

PILOTS' AMPLIFIED CHECK-OFF LIST

B-24D, E, & G AIRPLANES



CONSOLIDATED VULTEE AIRCRAFT CORPORATION

ZM-32-059

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GENERAL

1. Form No. 1 — Loading and Passenger List.
 - a. Pilot will thoroughly check the Form No. 1 and Form No. 1A, and sign the exceptional release if necessary. He will ascertain that the passenger list is correct, that the proper type and number of parachutes and oxygen masks are aboard and that the airplane is loaded within the allowable C.G. limits.
2. Engineer's Report. Contains all items on engineer's preflight check.
3. Set Parking Brakes. Depress pedals fully and set lever in UP position. Adjust seat, rudder pedals and safety belt.
4. Wheel Chocks removed. It is recommended that wheel chocks be removed at this time to obviate the danger to ground personnel who will otherwise have to remove the chocks with engines running. The present system is a carry-over from the days when airplanes were small and did not have parking brakes.
5. Pitot Head Covers removed.
6. Control Check.
 - a. Unlock and stow strap.
 - b. Check for fully depressed position of locking lever.
 - (1) Full forward and full right on wheel. Full right rudder.
 - (2) Full rear and full left on wheel. Full left rudder.
 - (3) Controls neutral.

Engineer will check and call out positions of control surfaces.
Order of calling out will be Aileron; Rudder; Elevator.
7. Pilot will check with engineer to ascertain that generators are OFF.
8. Fuel Valves.
 - a. 1 to 1, 2 to 2, 3 to 3, 4 to 4, for take off.
9. Auto Pilot.
 - a. All Auto Pilot switches must be OFF for takeoff. This applies under *All* conditions.
10. Deicers (Wing).
 - a. Valve in OFF position.
 - b. Check full deflation of all boots, visually.

Anti-Icers.
Check Propeller Anti-icer Rheostat OFF.
Check Carburetor Anti-icer Switches OFF.

11. Intercoolers OPEN. In the OPEN position cooling of the air being compressed by the Turbosupercharger is accomplished.
12. Main Line and Battery.
 - a. Upon direction from pilot, co-pilot will check magneto switches OFF and turn on battery switches and Main Line "bar" switch.
13. Auxiliary Power Unit.
 - a. To be started by engineer at pilot's direction and left running until generators are turned on just before takeoff.
14. A. C. Power.
 - a. Check both inverters.
15. Auxiliary Hydraulic Pump.
 - a. Leave off until other main switches are ON. Pilot checks with engineer that it is turned on at this time.
16. Cowl Flaps.
 - a. Pilot and co-pilot check visually to be sure all Cowl Flaps are in full open position.
17. Turbo Controls.
 - a. Place controls in OFF position.
18. High RPM.
 - a. Hold switches in increase position and check all four lights ON.
19. Idle Cut-Off.
 - a. Place mixture controls in Idle Cut-Off position.
20. Check Directional Gyro and Flight Indicator UNCAGED.
21. Check Carburetor Air Filter for proper setting. Filter should be used for dusty operations but should *not* be used when no dust is being encountered. Specific instructions will be issued when tests are complete.

STARTING ENGINES

1. Fire Guard.
 - a. Visually check that Fire Guard is posted at proper station for engine to be started. *All* propellers must be clear during entire starting procedure.
2. Ignition Switches.
 - a. Turn all ignition switches to "Both On" before starting first engine.
3. Booster Pumps.
 - a. Turn all boosters ON before starting first engine.
 - b. Check fuel pressures. Booster pumps should supply approximately 8 lbs. pressure before engines are started.

4. Start Engines.

- a. Prime 4 to 5 seconds with individual engine priming switch while starter is being energized. Energizing requires 12 seconds on NEW type starters and 20 seconds on OLD type starters.
- b. Set all Throttles at 1/3 open position.
- c. Mesh Starter. On OLD type starters the energizing switch is thrown over to MESH position. On NEW type, continue to hold energizing switch down and operate meshing switch.
- d. If engine does *not* fire immediately use additional prime.
- e. As soon as engine fires, move Mix Control to Auto Lean and check for oil pressure rise. Oil pressure *must* come up in 30 seconds to prevent damage to engine.
- f. If engine stops, return Mix to Idle Cut-Off and repeat whole procedure to re-start.
- g. Set throttle to obtain a steady idling speed of 1000 RPM.
- h. Turn booster pump off after engine is idling.
- i. Starting sequence:
 - (1) Electrically: 3, 4, 2, 1.
 - (2) Manually: 1, 2, 3, 4.

5. Flight Indicator.

- a. When engine operating vacuum pump is started, check Flight Indicator for rapid erection. This is an important operational test of the instrument and must be carefully checked to assure the pilot that this instrument is in good condition. Vacuum pumps are operated by No. 1 and No. 2 engines.

