RPM and manifold pressure (RPM should not exceed 1000).

LANDING GEAR SYSTEM

1. The landing gear is equipped with electrically driven retraction screws and limit switches, set to cut off the power supply when it has reached its proper position. These limit switches are set to cut out at "3/4" turns of the screw for the retracted "up" position and "¼" turns for the "down" position.

2. The control switch is located on the Pilot's aisle stand and serves to energize the solenoids according to desired direction of gear travel.

3. Two electrical retraction motors are installed for each gear, (normal and emergency) with a 100-1 gear reduction. The operating circuit is as follows:

   a. If switch is put in "down" position, it energizes the "down" solenoid, which sends the current to the correct set of field windings in the nacelle door motor. When doors are 1¼ turns from "down" position, power is tranferred to the "down" field of the gear motor by means of a cam-operated micro switch (in wheel well). When gear is "down", power is cut off by means of above-mentioned limit switches.

b. For retraction, the power first goes to the up-field of the gear motor. When gear is 3/4 turns from "up" position, power is transferred to Nacelle Doors by the micro switch and power is cut from the nacelle doors at 1 turn from fully retracted position, by cam limit switches.

c. For normal operation, the main gear, nose gear and tail skid are operated simultaneously.

NOTE: Emergency operation is explained in emergency procedures. Tail skid does not extend on emergency operation of gear.

HYDRAULIC SYSTEM

1. A hydraulic panel is located under the floor of the forward compartment, near station 218, and contains the following equipment:

   a. An electrically driven pump.

   b. Pressure accumulator.

   c. Filter

   d. Pressure switch.

   e. Relief valve.

   f. Shut-off valve.

2. Pressure is controlled automatically by the pressure switch, which cuts in at 800 PSI and cuts out at 1000 PSI. If pressure is below 200 PSI, it will prevent pump from running if lines are broken.

3. Pressure is controlled manually by putting momentary switch at engineer's panel in emergency position and holding until the desired pressure is reached. Switch is spring loaded to the auto-position.

NOTE: Emergency system explained in emergency procedures.

4. Metering valves mounted at the rudder pedals are for metering fluid under pressure to the deboost valve.

5. The deboost valve is mounted in the inboard nacelle, above the oleo strut and meters pressure to the expander tubes at a lower pressure (4-1) with a greater volume. This prevents brake lag and also helps to return fluid to the reservoir.

CABIN PRESSURE SYSTEM

Pressure is obtained from the inboard engine turbos through ducts to the communications tunnel and is distributed through the three pressurized compartments. It is regulated by cabin pressure regulators in the forward end of the rear pressurized compartment.

NOTE: Emergency operations explained in emergency procedures.

WING FLAP SYSTEM

1. The wing flaps are electrically operated and incorporate a position indicator on the torque tube at the rear mid-wing section. The flap motor is located on top of the mid-wing section. The switch is located on the pilot's aisle stand.

2. To operate, put switch in the desired position. When flaps reach their full travel, a limit switch will cut off the current to the flap motor.

3. The flap warning system is so connected with the landing gear warning that horn will blow under the following conditions.

   a. If flaps are more than 30° down with throttles 3/4 open and gear extended.

   b. Flaps less than 20° down, gear extended and throttles 3/4 open.

4. To correct this condition, put the flaps to 20-30° or retard throttle slightly.

VACUUM SYSTEM

1. Vacuum is maintained by the use of two vacuum pumps. (One on each inboard engine). Selection of these pumps is

made by a cable controlled selector valve, with the control lever mounted on the Engineer's stand.

2. Normal vacuum should read (3.8 to 4.2" HG) and is regulated by:

   a. Relief valve (set at 6") in the engine nacelle.

   b. Two schwein regulators (on navigator's chart case). (One set at 4.8 and one at 3.8 - 4.2" Hg.).

3. The air intake is at the Pilot's instrument panel and air filter should be cleaned in accordance with T.O. inspection.

4. Vacuum is supplied to camera shutters at 2" Hg, and is regulated by a needle valve restrictor.

SYSTEMS DRAWING

Simplified drawings of systems will be found on the following pages for the benefit of trouble shooting in the air and on the ground.

MISC. OPERATING DATA

The following charts, flight plan and Engineer's log are the latest available cruise control data. Plan your missions carefully from them and get comparison results as to the corrections for your particular aircraft.

TABLE OF AMPERAGE LOADS

Upper forward turret	132.5 (Battle load 275.5)
Upper aft turret	132.5 (Battle load 275.5)
Lower forward turret	84
Lower aft turret	84
Tail turret	242 (Battle load 420)
Tail ammunition booster motors (2)	40
C-1 auto pilot	6
Bomb doors (Forward and aft)	480
Landing gear (2)	460
Nose gear	155
Wheel doors (2)	280
Wing flaps	200 (350 in flight)
Hydraulic pump	110
Landing lights (2)	52
ATC radio set	35

POWER PLANT

The B-29 is powered by R-3350, Wright, 18-cylinder, radial engines. Hamilton Full-Feathering Propellers rotate clockwise, when viewed from the rear, on a shaft reduction ratio of .35. Propeller governors are controlled electrically by four two-position toggle switches on the Pilot's aisle stand. The Prop Governor system uses circuit breakers instead of fuses, with reset buttons at the aft end of the Pilot's aisle stand. Also on the Pilot's aisle

stand are four feathering buttons controlled by one fuse in the Pilot's aisle stand fuse panel.

The carburetor is a Chandler-Evans automatic, type 58-C PB-4.

The engine is started by a Jack and Heintz Combination inertia and direct cranking starter.

Vacuum pumps, one for each engine, provide vacuum for the cameras, de-icer boots and instruments; and provide pressure for inflating the de-icer boots. Either inboard vacuum pump may be used for vacuum (selector lever on Engineer's control stand). The other three pumps provide pressure for the de-icer boots.

MISCELLANEOUS DATA

NORMAL INSTRUMENT READINGS

Nose Oil Pressure	30-50 PSI
Rear Oil Pressure	60-80 PSI
Fuel Pressure	15-18 PSI
Oil Temperature	55-95° C.
De-Icer Pressure	7-7.5 PSI
Vacuum Pressure	3.8"-4.2" Hg.
Oxygen Pressure	400-425 PSI
Hydraulic Pressure (Normal)	800-1000 PSI
Hydraulic Pressure (Emergency)	900-1075 PSI

STRUCTURE

Wing Span		141'
Length		98'
Height		29'
Wing Design	Boeing	117

Compartments from nose to tail are:

Forward pressure cabin, forward bomb bay, fuselage wing gap, aft bomb bay, rear pressurized compartment, rear unpressurized compartment, Tail Gunner's compartment. Front and rear pressurized compartments are accessible when cabin is pressurized; others are not accessible.

Controls are conventional. Aileron and rudder trim tabs also function as servo tabs to make control movement easier.

Wing flaps (Fowler design) may be lowered to

25 deg. at indicated airspeeds below 220 mph, to 45 deg. at indicated airspeeds below 180 mph.

RESTRICTED

B-29 PRELIMINARY CHART

BASED ON TEST DATA OBTAINED TO 10-22-43

POWER CORRECTION FOR COWL FLAPS

COWL FLAP DEGREE

BASE 6 LINE

COWL FLAP CORRECTIONS ARE COMPROMISE VALUES

EXAMPLE: IT IS DESIRED TO FLY AT AN IND. ALT. F 15000 FT. - THE TEMP. IS -20°C (POINT O) IND. A. S IS TO BE 195 M.P.H. (POINT A) COWL FLAP SETTING IS 10° (POINT D) GROSS WT. OF AIRPLANE IS 110000 LBS. (POINT E) SPEED WILL THEN BE 238 M.P.H. (POINT A) POWER SETTINGS REQUIRED FOR THIS CONDITION WILL BE 2100 R.P.M. AND 31.5" HG. (POINT C) POINT C BEING ALMOST ON CURVE NO. 5 TRANSFER IT TO CORRESPONDING POSITION RELATIVE TO CURVE 5 (POINT G) FUEL CONSUMPTION IS TO BE 480 GAL./HR IN AUTO RICH AND 415 GAL./HR IN AUTO LEAN (POINT H) ENGINE H.P. IS SHOWN TO BE 1340 PER ENGINE (POINT J)

POWER CORRECTION FOR ALTITUDE
DENSITY ALTITUDE - 1,000'

30,000 25,000 20,000 STANDARD TEMPERATURE 15,000 10,000 5,000 - PRESS ALT. S.L.

380 - TRUE AIRSPEED M.P.H.

ESTIMATED FOR 2600 R.P.M. - 47.5" HG.

