

X-Plane

A 3D rendered aircraft, likely an X-Plane, is shown in flight over a runway. The aircraft is a high-wing, multi-engine plane with a blue and white livery. The runway is visible below, and the sky is a clear, light blue. The aircraft is viewed from a high angle, showing its wings and tail.

Mobile

X-Plane for iPhone, iPod Touch, Android, and Pre Operation Manual

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1. Introduction to X-Plane Mobile

The X-Plane Mobile apps are fun little “slices” of the X-Plane desktop flight simulator that are just the right size to run on Android devices, the Palm Pre, and Apple’s iPhone and iPod Touch.

The X-Plane Mobile applications use a flight model that is about 95% as accurate as the one used by the desktop simulator—that is, 95% as accurate as the simulator currently being used by companies like Boeing, Lockheed Martin, and NASA. Each of the \$10 “slices” comes with four to seven aircraft that can be used to explore the virtual skies of four to six regions of the globe, spanning from America’s West Coast to the capital of Nepal.

Updates to the X-Plane Mobile applications are released periodically. As the graphics, flight model, and interface technology are improved on one X-Plane app, *all* the applications will be updated—for free! We have big plans for the future of the mobile sim!

The goal of the X-Plane Mobile apps is to have most of the fun and power of the full desktop version available in a portable form. Due to these devices’ limited RAM and screen area, this will be broken into a number of little “pieces” of the desktop simulator. By pricing at only \$10 (or less), though, we can offer a pretty amazing value for each of these pieces of the X-Plane desktop simulator.

YouTube has a number of videos of users demonstrating X-Plane for the iPhone and iPod Touch. These can make for a faster learning experience than reading the manual, though they are obviously less detailed. We suggest that users interested in the following links go watch the videos, then

come back at a later time to read the manual:

[Introduction to X-Plane on the iPhone and iPod Touch](#)

[Visual Guide to Flying X-Plane Helicopter](#)

[Review and Guide for X-Plane Airliner](#) (Note that the description of the autopilot system here is incorrect—see Chapter 12, **Advanced Functions of X-Plane Mobile** for a correct description.)

Note: A **Glossary of Terms**, containing definitions for the aviation-specific terms used in the manual is provided beginning on page 64. We recommend that users consult this for reference as needed.

If you’ve enjoyed piloting the craft in the X-Plane flight simulators, why not try commanding a Giant Fighting Robot, too? There’s even a free Giant Fighting Robots Trainer! These apps, made by the same people who write X-Plane, are some of the most fun (and challenging) games available for the iPhone, iPod Touch, and Pre.

I. About This Manual

This is version 9.691 of the X-Plane Mobile for iPhone, iPod Touch, Android, and Pre manual, last updated May 9, 2011.

Throughout the manual are cross-reference links, formatted in bold, dark-gray type, **like this**. Clicking one of these links will take you to the indicated location of the manual. For instance, clicking this **Getting Acquainted with the Simulator** reference will take you to Chapter 2.

2. Getting Acquainted with the Simulator

Each of the X-Plane apps for Android, iPhone, iPod Touch, and Pre is built on the same framework, so flight controls and menu options vary only slightly between different versions. We'll go through the basics of using those flight controls and menus here. Then, in each application's own chapter, we'll discuss things pertinent to that app only—for instance, Chapter 7, X-Plane Racing (beginning on page 34) will discuss the planes found in that app, the race courses available, and how to fly the aircraft.

Remember that definitions for any unfamiliar terms may be found in the **Glossary of Terms**, beginning on page 64.

Note: Due to the uniqueness of their flight and thus the uniqueness of their user interfaces, X-Plane Helicopter, X-Plane Apollo, and Space Shuttle have their own separate manuals. These may be downloaded from the [X-Plane.com website](http://X-Plane.com).

I. Basic Flight Controls

Found on the left side of every flight view is a scrolling bar labeled THROT (number 1 in **Figure 2.1**). This controls the throttle. Slide it all the way to the top of the screen for full throttle, or all the way to the bottom of the screen for none.

In some aircraft (those with thrust reversal capabilities), the throttle slider will be about 1/3 of the way up the screen by default. Dragging the slider to the top of the screen will, of course, give the aircraft full (forward) throttle. Dragging it to the

bottom, however, will give it full *reverse* thrust, useful in slowing down after touching the ground on a landing. For a list of reverse thrust-capable aircraft, see each app's specific chapter.



Figure 2.1: Basic flight controls

The scrolling bar on the right side of the screen (number 2 in **Figure 2.1**) controls flaps. When at the top of the screen, this commands no flaps, and when at the bottom, it commands full flaps.

Note that when dragging the scroll bar controls, the box with writing on it (such as FLAPS or THROT) shows where the user has commanded the controls to be, while the other box shows where the setting is at the moment. If the user commands a quick, large movement of the controls, it will take the aircraft a second or two to meet that command.

The slider in the bottom of the screen (number 3 in **Figure 2.1**)

controls the rudder. This is used to control the aircraft's yaw. Drag the slider to the left to turn the aircraft to the left, and drag it right to turn the aircraft right. For a visual representation of yaw, see the **Flight Dynamics** appendix.

The button on the bottom left (number 4 in **Figure 2.1**) toggles the brakes on or off. When it is lit up, the brakes are on, and when it is off, the brakes are off.

The button to the right of the brakes (number 5 in **Figure 2.1**) controls the gear. When this button is lit, the gear is down, and when it is unlit, the gear is up. Of course, this only applies to aircraft with a retractable landing gear.

To steer the aircraft left, tilt the device left. To steer it right, tilt right. This movement—when the wings dip down or rise up while the fuselage (the main body of the plane) stays pointed in the same direction—is referred to as roll. To pull the airplane's nose up, tilt the device back toward you, and to push its nose down, tilt the device down away from you. This movement—when the wings remain at the same attitude, but the fuselage moves—is called pitch. See the **Flight Dynamics** appendix for a visual representation of this.

Because X-Plane Mobile does not take input from a third input axis for yaw (as it does from a joystick with a twisting handle in the desktop version), X-Plane will attempt to stabilize the aircraft's yaw for you.