RADIO ON

1. Turn switches on desired Command Receiver to proper positions. Turn transmitter switch to ON. Set selector to desired transmitting frequency. Turn volume controls on Jack boxes to maximum output. Set selector switch on Filter box to Voice and selector switch on Jack box to Command.

BEFORE TAXIING

1. Check All Instruments for proper operation. Tolerable limits permit so much variance that no readings need be considered at this time.
 - a. Oil Pressure.
 - b. Oil Temp.
 - c. Head Temp.

- d. Fuel Pressure.
 - e. Carburetor Air Temperatures.
 - f. Free Air Temp.
 - g. Tachometers.
 - h. Manifold Pressures.
 - i. Hydraulic Pressures.
 - j. Clock.
 - k. Magnetic Compass.
 - l. Landing Gear Warning Light.
2. Vacuum Pressures.
 - a. Switch valve and check pressure on both No. 1 engine and No. 2 engine. Pressure should be between 4 and $4\frac{1}{2}$ at 1000 RPM.
 3. Altimeter.
 - a. Radio check with tower. Obtain Landing Pressure, set on Altimeter, compare reading with surveyed elevation of field. Report any discrepancy of 50 feet or more to tower. Note whether instrument reads too high or too low, and how much, for future reference.

ENGINE RUN UP

1. Exercise Turbos, Flaps, and Props.
 - a. Place all mixture controls in Auto Rich and set throttles to obtain 1500 RPM.
 - b. At 1500 RPM with Props in full high RPM position (lights on) slowly push turbo regulators to full ON position. Run Props to full low RPM (Prop lights on again) then back to high RPM (lights on again) and slowly return turbos to OFF position.
 - c. Co-pilot runs flaps down full 40° and up while pilot is exercising props.
 - d. Repeat procedure three times if outside Air Temp. is below 0° Centigrade.
 - e. Set throttles at 1200 RPM. Return Mix to Auto Lean.
2. Run Up Engines in order No. 4, No. 3, No. 2 and No. 1.
 - a. Set Mix to Auto Rich for engine to be run up. No. 4 engine.
 - b. Open No. 4 throttle to 2000 RPM. Check mags. (Turn to L. mag. and back to Both, turn to R. mag. and back to Both. Do not operate on one Mag. for more than 5 seconds at one period.) Roughness as determined by visual check of nacelles is a better check of ignition operation than RPM drop. Check *Both*.
 - c. Advance throttle to full open position and *bold*. Check Engine Instruments for proper readings.

- d. Advance Turbo and set carefully to 47 inches. This setting allows 2 inches for ram during takeoff run. Maximum allowable is 49 inches. During this operation the Turbo control lock should be tightened to provide the friction necessary to hold the control at set position. Excessive tightening is not desirable. Check RPM to read 2700 maximum.
- e. Reduce throttle slowly to 1200 RPM and return Mix to Auto Lean.
- f. Repeat with No. 3, No. 2 and No. 1 engines in this sequence.

BEFORE TAKEOFF

1. Doors and Hatches.
 - a. Close Bomb Doors.
 - b. Close and latch Top Hatch.
 - c. Check Main Entrance Hatch. Closed and secure.
2. Gyros.
 - a. Pilot will set directional gyro to correspond to Magnetic Compass. When lined up for takeoff, check reading to correspond with runway heading. This provides two checks, one on the Magnetic Compass and one on runway to be used.
3. Wing Flaps.
 - a. Upon direction from Pilot, Co-pilot will extend flaps to 20° down and confirm to Pilot. Old procedure of running flaps down on No. 3 engine run up is discontinued as unnecessary.
4. Generators.
 - a. Upon direction from pilot, engineer will turn all four Generators ON. Turn auxiliary power unit OFF.
5. Booster Pumps.
 - a. Upon direction from pilot, co-pilot will turn fuel booster pumps ON.
6. High RPM.
 - a. Pilot will move gang switch to High RPM (forward position) and check all four green lights on.
7. Trim Tabs.
 - a. Pilot will check Trim Tabs for proper takeoff setting. Normal settings are 3° Right Rudder; 0° Aileron and 0° Elevator.
8. Check Controls
 - a. Pilot will move controls to Full Forward and Right on wheel. Full right rudder.
 - b. Pilot will move controls to Full Rear and Left on wheel. Full left on rudder.

9. Cowl Flaps.
 - a. Co-pilot will set Cowl Flaps to Trail, i.e., between 1/4 open and 1/3 open. Excessive Cowl Flap may cause tail buffeting on the takeoff.
10. Auto Rich.
 - a. Upon direction from pilot, co-pilot will place all Mix Controls in Auto Rich position.