2400 R.P.M. - 43.5" HG.

2300 R.P.M. 39" HG.

2200 R.P.M. - 35" HG.

2100 R.P.M. - 31.5" HG.

1800 R.P.M. 28" HG.

1650 R.P.M. 25" HG.

1500 R.P.M. 22" HG.

CLOSED WASTE GATES

475 A.R. 420 A.L.
340 A.L.
370 A.L.
480 A.R. 430 A.L.
610 A.R.
790 A.R.
940 A.R.
950 A.R.
790 A.R.
600 A.R.
320 A.L.
280 A.L.
350 A.L.
455 A.R. 410 A.L.
590 A.R.
950 A.R.
250 A.L.
270 A.L.
300 A.L.
770 A.R.
940 A.R.
570 A.R.
238 A.L.
330 A.L.
435 A.R. 390 A.L.
550 A.R.
790 A.R.
920 A.R.
220 A.L. 250 A.L. 280 A.L.
1120 A.R.

TEMP °C

PILOTS INDICATED AIR SPEED

B.H.P./ENGINE

DENSITY ALTITUDE - 1,000

GROSS WEIGHT - 1000 LBS.

BASE LINE

CHART BASED ON 90,000 LBS. GROSS WEIGHT AND 6° COWL FLAP SETTING

FOR MAX. RANGE USE V, FOR LBS. GR. WT.

180-185	80,000 - 90,000
185-190	90,000 - 100,000
190-195	100,000 - 110,000
195-200	110,000 - 120,000
200-205	120,000 - 130,000

ALTITUDE CORRECTION FOR POWER AND FUEL CONSUMPTION

NOTE—
FUEL CONSUMPTION SPOTTED ON POWER CURVES IS GAL./HR. FOR 4 ENGINES
THE FOLLOWING EFFECTS ARE ESTIMATED FROM THE INSTALLATION OF RADAR DOME.

	RADAR DOME RETRACTED	RADAR DOME EXTENDED
DECREASED SPEED	6 M.P.H.	10 M.P.H.
DECREASED RANGE	5%	9%

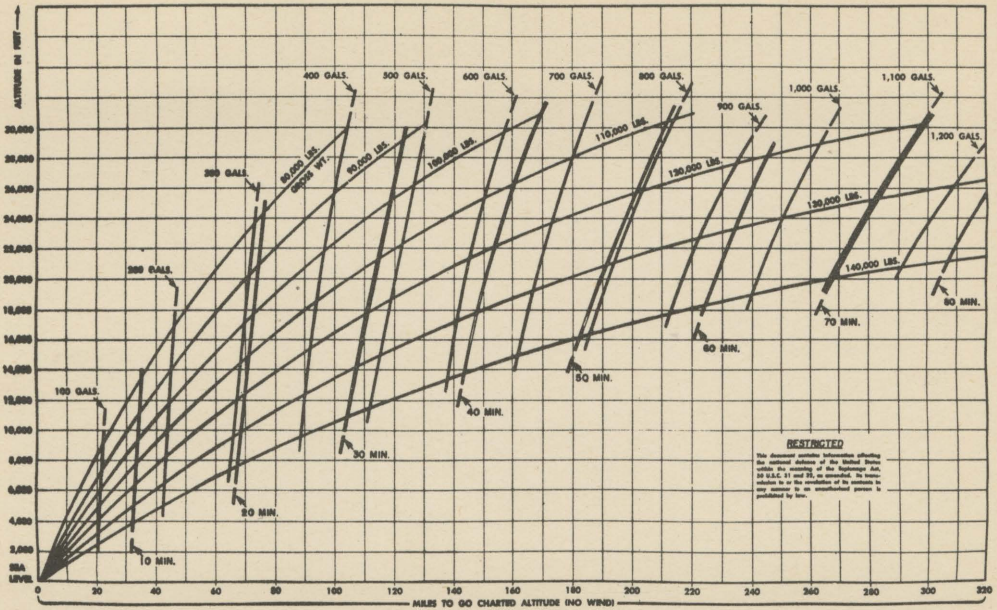
POWER CORRECTION FOR GROSS WEIGHT

RESTRICTED

RESTRICTED

RESTRICTED

THIS CHART TO BE USED FOR INSTRUCTIONAL PURPOSES ONLY



RESTRICTED

This document contains information affecting the national defense of the United States within the meaning of the Espionage Act, 50 U.S.C. 31 and 32, as amended. Its transmission in or the revelation of its contents in any manner to an unauthorized person is prohibited by law.

COLOR CODE

GALLONS OF FUEL REQUIRED TO CLIMB TO CHARTED ALTITUDE

TIME REQUIRED TO CLIMB TO CHARTED ALTITUDE

BOEING

B-29

RESTRICTED

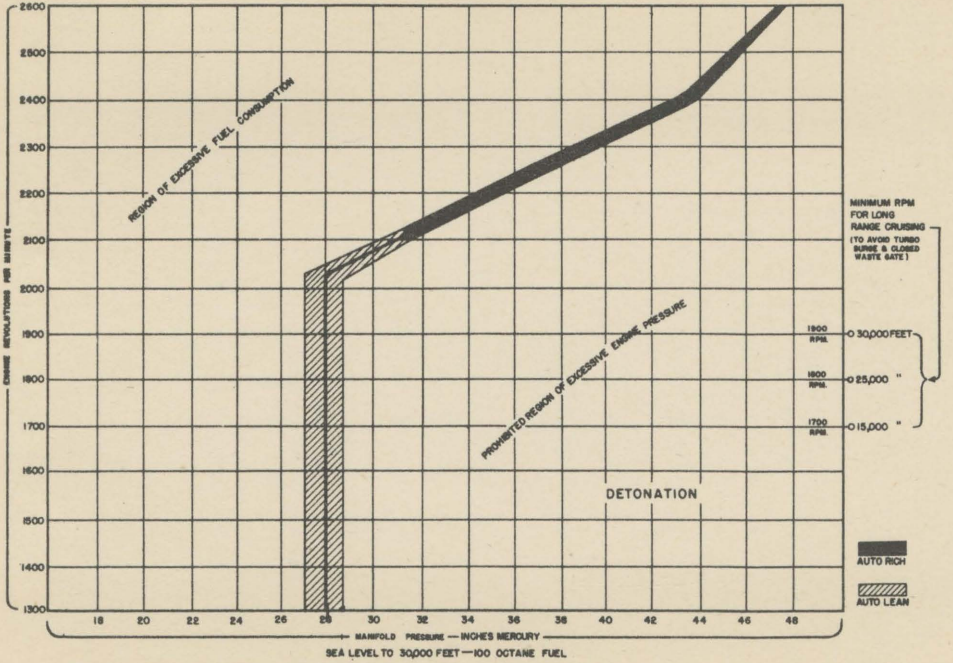
CLIMB CONTROL CONDITIONS

2,400 RPM — 43.5" H G. MAP
C.F.A. — 9" (2.5" GAP)
PILOT I.A.S. — 196 MPH
LONG COWL FLAPS
TOP COWL FLAPS OPEN 2.5"
POSITIVE ENGINE SEALS

B-29 Chart P-36 Serial No.

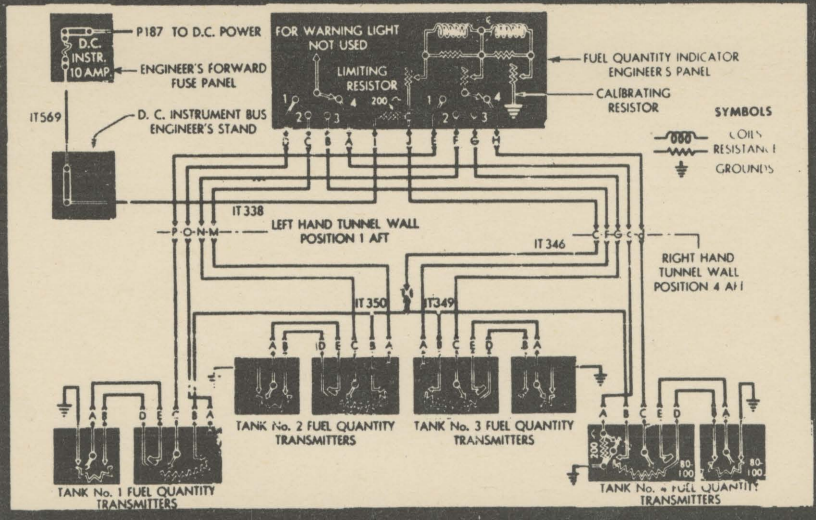
CLIMB CONTROL CHART

BOEING
B-29



B-29 CHART P-34

R-3350-23 ENGINE OPERATING LIMITS



FUEL QUANTITY GAGE CIRCUIT

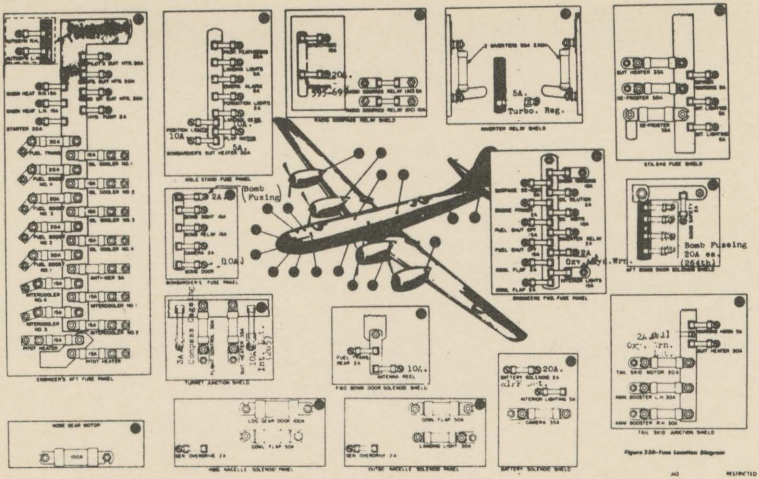


Figure 338-Fuse Location Diagram

1. Bombardier's Control and Fuse Panel

Bomb Door, 10A
Bomb Relay, 15A
Bomb Sight, 15A
Camera - Forward Section, 2A

2. Pilot's Aisle Stand and Fuse Panel

Emergency Alarm, 5A
Wing Flaps, 5A
Formation Lights, 2A
Landing Gear, 10A
Landing Lights, 5A
Propeller Feathering, 20A
Position and Identification Lights, 20A
Bombardier's Suit Heater, 20A
Warning Lights, 2A