Basic procedure for taking off (covered more in depth in each app's specific chapter) is as follows:

1. Turn off the brakes.
2. Drag the flaps about 1/3 of the way down to create some extra lift for takeoff.

3. Slide the throttle all the way up.
4. Drag the RUD (rudder) slider left and right to steer down the runway.
5. When the aircraft reaches its takeoff velocity (which is different for every craft—heavier planes need greater speed), tilt the device back toward you, thus pulling back on the craft's flight controls.
6. Once the airplane is safely in the air, drag the flaps back up to the top of the screen and toggle the gear up (if applicable).
7. Level the plane off once it is a few feet above the ground so that it can build up speed. This will act as a "cushion" to prevent it from stalling once it begins to climb in earnest.
8. Climb at around a 10 degree incline (more powerful craft can handle higher climb rates) at full throttle until the desired altitude is reached. Note that once the power is set at full, the performance of the plane (in terms of its climb rate and airspeed) is controlled by pitching the nose up and down. If its nose is pitched too high up, its speed will drop until it stalls. This can be thought of as being similar to a car trying to go up a hill—an excessively steep hill will cause the car to go very slowly and its engine to overheat.

Note: When your aircraft crashes, go into the settings menu and select either a new airport to take off from or a random flight. This will reset the airplane after the crash, giving you a brand new one to fly again.

II. Using the Menu and View Options

Tapping the *center* of the screen will cause the various menu icons to appear at the top. In most of the applications, there are two rows; the top row has six buttons, and the bottom row has two, as shown in **Figure 2.2** below.

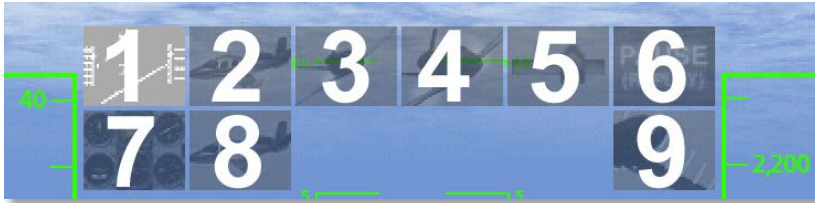


Figure 2.2: The menu and view options

The menu option labeled 1 in **Figure 2.2** above selects the default cockpit view, which is out the windshield with the head-up display (HUD). The HUD is described in detail in the section “**The Head-Up Display in Depth,**” found below.

The menu option labeled 2 in **Figure 2.2** selects the external view. Hit that, then drag your finger around on the screen to adjust the viewing angle. To zoom out, put *two* fingers down far apart on the screen and drag them closer together. To zoom in, put two fingers on the screen close together and drag them apart. This is a nice way of controlling the view that is just not possible with a mouse pointer, since the simulator takes input from *both* fingers at once.

The next view option from the menu (labeled 3 in **Figure 2.2**) is the spot view. Selecting this will give the user a stationary view from which to watch as the aircraft flies by.

The fourth view in the top row of the menu (labeled 4 in **Figure 2.2**) is the linear spot view, where the camera takes a constant-speed trajectory to match the airplane's flight path.

This is like the view of a pilot with whom the user is flying formation if that pilot were to turn around and look at the user's airplane. This will look identical to the spot view until the user's craft changes either speed or direction.

The menu option labeled 5 in **Figure 2.2** opens the Settings menu, discussed in the section “**The Settings Menu**” below (on page 12).

The final menu option in the top row (labeled 6 in **Figure 2.2**) is the pause button. When this is pressed, the replay buttons will appear, as highlighted in red in **Figure 2.3**.

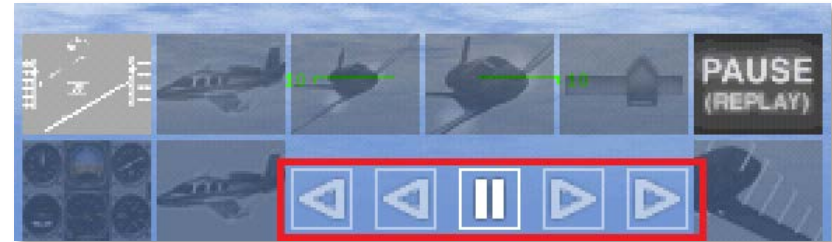


Figure 2.3: The replay buttons

The center of these five buttons pauses the replay. The two buttons immediately to the left and right, respectively, rewind and fast-forward the replay at a slower-than-real-time rate. The two outer buttons rewind and fast-forward the replay much faster.

The first view option in the second row (labeled 7 in **Figure 2.2**) displays the aircraft's instrument panel. This view is described in depth in the section “**The "Standard Six" Gauges,**” beginning on page 9. Note that in this view, the only menu options available are the HUD view and the pause button. Thus, to access the settings menu or switch to an external view, the user must first return to the HUD view.

The second view option in the second row (labeled 8 in **Figure 2.2**) is the circle view. This is similar to the chase view, labeled 2 in the same figure. However, where the chase view re-orientates the camera to track the aircraft, the circle view keeps a fixed heading and orientation as it follows the craft.

The final menu option (labeled 9 in **Figure 2.2**) will cause X-Plane to display the aerodynamic forces acting on the airplane. These are only visible when using an external view. These are a visual representation of the forces that X-Plane is calculating for each piece of the airplane. When in an external view, try maneuvering the plane around a good bit to see the little green bars move in real time. Just as in real life, it is these forces that act on the mass of the plane to accelerate it and move it through time and space—just as Newton predicted over three hundred years ago. Watch what happens as you add and decrease power, extend and retract the flaps, or slow to a stall (where the wings can no longer produce enough lift to support the weight of the plane). Cool!

A. The Head-Up Display in Depth

The head-up display, or HUD, allows the user to see a great deal of information regarding the aircraft's operation without sacrificing the view of the outside world.

