B-24 LIBERATOR

RAF VARIANTS EXPANSION

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 theaters. 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 favorable 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.

Important Note : This package is an EXPANSION for the Virtavia B-24 Liberator, the original product is however only needed for the SOUNDS. The sounds are presently aliased to one of the P3D default aircraft as a licencing agreement prevents us from including the original B-24 sounds in this package. These default sounds are not good quality so we urge users to obtain the B-24 Liberator package and alias the RAF variants' sound.cfg so the correct B-24 sounds can be heard.

Credits

Model, animations, manual – Virtavia

Textures – Dan Dunn/Virtavia

Gauges – Herbert Pralle/Virtavia

Flight Dynamics - Mitch London

Engine Sounds - TSS (not included in this package)

Testing - Frank Safranek, Mitch London

References

"B-24 In Action" - Squadron Signal Publications Inc.

www.joebaugher.com

Installation

We would have preferred to use the auto-discovery method of installation for this package, however technical issues within P3D means this RAF variants expansion package can not alias the sounds used by the original B-24 package, which was the original intention and which is also the method used in FSX Steam Edition. We are prohibited by a licence agreement from including those sounds with this new expansion. So unfortunately the RAF variants package has to be installed manually into the sim and the sounds will be temporarily aliased to one of the P3D default aircraft. The idea is that you copy and paste the entire sounds folder from your original B-24 Liberator package into the RAF variants folder, this is the equivalent of aliasing the sounds. The original B-24 package can be found in the My Documents/P3D v4 Add-ons folder, assuming you already have this model.

Here is the procedure for manually installing the RAF variants package :

The .msi installer puts the Virtavia model files into C:\Program Files (x86)\Virtavia.

!! The files must be copied or moved into the P3D directory structure before the aircraft will appear in P3D !!

!! Note there are custom Effects files (.fx) which have to be moved/copied manually to their home in P3D !!

Installation procedure

1) Open Windows Explorer in TWO windows.

2) In one Explorer window, locate and open the folder:

C:\Program Files (x86)\Virtavia (or Win8/10 equivalent)

Here you will find a single folder :

'Virtavia Liberator RAF variants'

3) In the other Explorer window, locate and open the folder:

C:\Program Files\Lockheed Martin\Prepar3D v4\SimObjects\Airplanes

4) Position the two Explorer windows side-by-side.

DRAG and DROP the ‘Virtavia Liberator RAF variants’ folder into :

C:\Program Files\Lockheed Martin\Prepar3D v4\SimObjects\Airplanes

Once you have done that, check you now have this structure :

C:\Program Files\Lockheed Martin\Prepar3D v4\SimObjects\Airplanes\
Virtavia Liberator RAF variants

*** **Custom Effects** ***

5) The model will run now but you should also copy the effects files over to P3D too ! The effects files are inside a folder called '_Effects' in the Virtavia Liberator RAF variants folder, so look for. :

C:\Program Files\Lockheed Martin\Prepar3D v4\SimObjects\Airplanes\
Virtavia Liberator RAF variants_Effects

Inside '_Effects' are five .fx files. Copy these five .fx files into the main Effects folder in P3D, which is here :

C:\Program Files\Lockheed Martin\Prepar3D v4\Effects

*** **Aircraft Manual** ***

The User Manual in PDF format can be found in the Virtavia Liberator RAF variants folder:

C:\Program Files\Lockheed Martin\Prepar3D v4\SimObjects\
Airplanes\Virtavia Liberator RAF variants_Manual

The installer will create a shortcut to the original installation, so if you have moved or deleted that, you will need to re-create the shortcut to reflect the manual’s new position in the P3D file structure.

If you experience any difficulties with this procedure, please e-mail tech.support@virtavia.com

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

Copyright Information

Exterior Model Variants

There are eleven different exterior model variants in this package. All represent the B-24 Liberator as it was produced by Consolidated for use by the British Royal Air Force, both by Bomber Command and Coastal Command, and in the case of the first RAF B-24, the LB30A, by Ferry Command. There are two variants with United States markings, these represent those Liberators which were manufactured for the Royal Air Force but for various reasons were either permanently or temporarily diverted to the United States Army Air Corps.

