

The background of the entire page is a faded, light blue image of a B-24 Liberator bomber aircraft in flight, viewed from a low angle looking up at the nose and cockpit.

# **B-24 LIBERATOR US NAVY VARIANTS EXPANSION USER MANUAL**

# Introduction

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The Consolidated B-24 Liberator became a major player for Allied forces during World War 2. Its exploits ranged the world over - as did its users - and it 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 its 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 the B-24's impact in the various roles it 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 for FSX, the original product is however only needed for the SOUNDS. If you are able to edit the sound.cfg to point to another model with appropriate sounds, or you wish to add your own sounds to the Sound folder of this package, then the original B-24 package will not be required. This package will also work in FSX Steam Edition, the files and folders need only to be copied over.

# Credits

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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

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

[www.joebaugher.com](http://www.joebaugher.com)

# Installation

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The .msi installer puts the Virtavia model files into the correct locations in FSX, no further intervention is required. Note the default path is to the C: drive, so if you are using a different drive letter and/or path to FSX, you should edit this path when prompted.

This User Manual in PDF format can be found in the Virtavia folder in the root of the simulator, eg.

C:\Program Files (x86)\Microsoft Games\Microsoft Flight Simulator X\  
Virtavia\Virtavia Liberator USN Variants

The installer will create a shortcut to the manual which is placed on the Desktop.

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](mailto:tech.support@virtavia.com)

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The source code for this product is closed. No modifications or reverse engineering may be carried out without prior consent from Virtavia.

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# Exterior Model Variants

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There are five different exterior model variants in this package. All represent the B-24 Liberator as it was produced by Consolidated for use by the United States Navy.

All the variants are listed below in approximate chronological order.

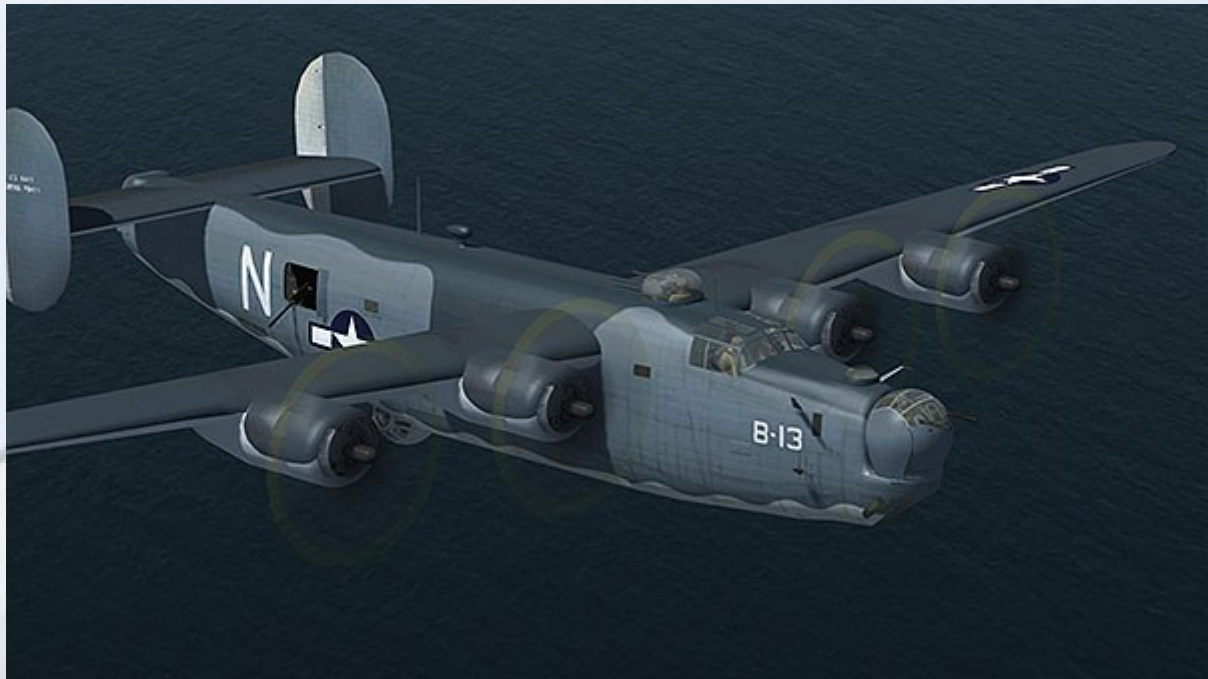
**PB4Y-1 Liberator, 'Muck's Mauler', FAW-7, VB-103, RAF Dunkeswell, Devon, England, 1944**



The first of the 977 PB4Y-1 aircraft were mostly indistinguishable from the USAAF B-24D. Common additions to the standard B-24D airframe were an additional .50 cal MG in the glazed nose and also a retractable radome in the vacated ball turret position on late production aircraft. The PB4Y-1 entered service with VP-101 in September 1942 at NAS Barber Point, Hawaii. 24 Navy and Marine PB4Y-1 squadrons had been formed by May 1945.