The ticking tape on the left side of the screen (numbered 1 in **Figure 2.4**) displays the aircraft's speed in knots. Note that this is the aircraft's *indicated* airspeed, not necessarily its *true* airspeed. This measurement comes from the airspeed indicator (ASI), which, in its simplest form, it is nothing more than a spring which opposes the force of the air blowing in the front of a tube attached to the aircraft. The faster the airplane is moving the stronger the air pressure is that acts to oppose the spring and the larger the indicated speed. However, when

there is little air available to "push" on that spring, the instrument will display a low number regardless of how fast the craft is moving. For instance, in the SR-71 Blackbird (found in X-Plane Extreme), the craft might be zipping along at Mach 1.5, but at an altitude of 70,000 feet, its ASI will show it moving at around 200 knots (around 0.3 Mach at sea level). Even better, in the Space Shuttle, the craft can be moving at around 17,000 miles per hour while its airspeed indicator shows zero (because, of course, there is no air at all in space).

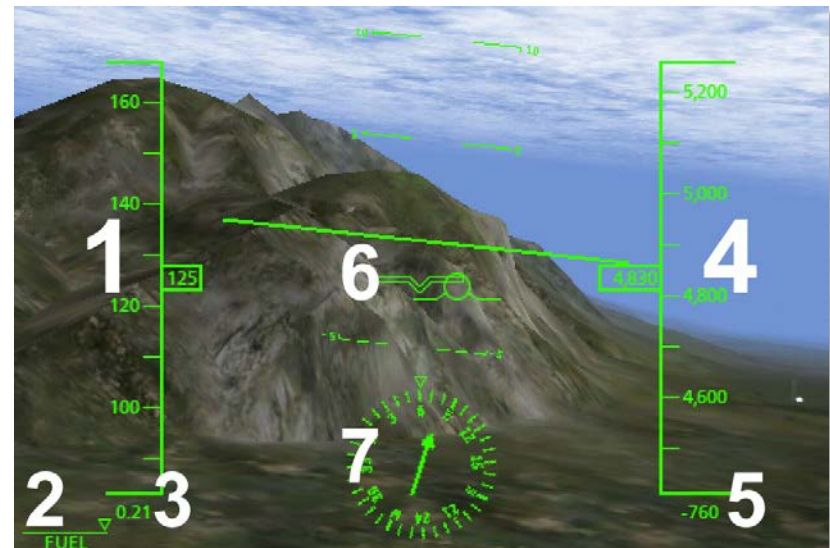


Figure 2.4: The HUD view

In the bottom left of the screen is a fuel gauge, labeled 2 in **Figure 2.4**. When the triangle-shaped indicator is at the far right, as it is in the figure, the aircraft's fuel tanks are full. When it is at the far left, the fuel tanks are empty, and the aircraft's engines will not be able to run.

Directly beneath the ticking airspeed indicator is the aircraft's speed relative to the speed of sound (numbered 3 in **Figure**

2.4). For instance, in **Figure 2.4**, the craft was moving at 0.21 Mach.

The ticking tape on the right side (number 4 in **Figure 2.4**) displays the craft's altitude in feet above mean sea level. For instance, in the figure, the aircraft was at 4830 feet above mean sea level. The number directly below this (labeled 5 in **Figure 2.4**) is the craft's climb rate in feet per minute. For example, in the figure, the craft was descending at a rate of 760 feet per minute, so the number displayed was -760.

In the center of the screen are two horizontal bars (labeled 6 in **Figure 2.4**). The V-shaped bar indicates the airplane's attitude—that is, the combination of its pitch and roll. The bar with a circle in the center of it is called the flight path indicator. It represents where the plane is actually flying, rather than where it is pointed. Thus, in the figure, the aircraft is *pointed* straight ahead (per the V-shaped bar), but it is *actually* travelling a bit to the right (per the circled bar).

When the craft is taken into a 90 degree stall, the attitude indicator (the V-shaped bar) will stay momentarily at the 90 degree mark even as the flight path indicator drops rapidly. This is due to the fact that the aircraft's vertical velocity slows to zero, then becomes negative, while its nose is still pointing up. Only after the craft falls a bit will its nose be pushed down.

Surrounding those bars are lines marking degrees of pitch. For instance, in the figure, the aircraft was pitched down at around 2 degrees (indicated by the V-shaped bar), and its wings were banked slightly to the left.

Note that the craft will hold a constant altitude (that is, it will have a climb rate of zero) when the *center* of the velocity vector's circle is at the zero degree mark.

Finally, in the bottom center of the screen (marked with a 7 in **Figure 2.4**) is a directional gyro, indicating which direction the aircraft's nose is pointing.

B. The Panel View in Depth

In the panel view, the aircraft's instrument gauges (or EFIS, whichever the case may be), navigation radios, and basic autopilot settings (where available) are accessible. Flying from this view requires the use of the artificial horizon. The piston-engined aircraft (that is, those with propellers) in the mobile X-Plane applications have a panel equipped with the "standard six" steam gauge flight instruments. Aircraft with jet engines, though, have an electronic flight instrument system, or EFIS.

Note: In the panel view, the only menu options available are the HUD view and the pause button (both marked with a red box in **Figure 2.5**). Thus, to access the settings menu or switch to an external view, the user must first return to the HUD view.

i. The "Standard Six" Gauges

There are six primary instruments that have become standard in any instrument panel. Since the early 1970s, these have been arranged in a standard layout referred to as "the six pack." In X-Plane for iPhone, iPod Touch, Android, and Pre, this standard layout has been adhered to with one exception (explained below).



Figure 2.5: The steam gauge panel

The first instrument in the top row (labeled 1 in **Figure 2.5**) is the airspeed indicator. In its simplest form, it is nothing more than a spring which opposes the force of the air blowing in the front of a tube attached to the aircraft. The faster the airplane is moving the stronger the air pressure is that acts to oppose the spring and the larger the deflection of the needle from which the pilot reads the craft's speed. There are a number of ways that this reading can be thrown off (most obviously by flying at an altitude where there is little to no air), so bear in mind that this is the *indicated* airspeed, not necessarily the *true* airspeed.

The second instrument in the top row (labeled 2 in **Figure 2.5**) is the attitude indicator, which displays the aircraft's position in space relative to the horizon. This is accomplished by fixing the case of the instrument to the aircraft and measuring the displacement of the case with reference to a fixed gyroscope inside.

