Consolidated B-24 Liberator

USER MANUAL
Introduction

The Consolidated B-24 Liberator became a major player for Allied forces during World War 2. Its exploits ranged the world over - as did her users - and she saw action in a variety of roles in all major theatres. Designed to overtake the mythical Boeing B-17 Flying Fortress and appearing as a more modern design in 1941, the Liberator fell short of this goal but instead operated side-by-side with her contemporary to form a powerful hammer in the hand of the Allied bombing effort. Though the B-17 ultimately proved the favourable mount of airmen and strategic personnel, one cannot doubt her impact in the various roles she was assigned to play in. The Liberator went on to become the most produced American aircraft of the entire war.
Credits

Model, animations, manual – Virtavia
Textures – Dan Dunn of Pixl Creative
Gauges – Herbert Pralle/Virtavia
Flight Dynamics - Mitch London
Engine Sounds - TSS
Testing - Frank Safranek, Mitch London
Support

Should you experience difficulties or require extra information about the Virtavia B-24 Liberator, please e-mail our technical support on tech.support@virtavia.com

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Exterior Model

The exterior model has all the usual animations such as ailerons, elevators and flaps. There is no external exit door on the model, crew entry was through bomb bay.

Bomb Bay Doors

These are animated using the 2nd Exit command (shift-e, then tap 2).

Crew figures, Waist Gunner, Bombs and Flag

Refer to the section on the Visual Load Editor section below.
Exterior Lighting

Pressing the L key will turn on all lights. You may however wish to turn them on using the appropriate switches in the cockpit, as the L key also turns the on navigation, landing lights and both instrument and red flood lighting in the cockpit, which should ideally be switched separately.

Shift-L will toggle the nav lights and the cockpit lights.

Crtl-L will toggle the landing lights.

Please refer to the cockpit section of this manual for information regarding light switch location.

View Options

There are several different ways of looking at the aircraft and the cockpit, select these alternative views by right-clicking in an empty area and picking the 'Aircraft' menu for external views and the 'Cockpit' menu for views inside the cabin. It is possible to zoom and pan as normal in these alternative views. Cycle though the available ones by pressing the A key.
Visual Load Editor (VLE)

By pressing Shift + 7, you can bring up the VLE.

**Bombs** - will display or hide the bomb load in the bomb bay.

**Waist Gunner** - when activated will remove the side windows and a gunner will man the guns.

**Crew** - toggles the crew.

**Flag** - will toggle a customisable flag from the cockpit window. Make sure to open the cockpit window using shift + e first.
## Instrument Panels

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Door / Bomb Bay Lights</td>
<td>Viewpoint Adjust Switch</td>
<td>Low Hydraulic Pressure Light</td>
<td>Copilot’s Panel Icon</td>
</tr>
</tbody>
</table>

![Instrument Panels Diagram](image-url)

**Virtavia Consolidated B-24 Liberator**

**Manual Version DTG 1.0**
Autopilot

- High Deflection Indicator Lights
- Speed Selector
- Master Switch
- Course Selector
- Heading Selector
- Altitude Selector
- Mode Switches*

- Approach / Backcourse Selector
- NAV / GPS Mode Switch
- Vertical Speed Selector
- Master ON Light

* When activated, the current values like the actual airspeed are held

Fuel & Electric Panel

- Fuel Indicators (for selected tank)
- Fuel Crossfed Switches
- Generator Voltmeters
- Voltmeter Selector
- Generator Switches
- Amperemeter
- Selectors for Fuel Indicators
Radio Panel

- Light Switch (for all Radios)
- COMM Frequency
- Tuning Knobs
- COMM 1 / 2 Selector

Identification Sound Switches
- DME Indicator
- NAV1 Signal Strength Indicator
- Transponder

Light Switch (for all Radios)
- NAV1 Frequency
- NAV / GPS Mode Switch
- Tuning Knobs

Light Switch (for all Radios)
- ADF Frequency
- ADF Signal Strength
- Tuning Knobs
NOTE: A power calculator in MS Excel format is included with the package. It can be found in the model’s folder in DLC\602818\SimObjects\Airplanes.
Reference Information

Virtavia B-24 Liberator Procedures

**Engine Start:**

1. Ensure battery master switch is ON.
2. Ensure sufficient fuel exists for an engine start.
3. Ensure mixture levers are at their full rich position (100%).
4. To start the engines in the correct sequence, click the correct area of the dual-position starter switch of engines #3/#4 to start engine #3 (inner right) first; the engine should immediately turn over.
5. Monitor engine parameters.
6. Repeat the steps for engine #4 (outer right), #2 (inner left), #1 (outer left). **NOTE:** For simplified procedure, Ctrl+E for auto-engine start. The engines will start in numerical sequence with this method.