3. Engineer's Forward Fuse

Interior Lights, 15A
Inverter, 2A
D. C. Instruments, 10A
Oil Dilution, 10A
Cabin Warning, 10A
De-icer, 5A
Primer, 5A
Fuel Shut-off, 5A (Two)
Cowl Flaps, 2A (Two)

4. Engineer's Aft Fuse

Pitot Heater, 15A (Two)
Intercooler, 15A (Four)
Fuel Boost, 20A (Four)
Fuel Transfer, 30A
Oil Coolers, 15A (Four)
Anti-icer, 5A
Starter, 20A
Cabin Heating, 15A (Two)
Autosyns (A. C. Instruments), 30A (Two)
Suit Heaters
Radio, 20A
Engineer's, 20A
Navigator's, 20A
Hydraulic Pump, 2A

5. Panel Junction Shield 586

Pilot's Suit Heater, 35A
Flight Controls, 30A
RC-103, 10A
Compass Caging Motor, 3A
Interior Lights, 10A

6. Radio Compass Relay Shield

Monitor Switch
Warning Relay
Fuse 595-695 Radio, 20A
Interphone Fuse, 15A
Radio Compass Relay Fuse, D. C. 28 Volts (10A)
Radio Compass Relay Fuse, A. C. 115 Volts (5A)

7. Inverter Relay Shield Panel

Main Inverter Fuse, 50A
Alternate Inverter Fuse, 50A
Supercharger Control Fuse, A. C., 5A

8. Fuse Station 646

Defroster Motor, 35A
Defroster Motor, 20A
Oxygen Warning, 5A
Suit Heater, 35A
Interior Lights, 5A (Two)
Cabin Warning, 5A

9. Battery Solenoid, Camera Relay, Fuses

Battery Solenoid and IFF Detonator, 20A
Camera, 35A
Interior Lighting, 5A

10. Tail Skid Junction Shield

Ammunition Booster, 30A (Two)
Tail Skid Motor, 20a
Cabin Warning, 5A
Tail Gunner's Suit Heater, 20A
Oxygen Pressure Warning, 2A

11. Forward Bomb Door Solenoid Shield

Fuel Transfer Relay
Down and Up Solenoids - Front Bomb Doors
Fuel Transfer Fuse, 2A
Antenna Reel Fuse, 2A

12. Aft Bomb Door Panel Junction Shield

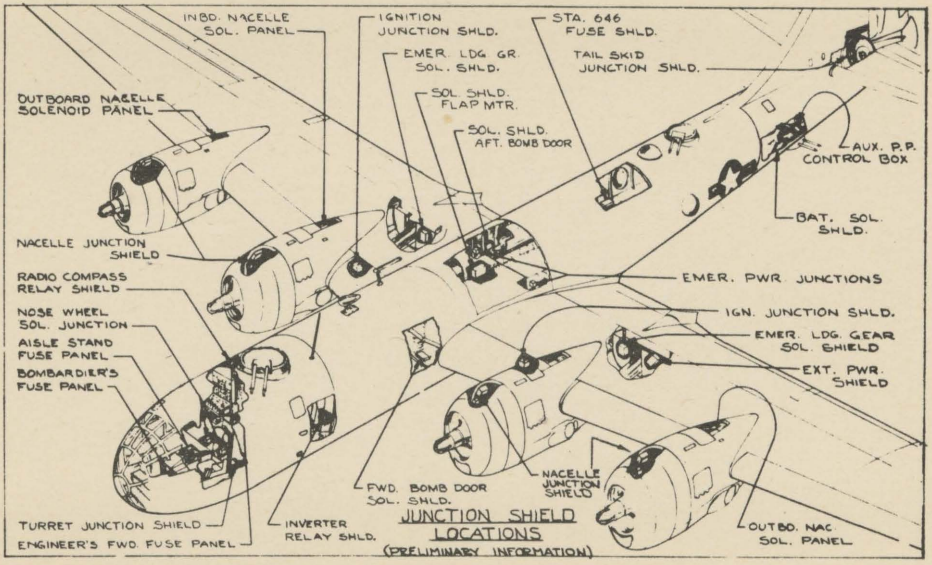
Up and Down Solenoids - Aft Bomb Doors
Power Transfer Solenoid
Up and Down Emergency Solenoids
Bomb Safety Switch Fuse, 2A

13. Outboard Nacelle Junction Box

General Overdrive Fuse, 2A (Not Inst.)
Cowl Flap Motor, 50A
Landing Light, 20A
Starter Solenoid
2 Reverse Current Relays
2 Circuit Breakers (D. C. Power)
Propeller Feathering Installed
2 Cowl Flap Solenoids

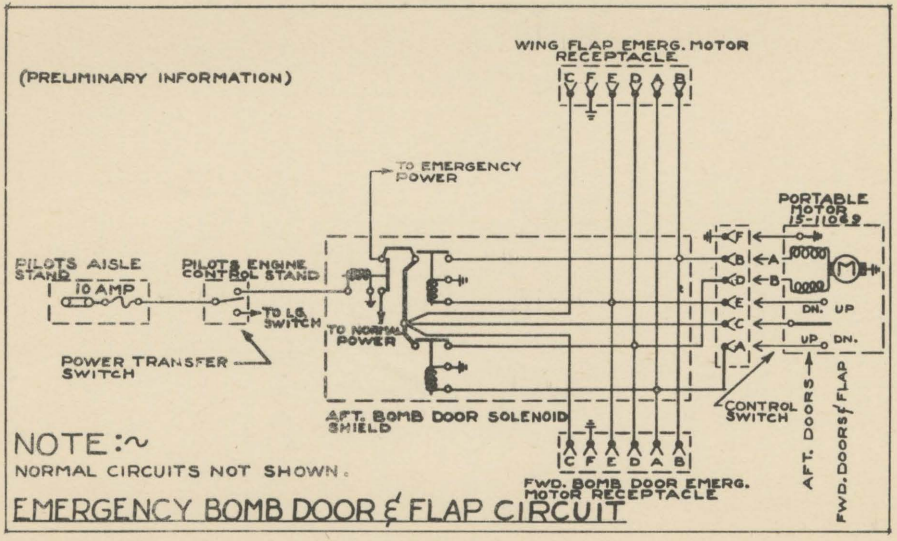
14. Inboard Nacelle Skate Junction Box

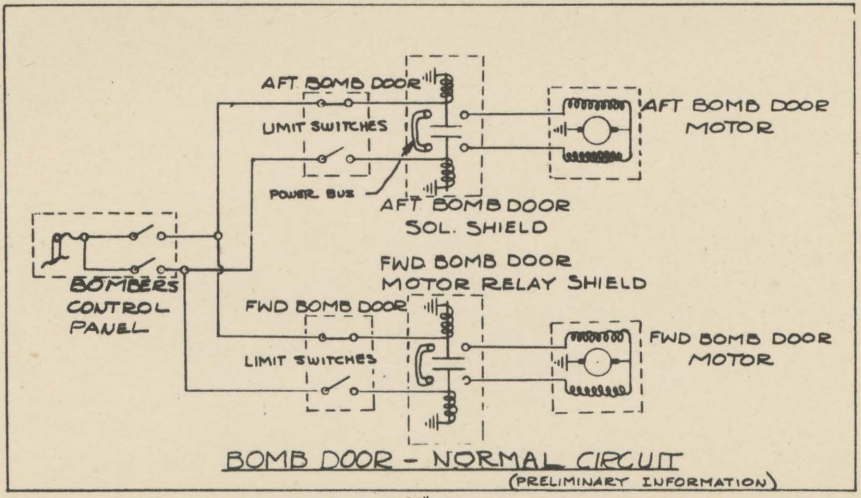
2 Landing Gear Solenoids
1 Starter Solenoid
2 Cowl Flap Solenoids
1 Reverse Current Relay
1 Propeller Feathering Solenoid
1 Circuit Breaker (D. C. Power)
General Overdrive Fuse, 2A (Not Inst.)
Wheel Door Motor Fuse, 100A
Cowl Flap Fuse, 50A