The third instrument in the top row (labeled 3 in **Figure 2.5**) is the altimeter. This displays the aircraft's altitude (in feet above mean sea level) by measuring the expansion or contraction of a fixed amount of air acting on a set of springs. As the airplane climbs or descends, the relative air pressure outside the aircraft changes and the altimeter reports the difference between the outside air pressure and a reference, contained in a set of airtight bellows.

The first instrument in the bottom row (labeled 4 in **Figure 2.5**) is the turn coordinator. This measures the aircraft's rate of turn. The instrument is only accurate when the turn is coordinated—that is, when the airplane is not skidding or slipping through the turn. A skid is the aeronautical equivalent to a car that is understeering, where the front wheels do not have enough traction to overcome the car's momentum and the front of the car is thus plowing through the turn. In a car, this results in a turn radius that is larger than that commanded by the driver. A slip is a bit more difficult to imagine unless one is a pilot already. It results from an aircraft that is banked too steeply for the rate of turn selected. To correct the slip, all the pilot has to do is increase back pressure on the yoke, pulling the airplane "up" into a tighter turn, such that the turn rate is in equilibrium with the bank angle.

The second instrument in the second row (labeled 5 in **Figure 2.5**) is *not* the directional gyro of the "standard six." Instead, to facilitate instrument flight, the directional gyro has been replaced with a horizontal situation indicator (or HSI). More information on this instrument can be found in the "**Flying an Approach Using the Instrument Panel**" section of Chapter 12 (beginning on page 50).

The final instrument in the second row (labeled 6 in **Figure 2.5**) is the vertical speed indicator, also called the vertical

velocity indicator or variometer. This reports the aircraft's climb or descent rate in feet per minute (fpm). Typically, non-pressurized airplanes will climb comfortably at about 700 fpm (if the plane is capable) and descend at about 500 fpm. Descent rates faster than this cause discomfort on the occupants which is felt in passengers' ears. Pressurized airplanes can climb and descend much more rapidly and still maintain the cabin rate of change at about these levels, since the cabin pressure is not related to the ambient altitude unless the pressurization system fails.

Scrolling down in the panel of the piston-engined aircraft (by touching your finger on the screen and dragging it up) will show the navigation radios, as in **Figure 2.6**.



Figure 2.6: The lower half of the panel

The **BRAKES** button here (labeled 1 in **Figure 2.6** above) functions just like the one in the HUD view—when it is lit up red, the brakes are on, and when it is dimmed, the brakes are off. To the right of this button in aircraft with a retractable landing gear is the **GEAR** button. When it is lit, the gear is down, and when it is dimmed, the gear is up.

The NAV 1 radio (labeled 2 in **Figure 2.6**) is used for navigating using a radio signal. It is tuned using the two knobs on the instrument. The first knob (labeled 3 in **Figure 2.6**) is used to tune the integer (or "counting number") portion of the frequency. The second knob (labeled 4 in **Figure 2.6**) is used to tune the decimal portion of the frequency.

To turn a knob up, tap directly above it, and to turn it down, tap directly below it. For instance, if the frequency read 111.10 and the user clicked above the *left* knob, the frequency would increase to 112.10. If the user instead clicked above the *right* knob, the frequency would increase to 111.20. More information on instrument navigation is found in Chapter 12, in the section "**Flying an Approach Using the Instrument Panel**" (beginning on page 50).

To the right of the NAV 1 radio is the navigation source selection switch (labeled 5 in **Figure 2.6**). This selects between navigating using the frequency on the NAV 1 radio and that of the NAV 2 radio; tap the switch to change its position.

To the right of the navigation source selector is the NAV 2 radio (labeled 6 in **Figure 2.6**). This is functionally identical to the NAV 1 radio.

ii. The EFIS

The electronic flight instrument system (or EFIS) displays much of the same information as the six gauges in the propeller-based aircraft, with a few additions.



Figure 2.7: The EFIS panel

The scrolling tape on the far left (labeled with a 1 in **Figure 2.7**) is the airspeed indicator. Once again, this is the *indicated* airspeed, not necessarily the *true* airspeed (see the discussion in the section “**The Head-Up Display in Depth**” on page 8 for information on why this is so). Directly below the scrolling tape is the craft’s speed relative to the speed of sound, just like in the HUD view.

In the center of the first display (labeled 2 in **Figure 2.7**) is the attitude indicator. This shows the aircraft’s pitch and roll attitude in space relative to the horizon. As in the HUD view, there are lines above and below the representation of the aircraft that mark degrees of pitch. Additionally, the two purple lines (one horizontal and one vertical) represent the course deviation indicator (CDI) and the glideslope indicator. More information on using the HSI for navigating is found in Chapter 12, in the section “**Flying an Approach Using the Instrument Panel**” (beginning on page 50).

The scrolling tape on the right (labeled 3 in **Figure 2.7**) is the altimeter. This displays the airplane’s altitude in feet above mean sea level.

In the bottom of the first EFIS panel is a modified view of the horizontal situation indicator (or HSI—labeled with a 4 in **Figure 2.7**). This is a combination of a directional gyro (DG) and the course deviation indicator (CDI). The DG is a gyroscopically driven compass, which makes it much more stable than the older “whisky” compasses (so named because of the whisky alcohol used to stabilize the compass inside the housing). It is the DG portion of the HSI that is marked 4 in **Figure 2.7**. Once again, more information on flying on instruments can be found in Chapter 12, in the section “**Flying an Approach Using the Instrument Panel**” (beginning on page 50).

At the top of the panel are the autopilot controls (labeled 5 in **Figure 2.7**). Use of the autopilot is described in Chapter 12, in the section “**Using the Autopilot**,” beginning on page 59.

The right display panel of the EFIS is the moving map (marked 6 in **Figure 2.7**). The local airport’s identifier is shown in blue—in **Figure 2.7**, this is the default field for X-Plane 9, LOWI. The magenta triangles are the localizers which set up the approach for that runway at that airport. Most unusually, the LOWI airport has two localizers—one pointing away from the field and one pointing toward it. More information on using the localizers can be found in Chapter 12, in the section “**Flying an Approach Using the Instrument Panel**,” beginning on page 50.

III. The Settings Menu

Selecting the fifth menu option from the left (highlighted in Figure 2.8 below) will open the Settings menu.