All the variants are listed below in approximate chronological order.

LB30A Liberator, RAF Ferry Command

The first 6 Liberators were YB-24A's, designated as 'LB30A' and were built for the French Air Force, but were never delivered due to the fall of France in 1940. The aircraft were instead sent to Canada in 1941 and supplied to British Royal Air Force. Although delivered with 6x 50 cal. guns, the abscence of self-sealing fuel tanks meant the RAF could not

use them in combat. They were de-armed and modified for transatlantic ferry duties. Two of the aircraft used BOAC crews and flew with civilian registrations to and from Egypt.

Liberator I (LB30B) - RAF Coastal Command, 15 Group, 120 Sqn, RAF Aldergrove, Northern Ireland, June 1941

The first 20 B-24A's (or LB30B's) were diverted from USAAC contracts to the Royal Air Force and were in action in the long-range anti-submarine role by the Summer of 1941. In addition to the 6x .30-cal Brownings fitted by Consolidated, the RAF fitted a 20mm cannon pack, ASV Mk.II radar aerials and bomb bay depth charge racks.

B-24A Liberator, USAAC Ferry Command, Bolling Field, DC, Oct. 1941

The YB-24A test aircraft and the next 8 B-24A's were painted in RAF camo but diverted for USAAC use, the US neutrality flag was added to the livery. They were used for the transatlantic crew ferry service, VIP transport and spy missions over Japanese bases. These missions were never carried out due to the Pearl Harbor attack. One 'spy' B-24A was lost at Hickam Field during the Japanese raid.

Liberator B.Mk.II, RAF Bomber Command, 148 Sqn, RAF Shandur, Egypt, 1943

The Liberator II was essentially the Liberator I with an added 3-foot section forward of the cockpit. It was intended solely for the RAF who installed powered 4x .50-cal Boulton-Paul mid-upper and rear turrets, whilst retaining the originally fitted hand-operated .303's in the waist, nose and belly positions, these were however fitted in pairs, giving the Liberator II a total of 14 .303's. This was the first variant with the longer nose and also had the longer hub Curtiss Electric prop spinners. This variant is a Bomber Command B.Mk.II, these entered service in January 1942.

Liberator II, RAF Coastal Command, 120 Sqn, RAF Nutts Corner, N. Ireland, April 1942

The Liberator II was essentially the Liberator I with an added 3-foot section forward of the cockpit. It was intended solely for the RAF who installed powered 4x .50-cal Boulton-Paul mid-upper and rear turrets, whilst retaining the originally fitted hand-operated .303's in the waist, nose and belly positions, these were however fitted in pairs, giving the Liberator II a total of 14 .303's. This was the first variant with the longer nose and also had the longer hub Curtiss Electric prop spinners. The first Liberator II's entered service with RAF Coastal Command 120 Squadron in November of 1941. The Coastal Command variant, also designated GR.Mk.2 or GR.2, is distinguishable from the bomber version by its ASW aerial arrays and the 4x 20mm cannon pod mounted under the front fuselage.

Liberator II - RY-3 (Liberator C.Mk.IX, VIP version)

The RY-3 was the transport version of the PB2Y-2 Privateer, its cockpit was further forward due to the 7ft. extension of the forward fuselage. A tall vertical tail replaced the B-24's usual arrangement. Most RY-3's were delivered to the RAF and were redesignated as the 'Liberator C.Mk.IX'. Airframe AL504, the 2nd Liberator II produced, was a special VIP version and became the personal transport of Prime Minister Winston Churchill, who named it 'Commando'. It was later converted to C.Mk.IX standard with addition of the longer cockpit section and vertical tail. This aircraft disappeared over the Atlantic in 1945. All C.Mk.IX's were S.O.C. in 1946.