JUNCTION SHIELD LOCATIONS

(PRELIMINARY INFORMATION)


(PRELIMINARY INFORMATION)
WING FLAP EMERG. MOTOR RECEPTACLE
C F E D A B
TO EMERGENCY POWER
PORTABLE MOTOR 15-10069
PILOTS AISLE STAND
10 AMP
PILOTS ENGINE CONTROL STAND
TO L.G. SWITCH
TO NORMAL POWER
POWER TRANSFER SWITCH
AFT. BOMB DOOR SOLENOID SHIELD
F
B
A
D
E
C
A
DN. UP
UP DN.
CONTROL SWITCH
AFT. DOORS
FWD. DOORS & FLAP
C F E D A B
FWD. BOMB DOOR EMERG. MOTOR RECEPTACLE
NOTE:~
NORMAL CIRCUITS NOT SHOWN.
EMERGENCY BOMB DOOR & FLAP CIRCUIT


AFT BOMB DOOR
LIMIT SWITCHES
POWER BUS
AFT BOMB DOOR
SOL. SHIELD
AFT BOMB DOOR
MOTOR
FWD BOMB DOOR
MOTOR RELAY SHIELD
BOMBERS
CONTROL
PANEL
FWD BOMB DOOR
LIMIT SWITCHES
FWD BOMB DOOR
MOTOR
BOMB DOOR - NORMAL CIRCUIT
(PRELIMINARY INFORMATION)

9½"

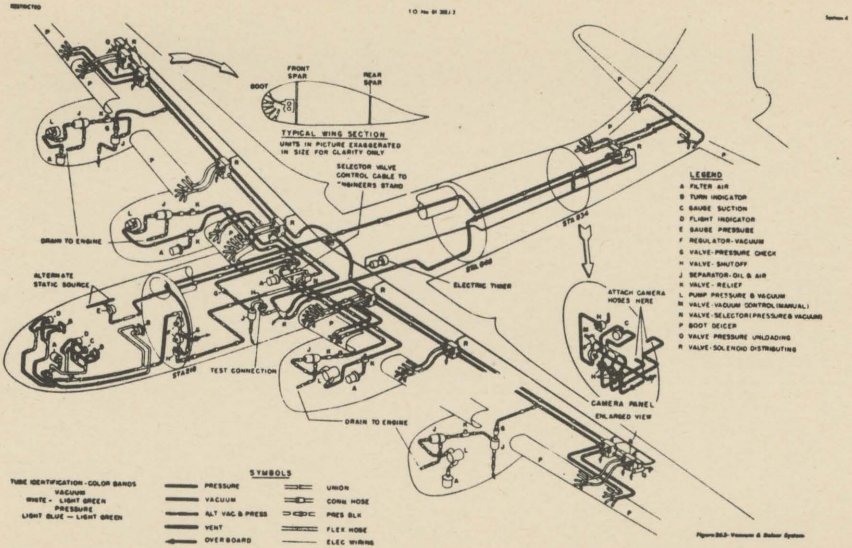
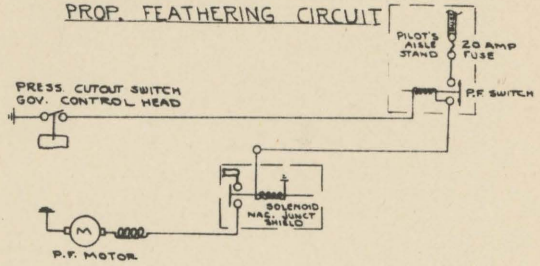
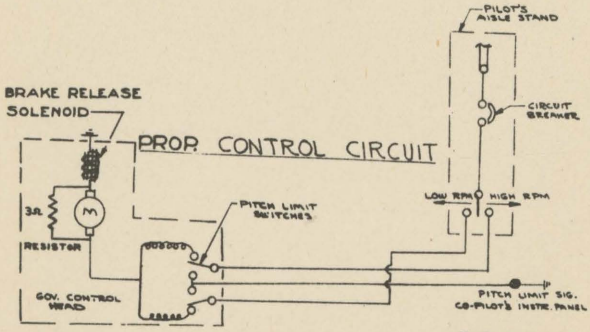


Figure 26.5- Vacuum & Static System

PROP. FEATHERING CIRCUIT





PRELIMINARY INFORMATION

MOTOR DIAGRAM — LANDING GEAR NORMAL & EMERGENCY

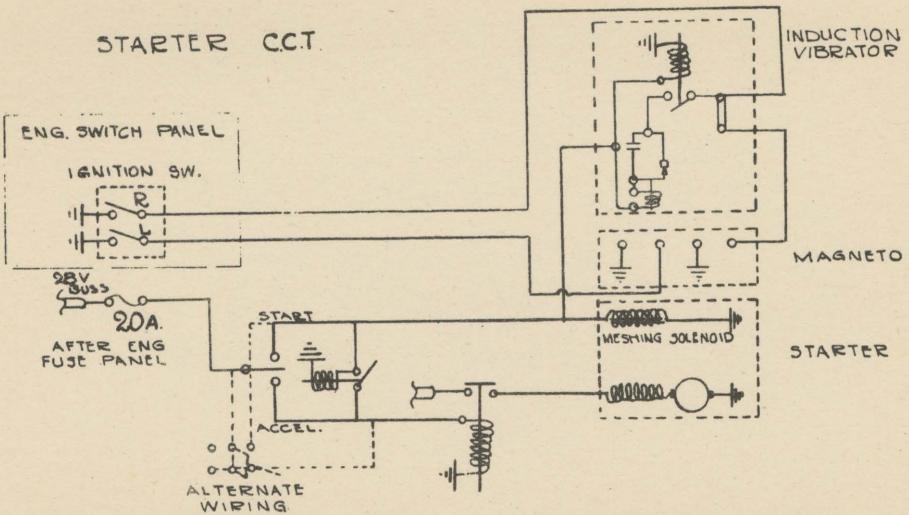
WHEN LANDING GEAR IS RETRACTING THE L.G. UPPER LIMIT SWITCH TRANSFERS POWER FROM THE DN SOLENOID OF THE L.G. TO THE UP SOLENOIDS ON THE DOORS. WHEN L.G. IS EXTENDING THE LOWER LIMIT SWITCH ON THE DOORS TRANSFERS POWER FROM THE DOWN SOLENOID OF THE DOORS TO THE DOWN SOLENOID OF THE L.G. WHEN OPERATING ON THE EMERGENCY SYSTEM THE LIMIT SWITCH TRANSFER POWER FROM THE UPPER WHEEL SOLENOIDS TO THE L.H.G. FROM THE L.H.G. TO THE R.H.G. THE CYCLE IS THE SAME IN EXTENTION OR RETRACTION OF THE GEAR. THE L.H.G. & R.H.G. DOORS ARE RENDERED BY CABLE FOR EMERGENCY MUST BE RETRACTED BY HOOKS OF THE VERNAL SYSTEM.

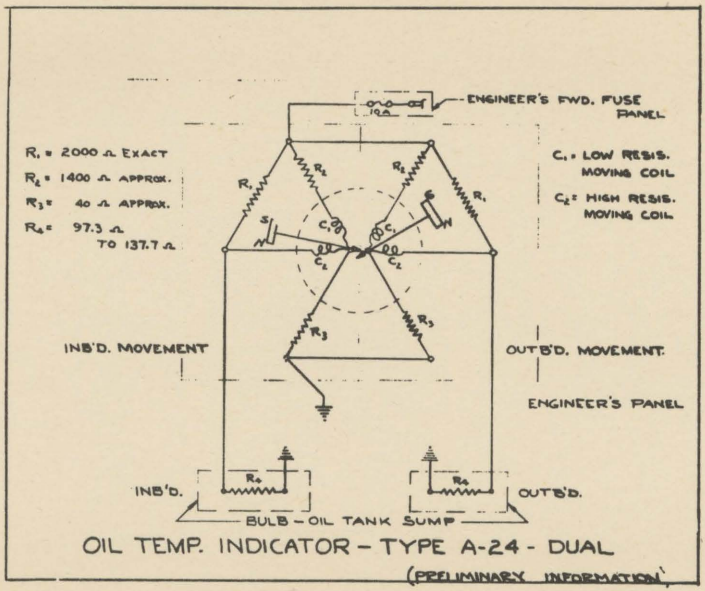
NORMAL POWER BUSS
EMERG. POWER BUSS

NOTE
LDG. GR. & LDG. GR. DOOR LIMIT SWITCHES SHOWN CORRESPONDING TO GEAR IN DOWN POSITION.