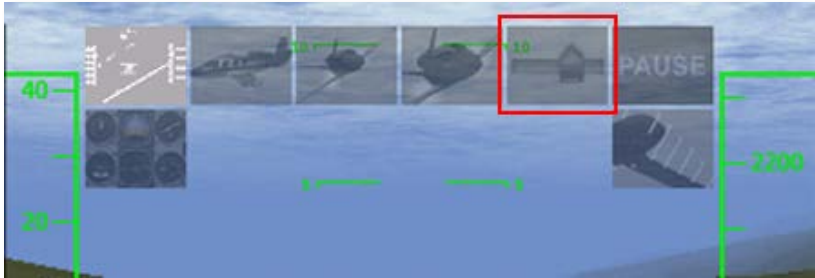


Figure 2.8: The Settings menu button

The Settings menu has nine tabs across the top, each of which shows a different set of options when selected. Tap one of the tabs to change the settings there, and tap the **Fly** button in the upper left to go back to the simulation.

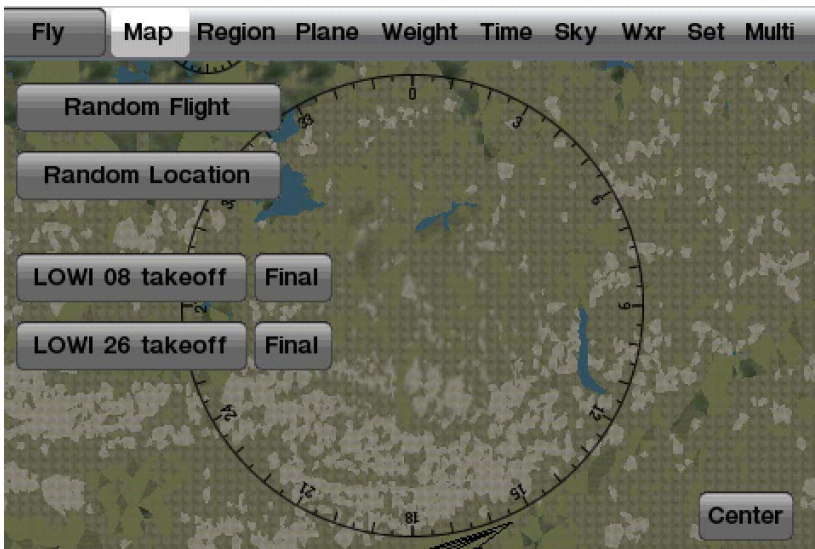


Figure 2.9: The Settings window

A. Map

The options available on the Map screen are simple: Place the craft in a random location or on whole new random flight by pressing the respective buttons. The buttons in the lower half of the screen place the aircraft either on the runway for the indicated airport (the **Takeoff** buttons) or on a final approach to that runway (the **Final** buttons). The map can be dragged using a single finger or zoomed in or out using two fingers, just like when using the external aircraft view. Additionally, placing two fingers on the screen and moving them in a circular motion (“swizzling” them) will rotate the map.

Tapping the **Center** button will center the map on your aircraft.

Zoom into the map near a navigational aid (NAVAID) or airport to view detailed information about it such as its ILS or VOR frequency.

The Map tab is also where you can reset a flight after a crash. Upon crashing, open the settings menu, which will come to the Map tab by default. Tap one of the location buttons (either for an airport or for a random flight) to “fix” your virtual aircraft and start a new flight.

B. Region

The Region menu allows the user to select which region to fly from. Tap a region to load it. The specific regions available in each app are discussed in that app’s chapter.

C. Plane

The Plane tab lets the user pick one of the four to nine different airplanes included in each app. Tap an aircraft to load it (it will be placed on the default runway for the current region). The specific craft available in each app are discussed in their respective chapters.

D. Weight

The Weight menu is interesting. Here, the user can drag the center of gravity *forward* to give the craft greater stability, or *aft* to make it more maneuverable. The weight of the aircraft can be adjusted the same way, using the slider—just tap it and drag. Lighter airplanes will of course perform better than heavier ones.

E. Time

The Time tab of the Settings window allows the user to set one of four times of day, and thus four corresponding levels of daylight.

F. Sky

The Sky tab is used to set one of five cloud conditions. You can also change the cloud base height and the visibility. To move a slider, simply tap and drag it.

G. Wxr

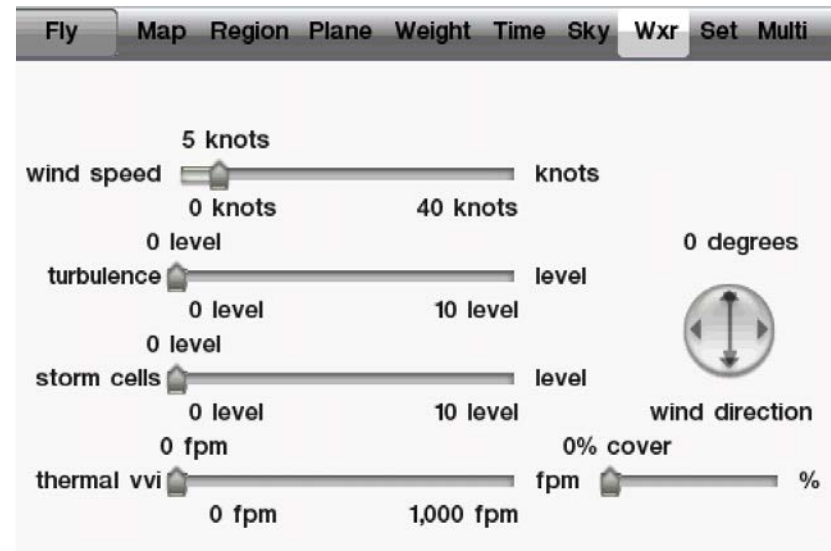


Figure 2.10: The Wxr (Weather) tab in the settings

The Wxr tab, seen in Figure 2.10, allows the user to set the weather. It has five sliders, each of which is moved just like in the rest of the app. The top two sliders set the wind speed and turbulence, which together define how rough a flight will be. Below these sliders is the storm cell “level,” which sets how severe the thunderstorms in the area will be. The two sliders at the bottom of the screen control the region’s thermals—that is, the columns of rising air in the area. The slider on the bottom left sets the rate in feet per minute at which the thermals move, and the slider on the bottom right sets the percentage of the flight region’s area which is covered by thermals. With the thermals set to 1000 fpm with 50% coverage, it will be very common to encounter very strong rising columns of air.