TAKEOFF PROCEDURE

1. Rolling starts are normal and more easily controlled in the B-24 airplane. Standing starts present a problem in that it is very difficult to stop the Nose Wheel in perfect alignment. When it is desirable to make a Standing Start takeoff, the brakes may be held until 25" of MP is attained and brakes then released carefully to maintain heading. Special attention must be paid to the alignment of the nose wheel. It MUST be allowed to roll as it is set for a few feet before turning airplane in with brakes.
2. Apply power smoothly until takeoff power is attained. Co-pilot will follow through with left hand and when throttles are against Stop, will snub throttles enough to prevent creeping. (During takeoff, co-pilot will watch to insure manifold pressure does not exceed 49" and props do not exceed 2700 RPM. Any power reduction necessary to maintain the maximum of 49" will be made with the throttles, *NOT with the turbo regulators.*)
3. Pilot will allow ship to attain 70 MPH in 3 point position, then put ship in slightly nose high altitude and hold to 110 to 130 MPH, depending on load.

AFTER TAKEOFF

1. Co-pilot will raise gear upon signal from pilot, this signal only to be given when pilot is positive airplane is flying and under complete control.
 - a. If hand signal is used the standard thumb up signal will apply.
 - b. Pilot will brake wheels before retraction is complete.
2. Upon attaining an airspeed of 150 MPH pilot will reduce turbo regulators to approximately 45 1/2". Upon signal from pilot, co-pilot will reduce props to 2550 RPM. Co-pilot will then make even adjustment on turbo regulators at 45 1/2" and synchronize propellers. *At no time will props be reduced before reduction of manifold pressure.*

3. At 800 ft. above terrain flaps will be retracted. It is recommended that flaps be left at 5° to 10° position for climbs on instruments and/or in turbulent air due to increased stability.

Engineer checks Wheels up and Turbos for torching at pilot's direction. Check wheels with flashlight at night.

CLIMB

1. a. Power Setting 2550 — 45½" maximum.
b. Power Setting 2550 — 41" minimum.
c. Intermediate settings should be discouraged for training purposes to insure standard operation of the engines.
d. Airspeed 150 to 160 MPH.
2. In setting turbos and throttles in the air it has been found desirable to adjust Outboards and Inboards in pairs; i.e., reduce or increase No. 1 and No. 4 together and No. 2 and No. 3 together to approximately the new settings, then adjust all four accurately.
3. Booster Pumps should be turned off by co-pilot at pilot's direction. Co-pilot checks Fuel Pressure prior to turning off boosters and checks again as each pump is turned off in turn No. 1, No. 2, No. 3, No. 4.
4. Cowl Flaps.
 - a. Cowl Flaps are to be used to regulate head temperatures. Co-pilot closes when and if temperatures permit.

CRUISE

1. Approach the cruising level from top side. After reaching cruising altitude, level off, get "ON THE STEP" and pick up speed before power is reduced to cruising requirements. If power is reduced too soon and before the airplane has picked up full momentum for cruising it will mush along in a high attack, high drag attitude in trying to gain speed under reduced power and will probably be quite sluggish. Approach the cruising condition from the top, both speed and altitude, NEVER FROM BELOW.
 - a. Power Settings.
 - (1) 35.5"—2325 RPM (75% of 1100) Auto Rich (maximum for continuous cruise).
 - (2) 32"—2200 RPM (65% of 1100) Auto Lean (maximum for Auto Lean cruise).

- b. Setting for ordinary training operation.
 - (1) 30"—2000 RPM—Auto Lean.
- c. Maximum Range Setting.
 - (1) No average maximum range setting is practical. Refer to Cruising Control Charts in airplane and in manual.
- 2. a. Requirements for Automatic Lean Cruising.
 - (1) Mixture Controls — Automatic Lean.
 - (2) Oil Temperature: 75° C. Max.
 - (3) Oil Pressure: 65 to 100 PSI.
 - (4) Cylinder Head Temperature: 232° C. Max.
 - (5) Fuel Pressure: 14 to 16 PSI.
 - (6) Cowl Flaps — Closed if possible — or as required.
- b. Setting for ordinary training operation 30" — 2000 RPM — Auto Lean. At altitudes where the manifold pressure available with turbo OFF permits, set throttles to 28" with turbo controls off. Then advance turbo control to obtain additional 2". At altitudes where less than 28" is available with wide open throttle (approx. 9000' and above), set throttles against the stop and adjust to 30" by advancing turbo controls.
- 3. Mixture Controls.
 - a. If selected cruising power setting is within Auto Lean Power Limits, mixture controls may now be moved to Auto Lean position. Move controls one at a time No. 4, No. 3, No. 2, No. 1. Co-pilot's duty.
- 4. A. C. Power.
 - a. Check both inverters by observing operation of Auto-Syn Instruments.
- 5. A visual check of Turbos, Cowl Flaps, Nacelles, etc., should be made at least every half hour. Engineer must go to rear of ship for this inspection. Extreme care must be exercised at High Altitude to avoid accidents due to oxygen want among personnel. This check may be postponed at 15000 ft. and above at discretion of pilot.
- 6. Fuel Gauges and Checks.
 - a. Set up Form and take hourly readings, regardless of Gauge dependability. Save completed Form for future comparison.