96	PILOT'S AISLE STAND	170	SOL. SHLD. - NOSE WHL. MTR. - R.H.	360	PLUG - TUNNEL - L.H. - POS. 2	583	PLUG - NOSE WHL. WELL
119	SWITCH - PILOT'S EMER. IGN.	188	SOL. SHLD. - AFT. BOMB DOOR MTR.	367	RECEPTACLE - TUNNEL - L.H. - POS. 1	680	SWITCH - L.G. POWER TRANSFER
120	SWITCH - IGNITION	193	JUNCTION SHIELD - BATTERY SOL.	368	PLUG - TUNNEL - L.H. - POS. 1	769	SHLD. - NOSE GEAR - UPPER LIMIT
132	CONTROL STAND - PILOT'S ENGINE	242	SOL. SHLD. - NOSE WHL MTR. - L.H.	371	RECEPTACLE - BLK 834 - POS. 1	710	SHLD. - NOSE GEAR - LOWER LIMIT
136	SOLENOID SHIELD - INSD. NAC.	243	MOTOR - EMER. NOSE WHL.	372	PLUG - BLK. 834 - POS. 1	711	SHLD. - LANDING GEAR - LOWER LIMIT
156	SWITCH - BATTERY RELAY	244	MOTOR - NOSE WHL.	399	SWITCH - EMER. CIRCUIT	712	SHLD. - LANDING GEAR - UPPER LIMIT
158	RECEPTACLE - TUNNEL - L.H. - POS. 4	307	SOL. SHLD. - EMER. LDG. GEAR	539	SHIELD - JUNCTION	744	SWITCH - LANDING GEAR
159	PLUG - TUNNEL - L.H. - POS. 4	339	RECEPTACLE - TUNNEL - L.H. - POS. 2	582	RECEPTACLE - NOSE WHL. WELL	748	MOTOR - TAIL SKID

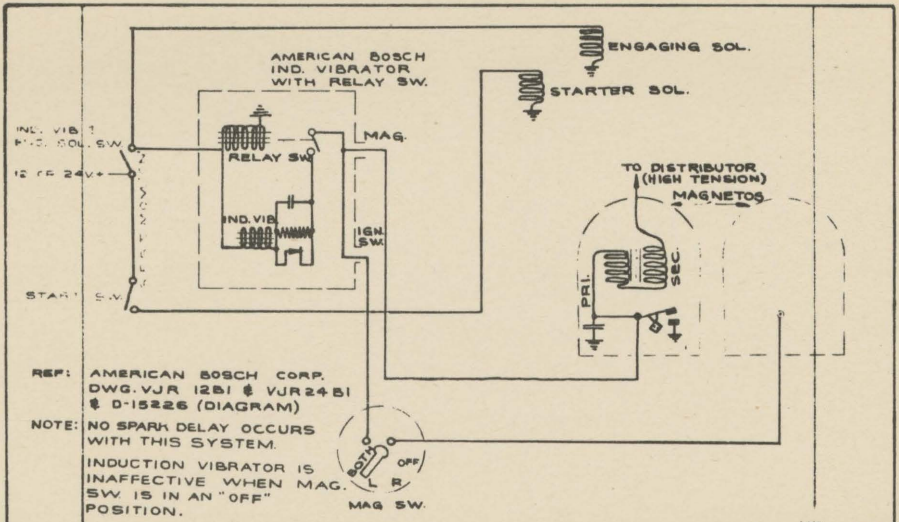
748	SWITCH - EMER. LDG. GR.
764	MOTOR - MAIN WHL. - L.H.
765	MOTOR - EMER. WHL. - L.H.
766	MOTOR - WHEEL DOOR - L.H.
775	MOTOR - EMER. WHL. - R.H.
776	MOTOR - MAIN WHL. - R.H.
777	MOTOR - WHL. DOOR - R.H.
939	SHLD. - WHL. DOOR LIMIT SW.


STARTER C.C.T.
INDUCTION VIBRATOR
ENG. SWITCH PANEL
IGNITION SW.
R
L
MAGNETO
28V
BUSS
20A.
AFTER ENG FUSE PANEL
START
MESHING SOLENOID
STARTER
ACCEL.
ALTERNATE WIRING



OIL TEMP. INDICATOR - TYPE A-24 - DUAL

(PRELIMINARY INFORMATION)



REF: AMERICAN BOSCH CORP. DWG. VJR 1281 & VJR 2481 & D-15226 (DIAGRAM)

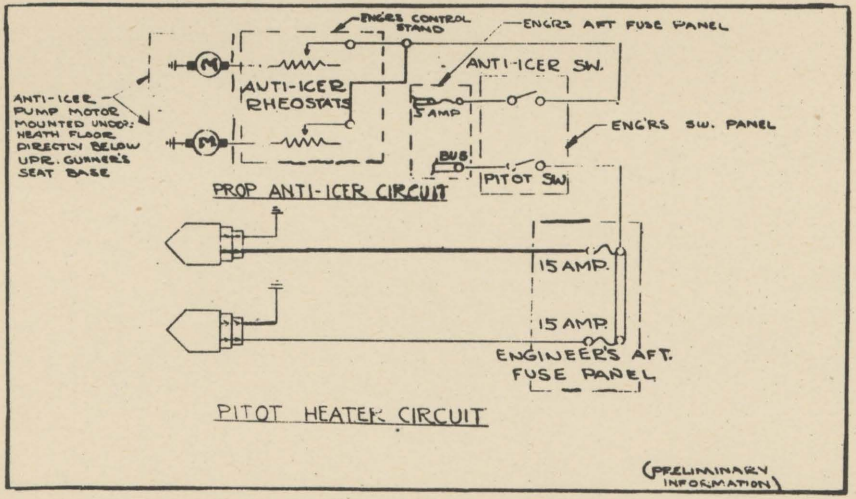
NOTE: NO SPARK DELAY OCCURS WITH THIS SYSTEM.

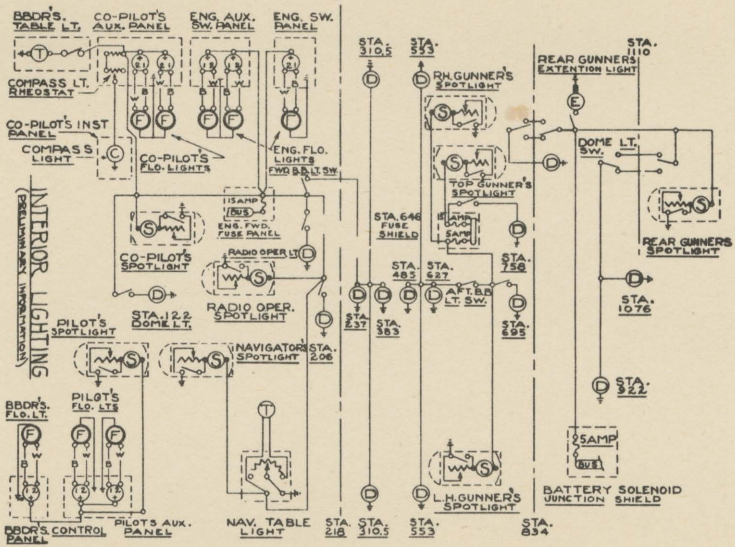
INDUCTION VIBRATOR IS INAFFECTIVE WHEN MAG. SW. IS IN AN "OFF" POSITION.