Liberator II (LB30), 'Jungle Queen', USAAC, 6th BG, Canal Zone, 1943

75 Liberator II's were requisitioned by the USAAF after Pearl Harbor and were redesignated 'LB30', they used a Martin A3 dorsal turret and and open, fixed twin-gun mount in the tail. LB30's were stationed thoughout SE Asia, the Canal Zone and Alaska. The remaining 23 LB30's were eventually returned to the RAF. A transport version of the LB30 was also constructed, the nose and tail positions were faired over and cargo doors were fitted to the port rear fuselage side.

Liberator B.Mk.III, RAF Bomber Command, 159 Sqn, RAF Digri, Bengal, British India, 1943

The first major production variant of the Liberator, the B-24D, was also supplied to the RAF as the 'Liberator III', they were redesignated B.Mk.III (Bomber Command) and GR.Mk.III (Coastal Command). These 366 aircraft were equipped with the RAF-specific twin .303's in the waist gun positions and a single .303 in the nose. The Martin dorsal turret of the D was retained, however the tail received a Bouton-Paul unit. There were also 11 'IIIA' variants, these were standard B-24D's in all respects. A small number of B.Mk.III's were used in the Far East and the Med. for convential bombing sorties. One such aircraft, 'Bulldog', is depicted above, notable for its unusual combination of RAF standard camo over white livery.

Liberator GR.Mk.III, RAF Coastal Command, 120 Sqn, RAF Aldergrove, N. Ireland, April 1943

Some Liberator III's were fitted with small fuselage winglets which carried eight RP-3 '25 pound' solid-shot armour-piercing rockets. These GR.Mk.III (GR.3) aircraft were assigned to RAF Coastal Command in the ASW role and sported several radar arrays around the aircraft as well as a Leigh Light on the starboard wing.

Liberator GR.V, RAF Coastal Command, 224 Sqn., RAF St. Eval, Cornwall, England, July 1943

The GR.V (GR.Mk. 5) was the final development of the RAF Coastal Command ASW Liberator III. Essentially a GR.Mk.III with the addition of a chin-mounted radome for the ASV radar unit, which was alternatively carried in the unused ventral ball turret position on some aircraft. All later RAF Liberators were based on the B-24G/H/J variants.

Liberator Gr.VI, RAF Coastal Command, 311 Sqn., RAF Predannack, Cornwall, England, May 1944

The GR.Mk.VI (GR.6) was essentially the standard B-24G/H/J type but used mainly as a long-range general reconnaissance aircraft by RAF Coastal Command. B.Mk.VI and B.Mk.VIII variants were used in small numbers, mainly in the Mediterranean and India. Around 1,600 aircraft were supplied under the Lend-Lease agreement in 1944-45. The GR.Mk.VIII (GR.8) designation was also applied to many aircraft in this batch, although there are no generally applicable differences between the two variants. Many were converted to transports using the designations C.VI and C.VIII. 311 Squadron was the RAF's only Czechoslovak-manned medium and heavy bomber squadron. It suffered the heaviest losses of any Czechoslovak formation in the RAF.

Exterior Model Animations

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.

Cockpit side windows

Exit Command (shift-e)

Bomb Bay Doors

2nd Exit command (shift-e, then tap 2).

ASW 'Dustbin' radar (GR.VI model only)

3rd Exit command (shift-e, then tap 3).

Crew figures

Ctrl-W (extend water rudder command)

Waist Gunners/Guns, Waist hatches and Tail Gunner Doors (LB models)

Shift-Q (tail hook command)

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.

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

Crtl-L will toggle the landing lights.

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.

2D / 3D Cockpits

This package is based on an older FSX product so a 2D panel suite is included. It is normal for the 2D panel to show first when cockpit view is first selected, especially when the 'S' key is pressed to cycle views. The 3D virtual cockpit can easily be accessed by using the right-click and select-views menu.