**Taxi Checklist (All weights):**

1. Verify that all engines are running within normal parameters.
2. Slowly increase power on all engines equally until reaching 1200 RPM; this is achieved at approximately 17 In. Hg manifold pressure. The aircraft will taxi at this power setting even at its heaviest weights.
3. For left or right turns, avoid using differential braking. Perform the turn using nose wheel steering at the lowest reasonable speed (at or below 10kts GS).

**Takeoff at normal loaded weight of 64,000lbs (applicable to all takeoff weights):**

1. Ensure sufficient fuel for the mission.
2. Set pitch trim to 1.5° aircraft nose-up.
3. Set flaps to 20° (Flap position 3).

4. Open cowl flaps to their 50% position on all engines.

5. Ensure turbochargers are appropriately set and propeller RPM is at its maximum position, and slowly apply full power on all engines (press F4 to ensure throttle is fully-forward).

6. At 100 mph IAS, apply back pressure to the control wheel. The intention is to remove the weight from the nose wheel. The nose will slowly begin to rise. Once the nose wheel is off the ground, hold this attitude, but be careful not strike the tail-skid.

7. The aircraft will lift off the runway on its own around 125 mph IAS assuming the correct shallow pitch attitude is maintained by back pressure on the control wheel.

8. Depress wheel brakes once airborne to stop wheels.

9. Retract landing gear.

10. Retract flaps to the 10° setting at 140 mph IAS (Flap position 2).

11. Retract flaps fully at 155 mph IAS (Flap position 0), continue to climb checklist.

12. As the flaps are retracted, the loss of lift may cause a loss in vertical speed. Be sure to compensate for the momentary sink by increasing back pressure on the elevator and/or elevator trim to maintain a positive climb rate.

**Climb (all weights):**

1. Continue accelerating to 170 mph IAS. This is the ideal climb speed for a heavily-loaded B-24.

2. After reaching climb speed, reduce manifold pressure to 46 In. Hg, and reduce engine RPMs via the propeller RPM switches to 2600 RPM. This is the climb setting.
3. During the climb, you will have to adjust at a minimum the engine mixture levers. The recommended mixture settings vs. altitude are as follows:

1. 1000ft: 70%
2. 2500ft: 60%
3. 5000ft: 50%
4. 10000ft: 40%
5. 15000ft: 25%
6. 20000ft: 20%
7. 25000ft: 15~16%

**NOTE:** If you are using the turbocharger system, you will need to also increase the turbocharger power as you climb. The turbocharger will allow you to maintain manifold pressure up to the critical altitude.

**Cruise:**

1. The B-24 was designed to cruise at 25,000ft. This should be the desired cruise altitude in all configurations. **NOTE:** If using autopilot vertical speed hold, manually reduce the vertical speed as you approach the desired altitude to assist the autopilot altitude capture mode. Use 500ft below desired altitude as the anticipation altitude for leveling out.

2. For cruise, slowly reduce the manifold pressure to approximately 32 In. Hg, and then reduce the propeller RPM switches until gauges indicate 2200 RPM.

3. At altitudes at or exceeding 25,000ft and airspeeds at or below 155 mph, it is recommended that flaps 8° (Flap position 1) be used to reduce the cruise pitch. This flap setting increases lift without seriously degrading the wing's drag profile. Flying with this flap setting above 170 mph may create a ballooning effect so it is advised to only use this setting during cruise.
4. The recommended cruise speed for the B-24 is between 145-150 mph IAS. Adjust the manifold pressure to achieve this speed. As weight decreases on the aircraft, manifold pressure should be reduced to maintain the recommended cruise speed.