BEFORE LANDING

- 1. Pilot or co-pilot will call Control Tower on Radio and get Altimeter Setting and landing information for field. Should repeat Altimeter setting to tower to eliminate any mistake.

2. Pilot will check crew positions for proper loading and ascertain that nose is clear.
3. Pilot will turn off Automatic Pilot. *All* switches to eliminate possibility of accidental engaging.
4. Pilot will direct co-pilot to put Booster Pumps in the ON position. At this time, all booster pumps may be turned on at once as no advantage accrues from noting gauge readings separately.
5. Upon direction from pilot, co-pilot will set mixtures in Auto Rich.
6. Pilot will check intercoolers for desired position. Open unless icing is suspected.
7. Upon direction from pilot, co-pilot will check Wing Deicers for OFF position. A visual check must be made for deflation of Boots.
8. Auxiliary Power Unit OFF unless required due to generator failure: Engineer will leave generators ON.
9. Landing Gear: Pilot will reduce throttle to obtain Airspeed of 155 and will direct co-pilot to lower landing gear by either a verbal command or a thumb down movement of the hand.
 - a. Put the gear lever in the UP position, check kick-out pressure 1050-1100, then place the gear lever in the DOWN position.
 - b. After the gear is down a visual check must be made by the engineer for proper locking of Main and Nose Gear. Flashlight will be used for checking locks at night.
 - c. Pilot checks green light ON.
 - d. Co-pilot will put gear lever in DOWN position to check kick-out pressure.
10. Pilot will direct engineer to turn on Electric Hydraulic Pump.
11. Pilot will check Brake Pressure Gauge for proper pressure, 850 lbs. to 1125 lbs.
12. Upon direction from pilot, co-pilot will increase RPM to 2400.
13. Upon direction from pilot, co-pilot will lower Wing Flaps. Lower 20° of Flaps before entering turn onto base leg. The pilot may give this order verbally or with a hand movement. A palm down movement of the hand is the standard signal.

FINAL APPROACH

1. Pilot will set Turbo Controls to one finger width from stops to insure sufficient power if approach is missed.
2. Upon direction from pilot, co-pilot will extend the flaps to landing position. The full 40° will be used for all normal operations.
3. Co-pilot will call out airspeed to pilot on final approach to insure safe flying speed.

AFTER LANDING

1. Co-pilot will open the Cowl Flaps after the airplane is on the ground and under control.

END OF LANDING ROLL

1. After the plane has lost momentum and the taxiing has started, pilot will direct co-pilot to retract Wing Flaps.
2. Pilot will place the Turbos in the OFF position.
3. Pilot will direct co-pilot to place the props in high RPM and check lights.
4. Co-pilot will place Mixtures in Auto Lean.
5. Co-pilot will turn off Booster Pumps.
6. Pilot will reset trim tabs to normal takeoff settings.

SECURING AIRPLANE

1. Engines.
 - a. Co-pilot will place Mixture Controls in Idle Cut-off at pilot's direction. After engines stop, co-pilot will turn all ignition switches to OFF.
 - b. Throttles will be advanced before engines stop rotating.
2. Radio.
 - a. Co-pilot will turn Compass, Command Receiver, and Transmitter to OFF and check Liaison Set Off.
3. Switches.
 - a. All electrical switches should be turned OFF before turning off Main Line (Bar switch above ignition switches) and Battery Switches (above ignition and main line switches). A. C. Power switch must not be turned OFF until engines are stopped and engine instruments have settled at neutral positions. Turn OFF Main Line and Battery Switches LAST. This procedure will eliminate arcing of relays at this time and heavy load on battery, when these switches are again turned on.
4. Chocks.
 - a. Pilot will hold ship stopped with brakes until chocks are in place. Brakes should then be released to facilitate cooling and prevent expander tube failure.
5. Gear Lever.
 - a. Pilot will place Gear Lever in DOWN position before leaving seat to insure proper equalization of pressures in the hydraulic system.

6. Controls Locked.

- a. Pilot will align controls in neutral position. Co-pilot will slowly engage lever and secure with strap and hook provided. Pilot will check to be sure that controls are actually locked against movement in any direction. Pawls engage in following sequence: Rudder, Elevators and Ailerons.