2D Cockpit Instrument Panels

1 = Door / Bomb Bay Lights

2 = Viewpoint Adjust Switch

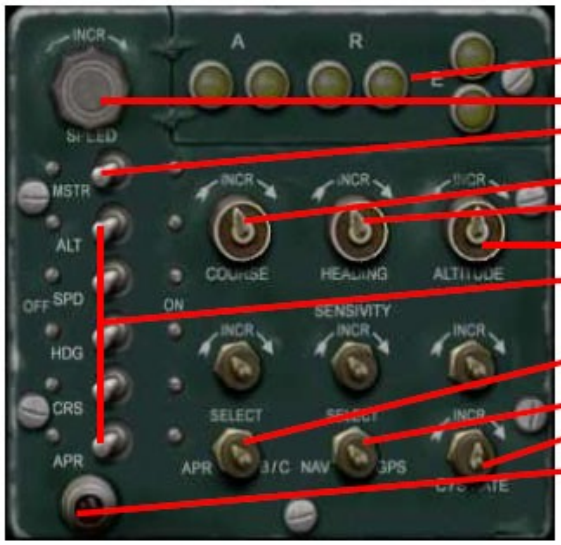
3 = Low Hydraulic Pressure Light

4 = Copilot's Panel Icon


Whisky Compass
Manifold Pressuse 3/4
Propeller RPM 1/2 & 3/4
Fuel Pressure 1/2 & 3/4
Cylinder Head Temp. 1/2 & 3/4
Gear Indicators
Flaps Position
Outside Air Temp.
Oil Pressure 1/2 & 3/4
Oil Temp. 1/2 & 3/4
Carburetor Temp 1/2 &3/4
Magneto Sw.
Battery & Avionic

Propeller High RPM or or Feather Lights | Propeller Deice | Structural Deice | Eng. Starter 1 & 2 | Eng. Starter 3 & 4 | Engine Primer | Fuel Boost Pumps

Autopilot



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

Aproach / 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 Crossffed Switches