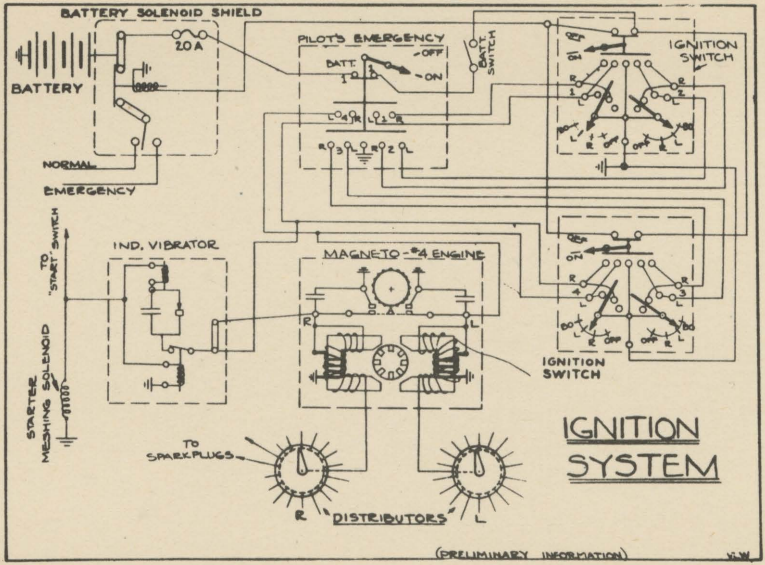
#1 SEP 1943

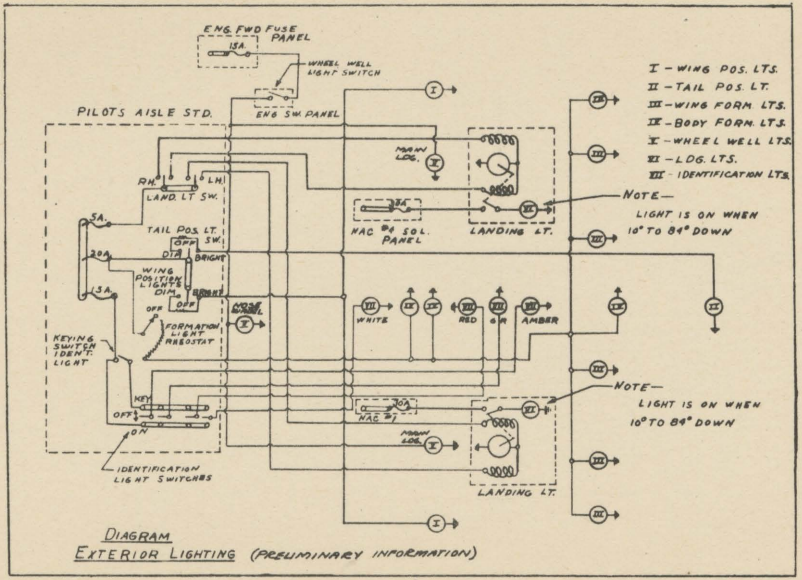
PRELIMINARY INFORMATION

DRAWN BY	C. MATSON	7-23-43	INDUCTION VIBRATOR	B-29
CHECKED BY	[illegible]	8-14-43		
APPROVED BY	[illegible]	8-14-43	BOEING AIRCRAFT CO. SEATTLE WASHINGTON	DRAWING NO. 1-30827
APPROVED BY				


ENGR'S CONTROL STAND
ENGR'S AFT FUSE PANEL
ANTI-ICER SW.
ANTI-ICER RHEOSTATS
5 AMP
ENG'RS SW. PANEL
ANTI-ICER PUMP MOTOR MOUNTED UNDER HEATH FLOOR DIRECTLY BELOW UPR. GUNNER'S SEAT BASE
BUS
PITOT SW.
PROP ANTI-ICER CIRCUIT
15 AMP.
15 AMP.
ENGINEER'S AFT. FUSE PANEL
PITOT HEATER CIRCUIT
(PRELIMINARY INFORMATION)


INTERIOR LIGHTING
(PRELIMINARY INFORMATION)
BBDR'S TABLE LT.
CO-PILOT'S AUX. PANEL
ENG. AUX. SW. PANEL
ENG. SW. PANEL
COMPASS LT. RHEOSTAT
CO-PILOT'S INST PANEL
COMPASS LIGHT
CO-PILOT'S FLO. LIGHTS
ENG. FLO. LIGHTS
FWD B&LT SW.
115AMP BUS
ENG. FWD. FUSE PANEL
CO-PILOT'S SPOTLIGHT
RADIO OPER. LT.
RADIO OPER. SPOTLIGHT
STA. 122 DOME LT.
PILOT'S SPOTLIGHT
NAVIGATOR'S SPOTLIGHT
STA. 206
BBDR'S FLO. LT.
PILOT'S FLO. LTS
BBDR'S CONTROL PANEL
PILOT'S AUX. PANEL
NAV. TABLE LIGHT
STA. 216
STA. 310.5
STA. 553
RH GUNNER'S SPOTLIGHT
STA. 646 FUSE SHIELD
SAMP BUS
STA. 483
STA. 527
AFT. B.B. LT. SW.
STA. 637
STA. 383
STA. 750
STA. 695
TOP GUNNER'S SPOTLIGHT
LH GUNNER'S SPOTLIGHT
STA. 834
REAR GUNNERS EXTENTION LIGHT
STA. 1110
DOME LT. SW.
REAR GUNNERS SPOTLIGHT
STA. 1076
STA. 322
2SAMP BUS
BATTERY SOLENOID JUNCTION SHIELD

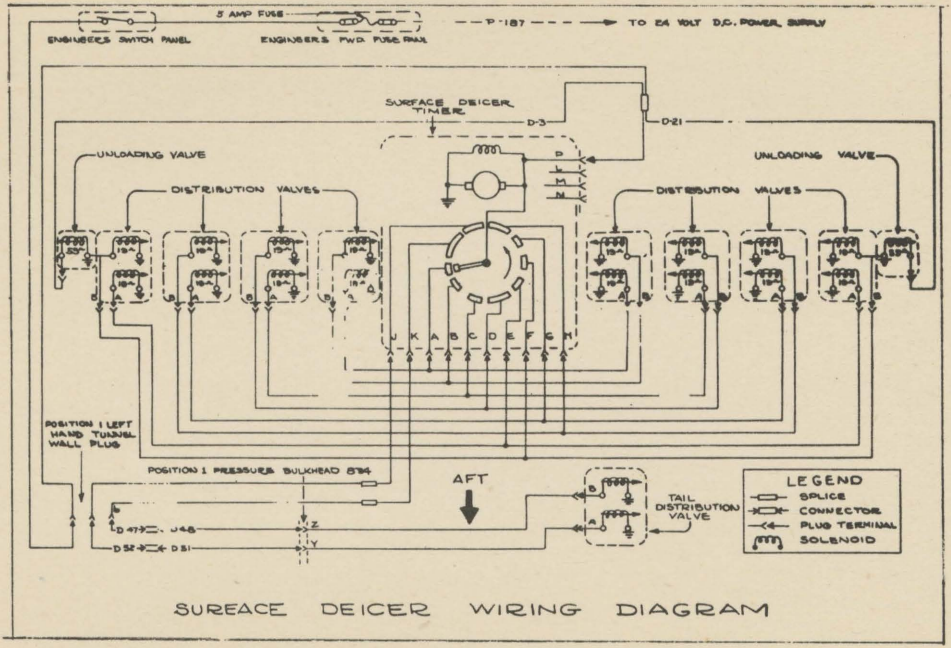

BATTERY SOLENOID SHIELD
20A
BATTERY
NORMAL
EMERGENCY
PILOT'S EMERGENCY
OFF
ON
BATT.
BATT. SWITCH
IGNITION SWITCH
IND. VIBRATOR
MAGNETO - 4 ENGINE
TO START SWITCH
STARTER MESHING SOLENOID
TO SPARK PLUGS
DISTRIBUTORS
R
L
IGNITION SYSTEM
(PRELIMINARY INFORMATION)
V.W.



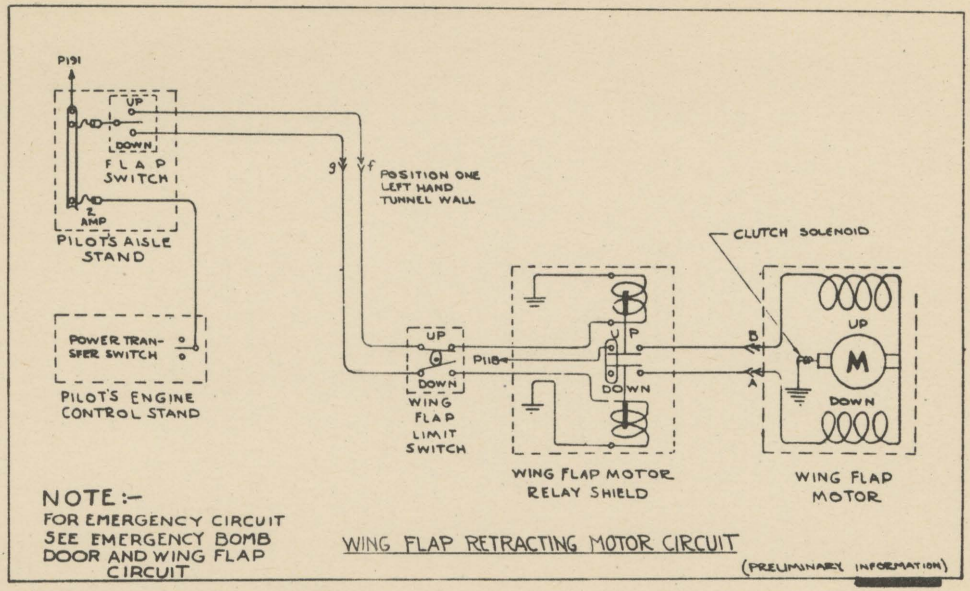
DIAGRAM

EXTERIOR LIGHTING (PRELIMINARY INFORMATION)