## PB4Y-1 Liberator, VPB-110, RAF Dunkeswell, Devon, England, 1944



Later PB4Y-1 airframes were fitted with the ERCO front ball turret in an effort to improve the frontal defence of the aircraft, which had been deemed unsatisfactory by the Navy. The more modern turret had been designed and produced for the abandoned prototype Consolidated XPBB-1 Sea Ranger flying boat patrol bomber. The Navy PB4Y-1's replaced the USAAF B-24's of the disbanded 479th Anti-Submarine Group who had previously occupied RAF Dunkeswell.

## **P4Y-1P Liberator, VJ-62 'Tigers', NAS Jacksonville, 1952**



The PB4Y-1P (P4Y-1P from 1952 on) was a long-range photo-reconnaissance variant. These aircraft were eventually replaced by the A3D-1P Skywarrior.

### **PB4Y-2 Privateer, VP-9 'Golden Eagles', Kimpo AB, Korea, 1951**



### **PB4Y-2 Privateer, 1945**



The PB4Y-2 Privateer was a development of the B-24 with a conventional tail, non-turbo-supercharged engines, and a 7ft fuselage plug to create room for a flight engineer's station. Also added was an additional dorsal turret and 'teardrop' Erco 250 THE powered waist blisters. Privateers saw action in WW2, Korea and Vietnam, they were redesignated P-4B in 1962. A total of 739 were built.



# Exterior Model Animations

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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

2<sup>nd</sup> Exit command (shift-e, then tap 2).

## ASW 'Dustbin' radar (PB4Y-1 (B-24D) model only)

3<sup>rd</sup> Exit command (shift-e, then tap 3).

## Ventral 'belly' Turret

3<sup>rd</sup> Exit command (shift-e, then tap 3).

## Crew figures

Ctrl-W (extend water rudder command)

## Waist Gunners/Guns, Waist hatches

Shift-Q (tail hook command)

# Exterior Lighting

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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

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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 through the available ones by pressing the A key.

## 2D / 3D Cockpits

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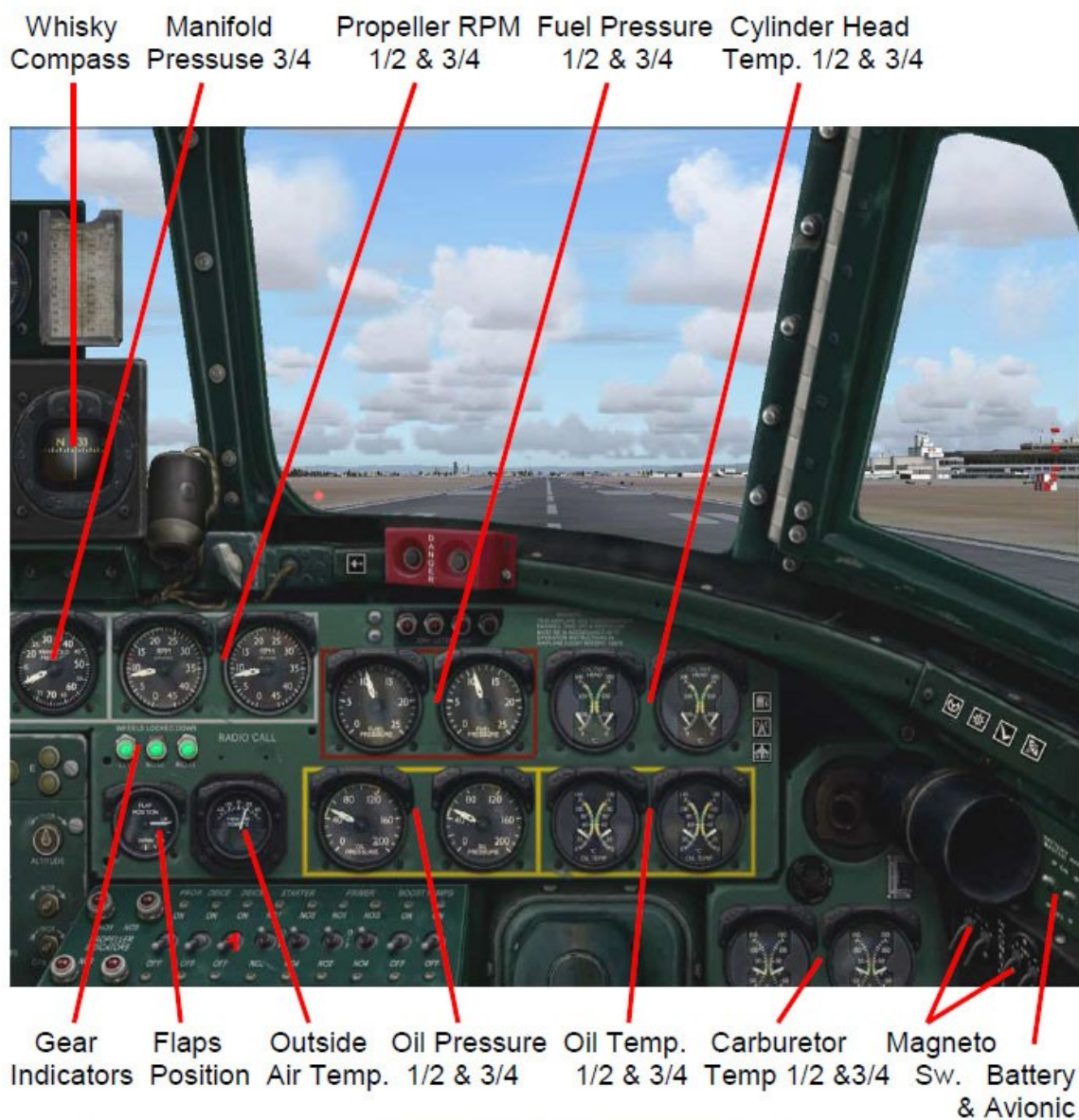
This package is based on an older FSX product so a 2D panel suite is included. It is normal for the 2D panel to show first when cockpit view is first selected, especially when the 'S' key is pressed to cycle views. The 3D virtual cockpit can easily be accessed by using the right-click and select-views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