Finally, the round button on the right side is used to set wind direction. To move this, tap near the edge of the circle and drag your finger around the circle. Wherever your finger releases is where the wind will come from.

H. Set

The Set menu allows the user to change the phone or iPod's "control calibration." Just hold the device at the desired angle and tap the **Set current phone pitch and roll as center** button to make the current attitude of the phone or iPod the point for which input is zero. This lets users fly with the device in their lap when sitting or standing, or held vertical when lying down—kind of convenient!

In the X-Plane 9 app, there is a button labeled **Show instructions in flight if in Cessna 172**. This enables on-screen, step-by-step instructions for taking off, climbing, cruising, approaching the runway, and landing in the Cessna 172.

Additionally, at the bottom of this screen is the sound slider, set by default at 50%.

I. Multi

The Multi tab is used to set up multiplayer flights. When it is selected, X-Plane will search for other devices running the simulator. Both users need to tap the button labeled with the other user's device in order to play with that person. For example, if William and Mary want to fly together, William will need to go to the Multi tab and tap the **Mary's iPod** button, and Mary will need to go to the Multi tab and tap the **William's iPhone** button. Note that the button is selected when it turns a very light gray color. When both users have selected the other, click Done and X-Plane will set both users at the default runway.

Also, note that both users must be on the *same wireless network* in order to play together. This is configured in the iPhone/iPod's Wi-Fi setup (found in the device's Settings, as shown in **Figure 2.11**).



Figure 2.11: The iPhone and iPod Touch Wi-Fi setup

In multiplayer mode, hitting the other aircraft will result in damage (sometimes fatal) just like hitting the ground in the simulator. If this occurs, simply open up the Settings menu and take off from an airport again. Note that *both* users must select the *same* airport if they are to fly together; otherwise, X-Plane assumes that the users want to start in different places and meet up somewhere.

Finally, when in multiplayer mode, a pointer will appear (in the shape of a little airplane) near the directional gyro indicating the other user's location. Follow this pointer to join up with the

other player in the event that you lose each other.

automatically download the updates.

IV. Updating the X-Plane Apps

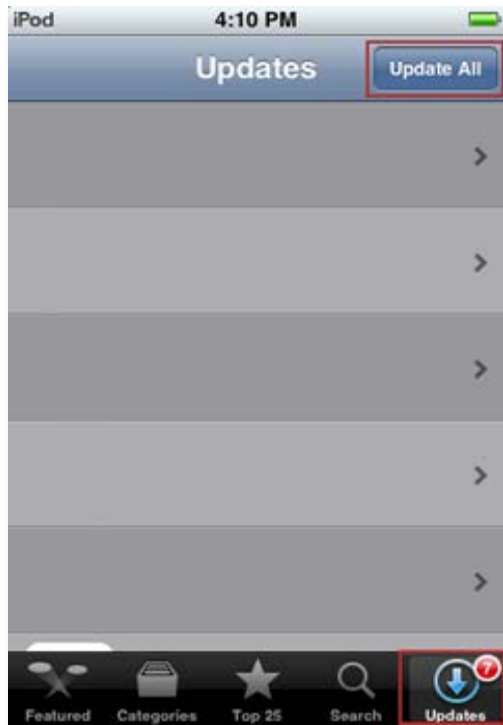


Figure 2.12: The Update tab of the App Store

The easiest way to update the mobile X-Plane applications is to go to the App Store (found on the device's "home page") and tap Updates down at the bottom of the screen. There, simply select Update All (as marked in **Figure 2.12**).

The device will prompt for the username and password that were used to purchase the applications, then it will

3. Features and Flight in X-Plane Trainer (Legacy)

X-Plane Trainer is no longer available in the iTunes App Store, and it is included here only for “legacy” support. This app was nearly identical to the X-Plane 9 app in its features. Unlike the X-Plane 9 application, though, Trainer was limited to only the Cessna 172 aircraft. Additionally, X-Plane Trainer provided on-screen instruction for taking off, flying, and landing the aircraft, as is now available in the X-Plane 9 app. Finally, instrument navigation was unavailable; the navigation radios could be tuned, but they were not linked to anything.

I. Aircraft

X-Plane Trainer comes with only the Cessna 172 aircraft, a very common craft for pilots in the real world to learn in. For more aircraft, purchase X-Plane 9 or any of the numerous spin-off applications, all available at the iTunes App Store.

II. Regions and Airports

The same regions as in the X-Plane 9 application, with their respective airports, are available in X-Plane Trainer.

The detailed Innsbruck, Austria region includes Innsbruck Airport (LOWI). The city of Innsbruck, nestled as it is in the valley of the Inn River and surrounded by mountains, is an ideal spot to take off from.

The Hawaii region includes nearly the whole of the Maui and Lanai islands. Its main airports are Kahului Airport (PHOG)

and Lanai Airport (PHNY). With the close combination of flats, gently sloping mountains, jagged peaks, and the ocean, Hawaii makes a beautiful place to fly.

The Boswell Bay region features prominently Boswell Bay and a large portion of Prince William Sound, located in southeastern Alaska.

The Southern California region spans the coast of California from Imperial Beach in the south to Barstow in the northeast to Edwards Air Force Base in the northwest. It includes San Bernardino International (KSBD), San Diego International (KSAN), and Ontario International (KONT) airports.

The San Francisco region spans from San Rafael in the northwest, to Concord in the northeast, to Santa Cruz in the south.

The Desert Sky region encompasses much of the Salton Sea, and it is virtually right next door to the Southern California Desert map.

III. Taking Off and Flying

Before we begin, remember to consult the **Glossary of Terms** found on page 64 with any unfamiliar terms.

The on-screen text in X-Plane Trainer will provide a walkthrough for taking off, climbing, cruising, approaching the runway, and landing.