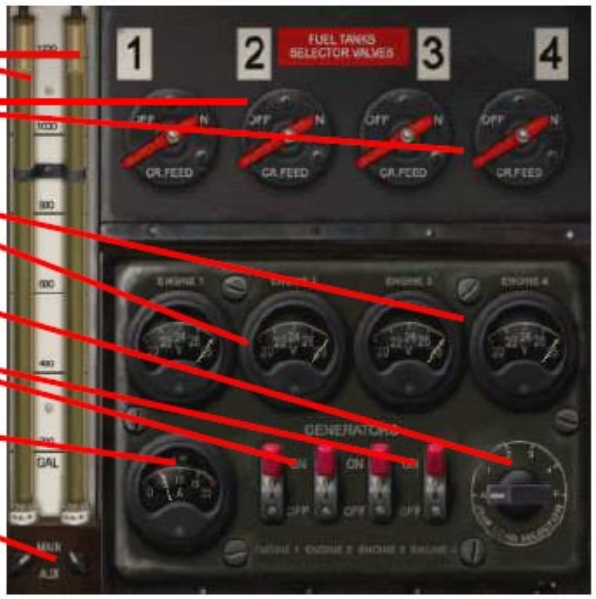
Generator Voltmeters

Voltmeter Selector

Generator Switches

Amperemeter

Selectors for Fuel Indicators



Radio Panel

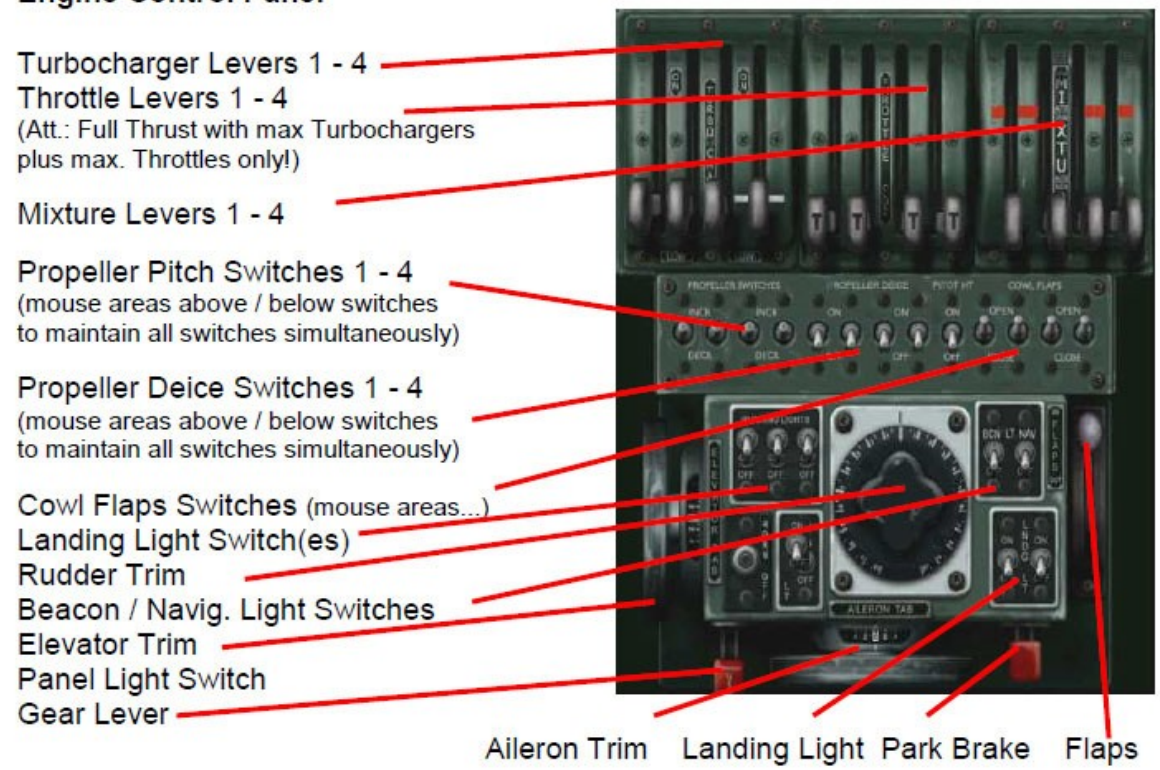
Light Switch (for all Radios)
COMM Frequency
Tuning Knobs
COMM 1 / 2 Selector

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

Engine Control Panel



NOTE : A power calculator in MS Excel format is included with the package. It can be found in the model's folder in 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):

Altitude	Airspeed	Fuel Burn
100 ft	250 mph	840 gal/hr
25,000 ft	146 mph	320 gal/hr
25,000 ft	195 mph	832 gal/hr

= 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:

Stall speed, clean:	115 mph IAS (max gross weight)
Max gear extension:	155 mph IAS
Max gear retraction:	155 mph IAS
Max indicated airspeed:	355 mph IAS
Max speed, Sea Level:	250 mph (212 KIAS)

Max speed, 25,000 ft:	290 mph (190 KIAS)
Maximum G:	2.67 / -2.00

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:

Station_load.0	Pilot	220.00 lbs
Station_load.1	Copilot	220.00 lbs
Station_load.2	Flight Engineer	220.00 lbs
Station_load.3	Navigator	220.00 lbs
Station_load.4	Bombardier	220.00 lbs
Station_load.5	Nose Gunner	220.00 lbs
Station_load.6	Waist Gunner	220.00 lbs
Station_load.7	Tail Gunner	220.00 lbs
Station_load.8	Belly Gunner	220.00 lbs
Station_load.9	Radio Man	220.00 lbs
Station_load.10	4x500lbs LF	2000.00 lbs
Station_load.11	4x500lbs RF	2000.00 lbs
Station_load.12	4x500lbs LR	2000.00 lbs

Station_load.13	4x500lbs RR	2000.00 lbs

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:

Lefttip:	Left bomb bay auxiliary tank (390 gallons)
Righttip:	Right bomb bay auxiliary tank (390 gallons)

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 maneuvers are restricted and should never be performed in the B-24 Liberator:

Loop

360° roll

Intentional spin

Inverted flight

Immelmann

Vertical bank

Airspeed limitations:

40° Flaps:	155 mph IAS
10° Flaps:	180 mph IAS
Lowering landing gear:	155 mph IAS
41,000lbs GW:	355 mph IAS
56,000lbs GW:	275 mph IAS
Min A/P speed:	155 mph IAS
Turbulent air penetration:	150 mph IAS

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.