# 2D Cockpit Instrument Panels



- 1 = Door / Bomb Bay Lights
- 2 = Viewpoint Adjust Switch
- 3 = Low Hydraulic Pressure Light
- 4 = Copilot's Panel Icon







Propeller High RPM 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\*  
 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 Crossfeed Switches

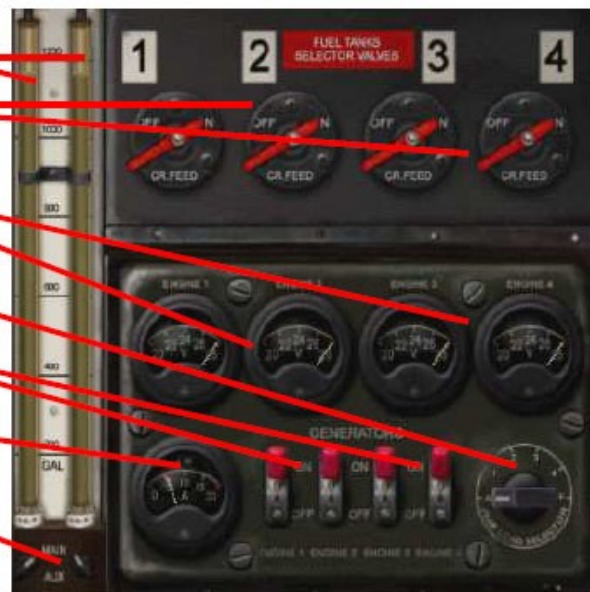
Generator Voltmeters

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

Turbocharger Levers 1 - 4

Throttle Levers 1 - 4

(Att.: Full Thrust with max Turbochargers  
plus max. Throttles only!)

Mixture Levers 1 - 4

Propeller Pitch Switches 1 - 4

(mouse areas above / below switches  
to maintain all switches simultaneously)

Propeller Deice Switches 1 - 4

(mouse areas above / below switches  
to maintain all switches simultaneously)

Cowl Flaps Switches (mouse areas...)