Figure 3.1: Taking off in X-Plane Trainer

To begin, tap the FLAP slider (labeled 1 in **Figure 3.1** above—the slider on the right side of the screen) and drag it about a third of the way down. This will partially engage the flaps in order to generate more lift, thus getting the airplane off the ground more quickly.

Next, tap the **BRAKES** button (labeled 2 in **Figure 3.1**) to toggle the brakes off. It will go from being lit red (brakes on) to being dim (brakes off).

Then, drag the THROT slider (labeled 3 **Figure 3.1**) to the top of the screen. This will set the throttle at full.

When the airspeed reaches about 65 knots, pull the nose off the ground and begin climbing. Raise the flaps slider back up to the top of the screen in order to reduce the craft's drag.



Figure 3.2: Rotating the Cessna 172 (pulling the aircraft off the ground)

To climb most efficiently, raise the nose to the point that the aircraft's speed is 76 knots. At full throttle, this is when the craft's nose is pitched up at about 10 degrees.

After climbing awhile, the on-screen text will suggest that you level the craft off and cruise. At this point, move the throttle slider down to about three quarters of its maximum and gently move the nose down to a pitch of zero (as shown in **Figure 3.3** below).

Eventually, the on-screen text will suggest turning back to the runway. At the point, tilt the iPod or iPhone to the left or right and tilt it back slightly (thereby pulling the nose "into" the turn).



Figure 3.3: Leveling off to cruise



Figure 3.4: Aligning with the runway to land

Keep turning until the runway is in sight (as in **Figure 3.4** following). Ideally, the aircraft will be oriented in line with the runway while it is still far off. This is referred to as the approach to the runway. On the approach, keep the craft's airspeed a little above 90 knots.

As the craft gets closer to the runway, gradually decrease its speed, either by lowering the throttle or by adding flaps. This gradual slowdown should put the plane at a little under 70 knots when it touches down on the runway, with its power at zero and flaps at full. Follow a shallow glide path in to the runway—that is, point the nose down between 3 and 5 degrees. Right before the craft reaches the ground, raise the nose *up* to about 7 degrees for a gentle touchdown.

With the aircraft on the ground, tap the **BRAKES** button to toggle the brakes on.

Now that the flight is complete, open the Settings menu (as described in Chapter 2, in the section “**The Settings Menu**”) and select a new flight.

4. Features and Flight in X-Plane 9

The “X-Plane 9” mobile application has six map regions and seven airplanes available. The standard controls for time of day, weather, and aircraft weight are also configurable as per the section “**The Settings Menu**” of Chapter 2, beginning on page 12. Multiplayer also works as described in that section. Navigation radios and autopilots (where available) both work as described in Chapter 12, “**Advanced Functions of X-Plane Mobile**,” beginning on page 50.

I. Aircraft

The following aircraft are included in X-Plane 9:

- Cessna 172
- Columbia 400
- Piper Malibu
- Cirrus Vision
- Piaggio Avanti
- Beechcraft King Air
- Eclipse 500

The Cessna 172 is the most basic of the available craft, while the Columbia 400 is a high performance, turbocharged piston (that is, propeller-based) aircraft. The Piper Malibu is a piston-engined craft with a maximum speed very close to that of the Columbia 400. The Beechcraft King Air is a twin-turboprop craft, and the Cirrus Vision is a next-generation personal jet still being developed. The Eclipse 500 is a six-seater, business-class very light jet (VLJ). Finally, the Piaggio Avanti is a super-efficient Italian turboprop business aircraft.

When flying the Cessna 172, if the **Get flight instruction if in**

Cessna 172 button is enabled in the Set menu (which it is by default), the simulator will give on-screen, step-by-step instructions for taking off, flying, and landing the aircraft.

Reverse thrust capabilities are available in the Piaggio Avanti and Beechcraft King Air. As with other reverse thrust-capable aircraft, the throttle slider in these aircraft will sit by default about 1/3 of the way up the screen. Drag it to the bottom of the screen to give the aircraft full backward throttle, or drag it to the top of the screen to give it full forward throttle.

Table 4.1 lists the approximate minimum takeoff speed for each of the aircraft in X-Plane 9. It is a good idea to add five to ten knots to this number as a "speed cushion" before pulling the aircraft's nose off the ground during takeoff (called "rotating"). Note that each of these numbers assume that 1/3 flaps have been pulled in.

Aircraft	Approx. Takeoff Speed (knots)
Cessna 172	60
Columbia 400	95
Piper Malibu	90
Cirrus Vision	80
Piaggio Avanti	95
Beechcraft King Air	90
Eclipse 500	85

Table 4.1: Approximate takeoff speeds for general aviation craft

II. Regions and Airports

The regions listed below, with their respective airports, are available in X-Plane 9. Note that these are the same as in X-Plane Trainer.

The detailed Innsbruck, Austria region includes Innsbruck

Airport (LOWI). The city of Innsbruck, nestled as it is in the valley of the Inn River and surrounded by mountains, is an ideal spot to take off from.

The Hawaii region includes nearly the whole of the Maui and Lanai islands. Its main airports are Kahului Airport (PHOG) and Lanai Airport (PHNY). With the close combination of flats, gently sloping mountains, jagged peaks, and the ocean, Hawaii makes a beautiful place to fly.

The Boswell Bay region features prominently Boswell Bay and a large portion of Prince William Sound, located in southeastern Alaska.

The Southern California region spans the coast of California from Imperial Beach in the south to Barstow in the northeast to Edwards Air Force Base in the northwest. It includes San Bernardino International (KSBD), San Diego International (KSAN), and Ontario International (KONT) airports.

The San Francisco region spans from San Rafael in the northwest, to Concord in the northeast, to Santa Cruz in the south.

The Desert Sky region encompasses much of the Salton Sea, and it is virtually right next door to the Southern California Desert map.