**Fuel burn estimates (at high gross weight):**

<table>
<thead>
<tr>
<th>Altitude</th>
<th>Airspeed</th>
<th>Fuel Burn</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 ft</td>
<td>250 mph</td>
<td>840 gal/hr</td>
</tr>
<tr>
<td>25,000 ft</td>
<td>146 mph</td>
<td>320 gal/hr</td>
</tr>
<tr>
<td>25,000 ft</td>
<td>195 mph</td>
<td>832 gal/hr</td>
</tr>
</tbody>
</table>

= Optimum Cruise, all speeds indicated

**Descent:**

1. The B-24 should descend at a low speed. It is not recommended to quickly idle the engines for a steep descent in order to avoid flash-cooling the engines.

2. Ideally a descent in the B-24 from 25,000ft should take at least 40 minutes, with a very shallow descent rate.

3. It is up to the pilot to decide how to descend, but the aircraft’s maximum speed must never be exceeded for any situation during descent.
Approach and landing ~ 41,000lbs

1. Slow the aircraft to 200 mph, or the recommended pattern speed.
2. Lower the landing gear at or below 200 mph IAS.
3. Set flaps 10° (flap position 2) at 155 mph IAS.
4. Set flaps 20° (flap position 3) at 125 mph IAS.
5. Set flaps 40° (flap position 4) at 110 mph IAS.
6. At landing weight of 41,000lbs final approach speed should be approximately 100-110 mph IAS.
7. At 10ft AGL, slowly retard the throttles.
8. The B-24J does not exhibit a significant ground effect, so a slight flair is required, but be sure not to scrape the tail skid.

**NOTE:** Aerodynamic braking is not recommended in the B-24. It is more effective to get all the wheels on the ground and use wheel brakes to slow the aircraft.
B-24 Liberator Specifications and Speed References

Specifications

- Engines: 4 × Pratt & Whitney R-1830-35 or -41 turbo-supercharged radial engines
- Horsepower: 1,200 s.h.p. per engine
- Wingspan: 110 ft 0 in (33.5 m)
- Length: 67 ft 8 in (20.6 m)
- Tail Height: 18 ft 0 in (5.5 m)
- Never-exceed speed: 250 kts
- Maximum range: 3200 nm
- Empty Weight: 36,500 pounds
- Typical TO Weight: 58,000 pounds
- MTOW: 65,000 pounds
- Fuel Capacity: 2,814 US Gal. Internal
- Drop tanks: 390 US Gal. Each
- Initial climb rate: 1,200 ft/min
- Service ceiling: 30,000 ft
- Guns: 10 × .50 caliber (12.7 mm) M2 Browning machine guns in 4 turrets and two waist positions
- Bombs: up to 8,000 pounds (3,600 kg)
- Crew: 7 - 11

Aircraft Limitations:

<table>
<thead>
<tr>
<th>Stall speed, clean:</th>
<th>115 mph IAS (max gross weight)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max gear extension:</td>
<td>155 mph IAS</td>
</tr>
<tr>
<td>Max gear retraction:</td>
<td>155 mph IAS</td>
</tr>
<tr>
<td>Max indicated airspeed:</td>
<td>355 mph IAS</td>
</tr>
<tr>
<td>Max speed, Sea Level:</td>
<td>250 mph (212 KIAS)</td>
</tr>
<tr>
<td>Max speed, 25,000 ft:</td>
<td>290 mph (190 KIAS)</td>
</tr>
<tr>
<td>Maximum G:</td>
<td>2.67 / -2.00</td>
</tr>
</tbody>
</table>
Notes on configuration and load-out:

All applicable load stations are included in the configuration file. In the event the user wishes to use a model with particular load-out, they will need to add weight to the particular load station. The recommended and researched weights for each load station are as follows:

<table>
<thead>
<tr>
<th>Station_load.x</th>
<th>Description</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Station_load.0</td>
<td>Pilot</td>
<td>220.00 lbs</td>
</tr>
<tr>
<td>Station_load.1</td>
<td>Copilot</td>
<td>220.00 lbs</td>
</tr>
<tr>
<td>Station_load.2</td>
<td>Flight Engineer</td>
<td>220.00 lbs</td>
</tr>
<tr>
<td>Station_load.3</td>
<td>Navigator</td>
<td>220.00 lbs</td>
</tr>
<tr>
<td>Station_load.4</td>
<td>Bombardier</td>
<td>220.00 lbs</td>
</tr>
<tr>
<td>Station_load.5</td>
<td>Nose Gunner</td>
<td>220.00 lbs</td>
</tr>
<tr>
<td>Station_load.6</td>
<td>Waist Gunner</td>
<td>220.00 lbs</td>
</tr>
<tr>
<td>Station_load.7</td>
<td>Tail Gunner</td>
<td>220.00 lbs</td>
</tr>
<tr>
<td>Station_load.8</td>
<td>Belly Gunner</td>
<td>220.00 lbs</td>
</tr>
<tr>
<td>Station_load.9</td>
<td>Radio Man</td>
<td>220.00 lbs</td>
</tr>
<tr>
<td>Station_load.10</td>
<td>4x500lbs LF</td>
<td>2000.00 lbs</td>
</tr>
<tr>
<td>Station_load.11</td>
<td>4x500lbs RF</td>
<td>2000.00 lbs</td>
</tr>
<tr>
<td>Station_load.12</td>
<td>4x500lbs LR</td>
<td>2000.00 lbs</td>
</tr>
<tr>
<td>Station_load.13</td>
<td>4x500lbs RR</td>
<td>2000.00 lbs</td>
</tr>
</tbody>
</table>

The B-24 can carry two auxiliary fuel tanks in the bomb bay for ferrying operations. In the fuel load-out editor, two optional auxiliary tanks are listed as following:

<table>
<thead>
<tr>
<th>Tip</th>
<th>Tank Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lefttip</td>
<td>Left bomb bay auxiliary tank (390 gallons)</td>
</tr>
<tr>
<td>Righttip</td>
<td>Right bomb bay auxiliary tank (390 gallons)</td>
</tr>
</tbody>
</table>

If you are not using these fuel tanks, set the fuel level for the given tank to 0. You must do this as the fuel tank will always default to the maximum capacity of the tank as per Flight Simulator hard-coding.
Autopilot:

The B-24 Liberator is equipped with a simplistic autopilot system that keeps the plane flying straight and level. It can also be used to make turns. However, the autopilot in the B-24 should not be seen as a replacement for the human pilot any in any situation other than simple course changes or holding a straight-and-level attitude, the autopilot should not be used. Additionally, the minimum speed for autopilot operation is 150 mph IAS. Below this speed the pilot must disengage the autopilot and control the aircraft manually.

Trim Characteristics:

The aircraft will require only small trim adjustments throughout its flight envelope, with the exception of landing, where the gear and flaps cause a nose-down tendency. The aircraft is capable of trimming +/- 10° in either direction; though it is highly unlikely that this much trim would be required at any phase of flight.

General Notes on Handling:

The following manoeuvres are restricted and should never be performed in the B-24 Liberator:

- Loop
- 360° roll
- Intentional spin
- Inverted flight
- Immelmann
- Vertical bank

Airspeed limitations:

<table>
<thead>
<tr>
<th>Flaps Position</th>
<th>Airspeed Limitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>40° Flaps</td>
<td>155 mph IAS</td>
</tr>
<tr>
<td>10° Flaps</td>
<td>180 mph IAS</td>
</tr>
<tr>
<td>Lowering landing gear</td>
<td>155 mph IAS</td>
</tr>
<tr>
<td>41,000lbs GW</td>
<td>355 mph IAS</td>
</tr>
<tr>
<td>56,000lbs GW</td>
<td>275 mph IAS</td>
</tr>
<tr>
<td>Min A/P speed</td>
<td>155 mph IAS</td>
</tr>
<tr>
<td>Turbulent air penetration</td>
<td>150 mph IAS</td>
</tr>
</tbody>
</table>
The B-24 has an 8° flap setting intended for cruise flight. At altitudes at or exceeding 25,000ft and airspeeds at or below 155 mph, it is recommended that flaps 8° be used to reduce the cruise pitch. This flap setting increases lift without seriously degrading the wing’s drag profile. Flying with this flap setting above 170 mph, however, may create a ballooning effect so it is advised to only use this setting during cruise.