CHECKED SUTTERLY



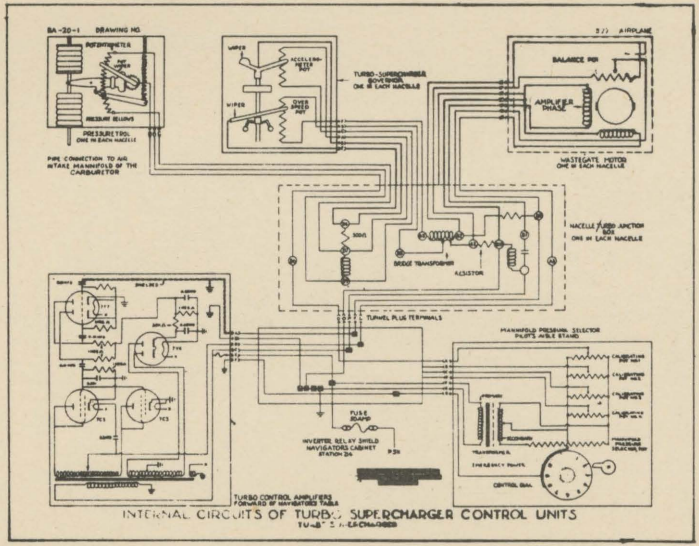
SUREACE DEICER WIRING DIAGRAM



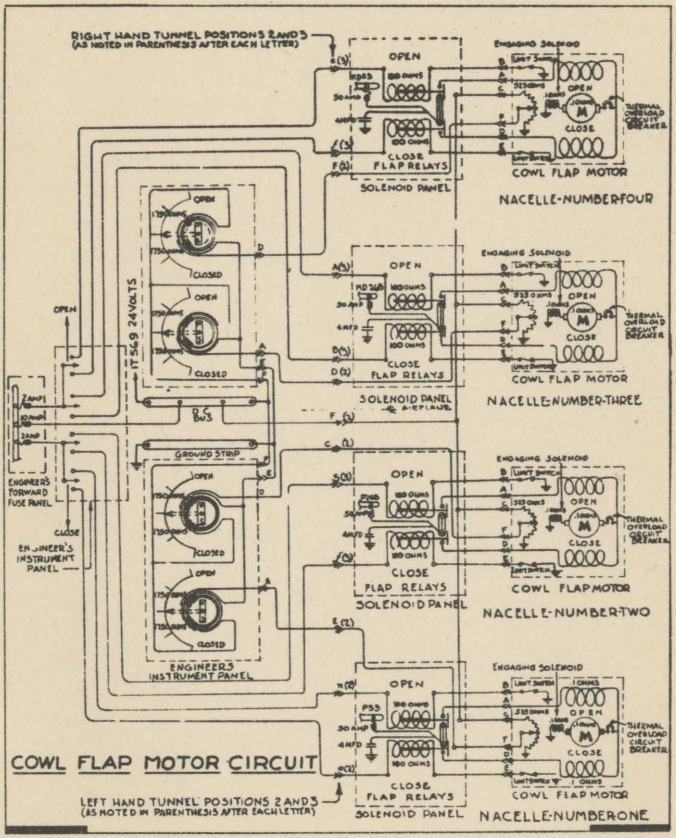
NOTE:-
FOR EMERGENCY CIRCUIT SEE EMERGENCY BOMB DOOR AND WING FLAP CIRCUIT

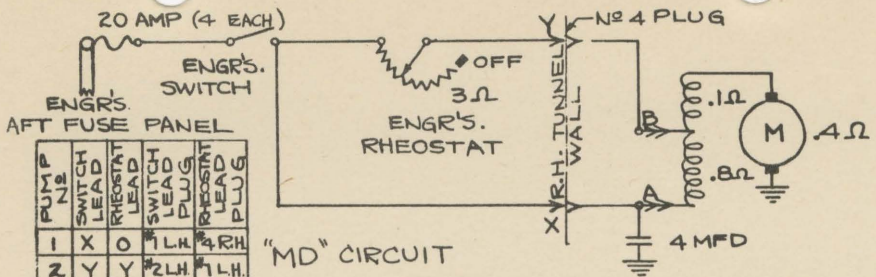
WING FLAP RETRACTING MOTOR CIRCUIT

(PRELIMINARY INFORMATION)

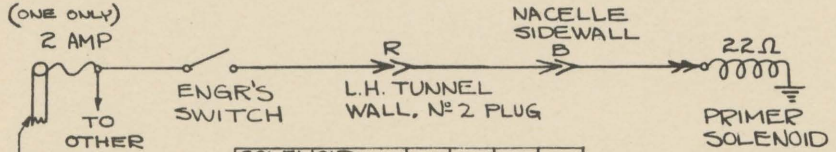


INTERNAL CIRCUITS OF TURBO SUPERCHARGER CONTROL UNITS


RIGHT HAND TUNNEL POSITIONS 2 AND 3
(AS NOTED IN PARENTHESIS AFTER EACH LETTER)
OPEN
CLOSE
FLAP RELAYS
SOLENOID PANEL
ENGAGING SOLENOID
THERMAL OVERLOAD CIRCUIT BREAKER
COWL FLAP MOTOR
NACELLE-NUMBER-FOUR
NACELLE-NUMBER-THREE
NACELLE-NUMBER-TWO
NACELLE-NUMBERONE
IT 5&9 24 VOLTS
BUS
GROUND STRIP
ENGINEER'S FORWARD FUSE PANEL
ENGINEER'S INSTRUMENT PANEL
ENGINEER'S INSTRUMENT PANEL
COWL FLAP MOTOR CIRCUIT
LEFT HAND TUNNEL POSITIONS 2 AND 3
(AS NOTED IN PARENTHESIS AFTER EACH LETTER)

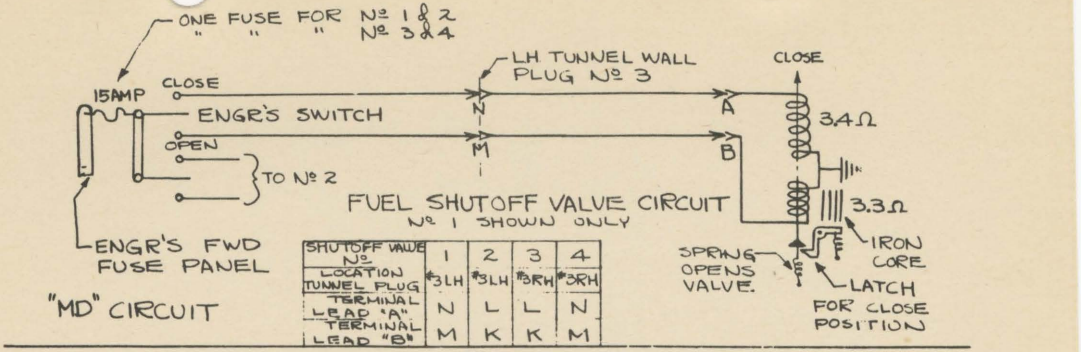


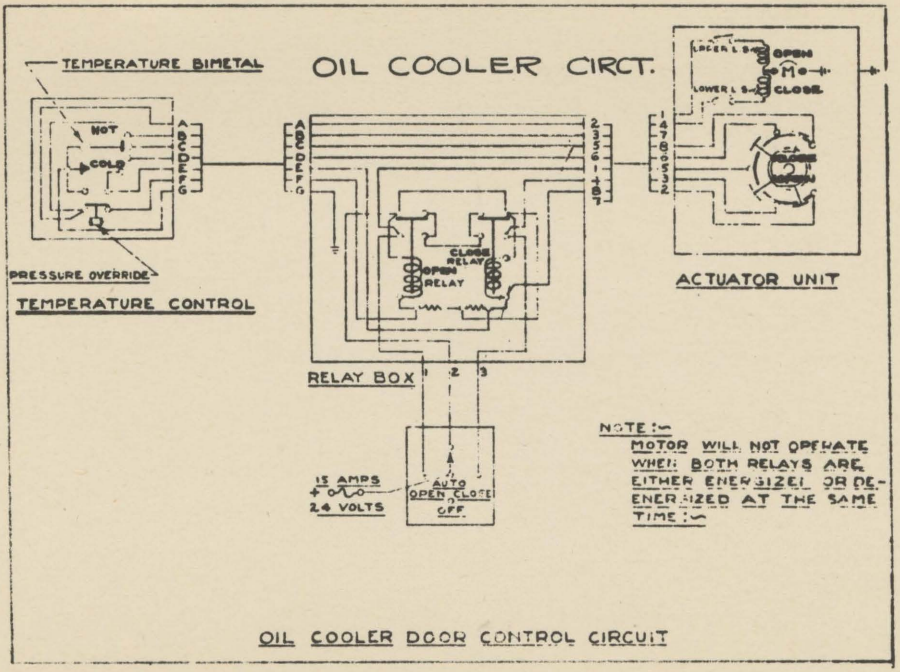
PUMP Nº	SWITCH LEAD	RHEOSTAT LEAD	SWITCH LEAD PLUG	RHEOSTAT LEAD PLUG
1	X	O	#1 L.H.	#4 R.H.
2	Y	Y	#2 L.H.	#1 L.H.
3	X	Y	#4 R.H.	#4 R.H.
4	U	R	#2 R.H.	#4 R.H.