Landing Light Switch(es)

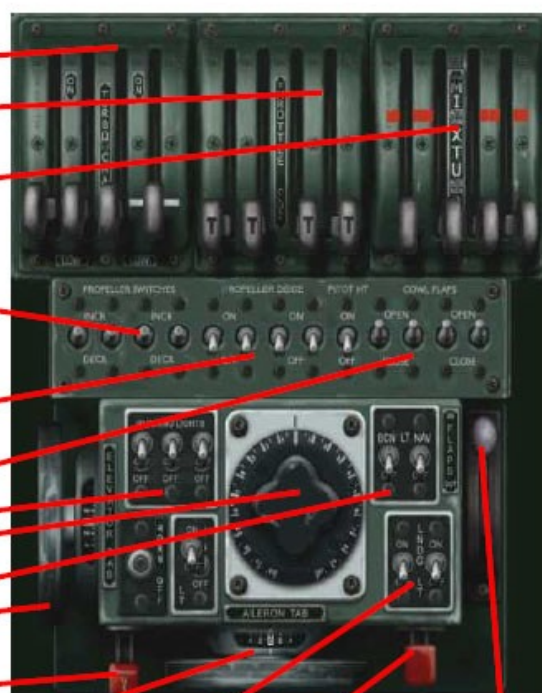
Rudder Trim

Beacon / Navig. Light Switches

Elevator Trim

Panel Light Switch

Gear Lever



Aileron Trim

Landing Light

Park Brake

Flaps

**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.

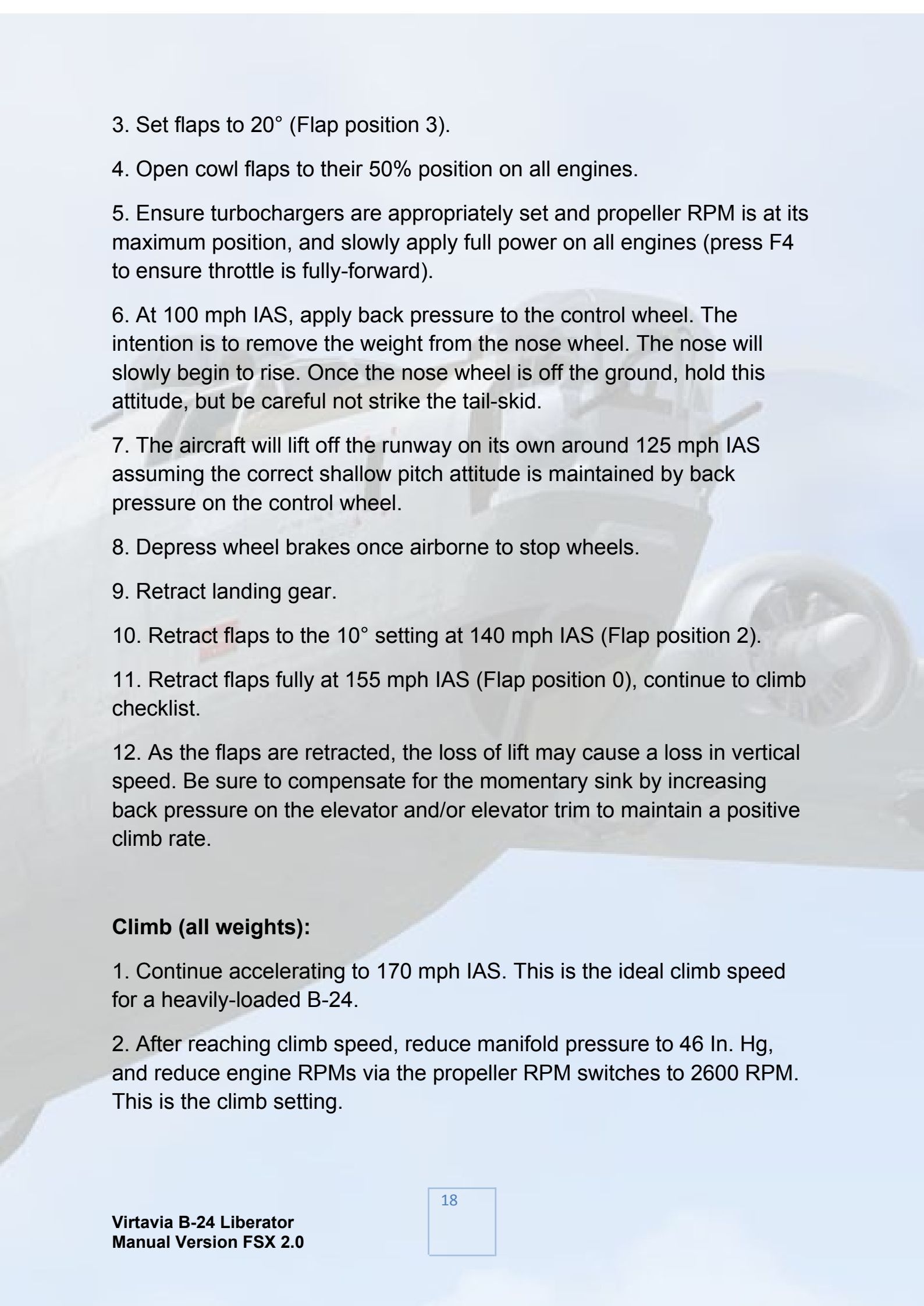
### **Taxi Checklist (All weights):**

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.