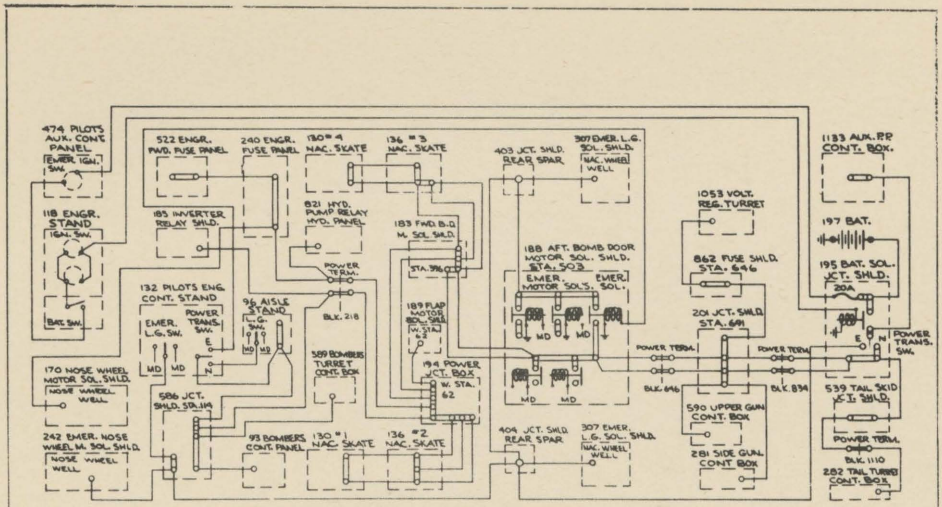


SOLENOID Nº	1	2	3	4
TUNNEL PLUG TERMINAL	R	S	R	S
TUNNEL PLUG LOCATION	#2LH	#2LH	#2RH	#2RH
NAC. FIREWALL PLUG TERMINAL	B	C	I	H

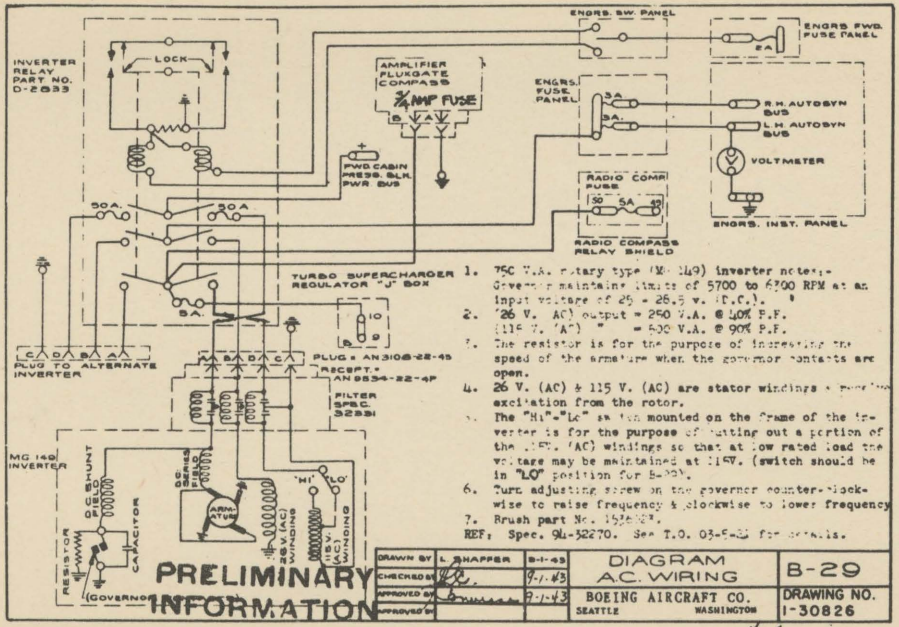
ENGINE PRIMER SOLENOID CIRCUIT
ONLY Nº 1 CIRCUIT SHOWN


ONE FUSE FOR Nº 1 & 2
" " " Nº 3 & 4
15AMP
CLOSE
ENGR'S SWITCH
OPEN
TO Nº 2
ENGR'S FWD FUSE PANEL
"MD" CIRCUIT
LH TUNNEL WALL PLUG Nº 3
N
M
A
B
CLOSE
3.4Ω
3.3Ω
IRON CORE
SPRING OPENS VALVE.
LATCH FOR CLOSE POSITION
FUEL SHUTOFF VALVE CIRCUIT
Nº 1 SHOWN ONLY
SHUTOFF VALVE Nº
LOCATION TUNNEL PLUG
TERMINAL LEAD "A"
TERMINAL LEAD "B"
1 2 3 4
*3LH *3LH *3RH *3RH
N L L N
M K K M
HYDRAULIC SYSTEM CIRCUIT
WARNING CIRCUIT "W"
POWER " "P"
PRESSURE WARNING NORMAL SYSTEM
JUNCTION SHIELD FWD. FRES. BLK.
M
TO EMER ACCUMULATOR
EMER. PRESS. WARNING
ENGR'S OVER-RIDE SWITCH
EMER PRESS. SWITCH (900 PSI)
WARNING SWITCH (600 PSI)
MOTOR SHUTOFF (2400 PSI)
A
D
C
B
SPRING
MOTOR SWITCH (2400-1000 PSI)
BOURDON TUBE
2AMP
10 AMP
ENGR'S. FWD FUSE PANEL
ENGR'S. AFT FUSE PANEL


OIL COOLER CIRCT.
TEMPERATURE BIMETAL
HOT
COLD
PRESSURE OVERRIDE
TEMPERATURE CONTROL
A B C D E F G
A B C D E F G
CLOSE RELAY
OPEN RELAY
RELAY BOX
1 2 3
2 3 5 6 1 4 7
1 4 7 8 9 5 3 2
UPPER L.S.
OPEN
LOWER L.S.
CLOSE
ACTUATOR UNIT
15 AMPS
24 VOLTS
AUTO
OPEN CLOSE
OFF
NOTE :-
MOTOR WILL NOT OPERATE WHEN BOTH RELAYS ARE EITHER ENERGIZED OR DE-ENERGIZED AT THE SAME TIME :-
OIL COOLER DOOR CONTROL CIRCUIT



D. C. POWER SYSTEM



1. 750 V.A. rotary type (Mfr. 142) inverter motor-Governor maintains limits of 5700 to 6300 RPM at an input voltage of 25 - 28.5 v. (D.C.).
2. 26 V. (AC) output = 250 V.A. @ 40% P.F.
   115 V. (AC) " = 500 V.A. @ 90% P.F.
3. The resistor is for the purpose of increasing the speed of the armature when the governor contacts are open.
4. 26 V. (AC) & 115 V. (AC) are stator windings & receive excitation from the rotor.
5. The "Hi"-"Lo" switch mounted on the frame of the inverter is for the purpose of cutting out a portion of the 115 V. (AC) windings so that at low rated load the voltage may be maintained at 115V. (switch should be in "LO" position for 5-20).
6. Turn adjusting screw on the governor counter-clockwise to raise frequency & clockwise to lower frequency.
7. Brush part No. 15[illegible].

REF: Spec. 9L-32270. See T.O. 03-5-2[illegible] for details.

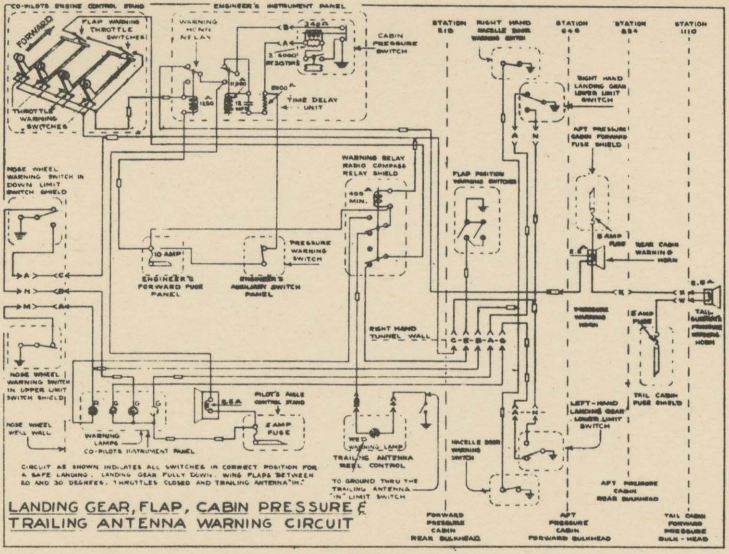
DRAWN BY	L. SHAPPER	8-1-43	DIAGRAM A.C. WIRING	B-29
CHECKED BY	[illegible]	9-1-43		
APPROVED BY	[illegible]	9-1-43	BOEING AIRCRAFT CO. SEATTLE WASHINGTON	DRAWING NO. 1-30826
APPROVED BY				

#1

SEP [illegible] 1943

BA-20-1 Drawing No

B 29 AIRPLANE



LANDING GEAR, FLAP POSITION, CABIN PRESSURE AND TRAILING ANTENNA WARNING CIRCUIT

REG. H CARTER

Pvt. Edwin H. Bellair