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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  $\pm 10^\circ$  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

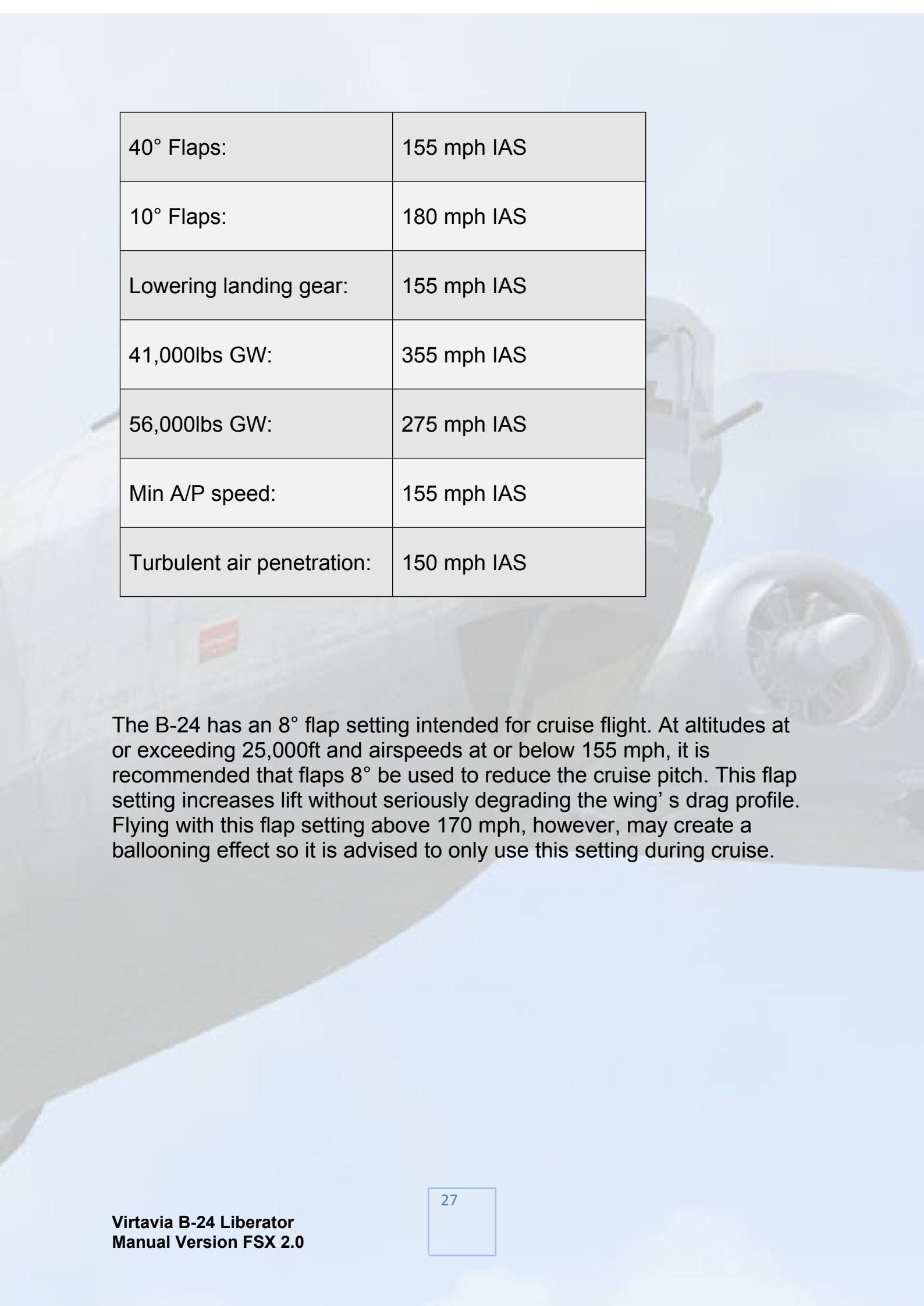
Intentional spin

Inverted flight

Immelmann

Vertical bank

## **Airspeed limitations:**

A faded background image of a B-24 Liberator aircraft, showing the tail section and one of the four engines.

|                            |             |
|----------------------------|-------------|
| 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.