As a side note, the Innsbruck field (LOWI) presents an interesting challenge for users who want to fly an instrument approach. The airport is very unusual in that, due to the nearby mountains, it sits in a deep valley. Thus, the normal 3 degree descent path to the runway would not provide the required terrain clearance. Instead, two localizers (discussed in Chapter 12, in the “**Flying an Approach Using the Instrument Panel**” section on page 50) are used—one

pointing toward the runway and the other away from it. Pilots must first fly over the airport at a high altitude on approximately the reciprocal heading to the runway of intended landing, then come back around to touch down. To see this more clearly, go to the Map screen and zoom in on the LOWI airport. The two localizers (LOC) that set up this approach can be seen clearly—note how they are set inside the valley between the peaks. Note also that they are slightly offset, so that when pilots fly the first LOC (heading about 070 degrees) they reach the end and must make a pretty sharp right-hand turn of just under 180 degrees, after which they fly the second LOC back to the airport. For more information on flying an instrument approach, see the section “**Flying an Approach Using the Instrument Panel**” in Chapter 12, beginning on page 50.

III. Taking Off and Flying

We will go through the takeoff and flight of X-Plane 9’s default aircraft, the Cirrus Vision. Takeoff in the simulator’s other aircraft will be nearly identical—simply substitute in that aircraft’s takeoff speed (found in the chart in the “**Aircraft**” section above) for the 80 knots specified here for the Cirrus.

When the simulator loads initially, the Cirrus is placed on LOWI’s runway with its engine running and ready to go.

Tap the **BRAKES** button on the lower left of the screen to turn the brakes off. Drag the flaps (controlled with the scroll bar on the right side of the screen) to about 1/3 or 1/2 of the way down to get ready to take off. This will partially lower the flaps in order to give the craft more lift, getting it into the air more quickly. Do *not* put the flaps *all* the way down because they would add too much drag. Full flaps are only used when landing.

With the flaps dialed in, drag the throttle (the scroll bar on the left) all the way to the top. This will give the aircraft full power. At this point, the screen should look like it does in **Figure 4.1**.

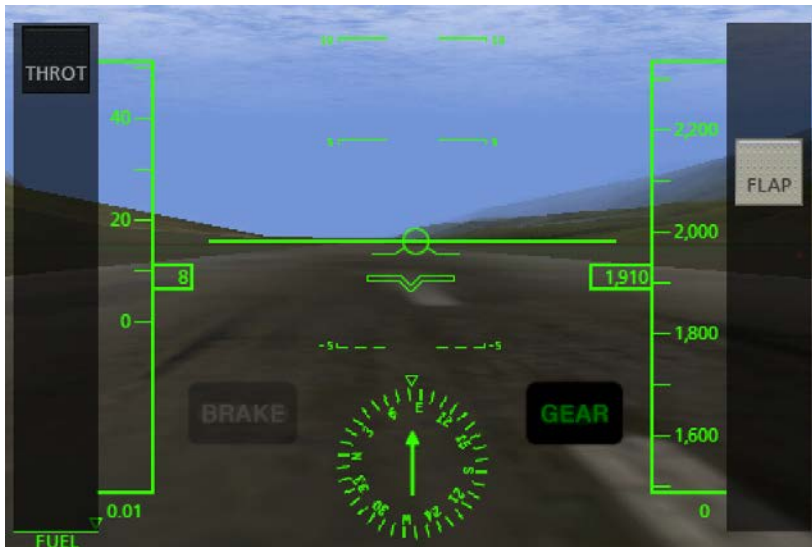


Figure 4.1: The HUD view with brakes off, full throttle, and 1/3 flaps

Drag the rudder slider (at the bottom of the screen) left and right to steer down the runway, holding the phone at about a 45 degree pitch (for a neutral elevator). When the craft reaches about 80 knots (indicated by the scrolling tape on the left side of the screen), tilt the phone back toward you to raise the nose and get the craft off the ground.

After the craft has risen a few feet, let the nose drop back down a bit to (nearly) level off, but don't settle back to the runway. Let the plane accelerate for a few moments like this (until it reaches, say, 100 knots), then resume climbing. Leveling off in this way will provide a “cushion” of speed for the aircraft so that when it begins to climb in earnest, it will be less

likely to slow down toward the stalling speed.

Note that once the power is set at full, the performance of the plane (in terms of its climb rate and airspeed) is controlled by pitching the nose up and down. If the craft's nose is pitched too high up, its speed will drop until it stalls. This can be thought of as being similar to a car trying to go up a hill—an excessively steep hill will cause the car to go very slowly and its engine to overheat. In the Cirrus Vision, a speed of around 130 knots is desirable when climbing.

Tilt the phone left and right to steer, and hold the nose about 10 degrees up to climb away from the runway. Hit the **GEAR** button to raise the landing gear, and, once the craft is safely in the air, drag the FLAP slider back up to the top to fully retract the flaps. Continue to hold the nose up about 10 degrees as the plane climbs out. In the climb, both the gear and flaps should be up and power should remain at full. When flying, always keep the plane's speed above about 80 knots as an absolute minimum to avoid stalling. It may be necessary to either add power or lower the nose to maintain this speed.

Once again, note that the craft's altitude is displayed on the tape on the right, and its vertical speed is shown right underneath it.

5. Features and Flight in X-Plane Extreme

The X-Plane Extreme app features some of the biggest and fastest aircraft in the world. These planes are set in regions populated by mountains and canyons that are a thrill to fly through. The application comes with six map regions and eight jets. The standard time of day and weather conditions are available, as described in the section “**The Settings Menu**” of Chapter 2 (page 12). Multiplayer works as described in that section also, and the autopilots and navigation radios work as described in Chapter 12, “**Advanced Functions of X-Plane Mobile**” (on page 50).

I. Aircraft

The following aircraft are included in the Version 9.10 update to X-Plane Extreme:

- F-22 Raptor
- SR-71 Blackbird
- B-1 “The Bone”
- B-2 “The Jet”
- B-52 Stratofortress
- North American X-15
- XB-70 Valkyrie
- C-130 Hercules

These are eight of the most unusual and advanced aircraft ever created. Each has its own unique control system that radically affects the way the plane handles and how it must be flown. The aircraft included with X-Plane Extreme are stunningly different to fly—much more so than any other

planes for X-Plane.

A. The F-22 Raptor

The F-22 Raptor is by far the most maneuverable and powerful fighter in the sky. Nothing else comes remotely close. An interesting point regarding the Raptor is that the thrust vectors up and down to steer the craft. This lets the plane pitch the nose up and down with full authority even at zero speed, simply by vectoring the thrust—it can even hang (nearly) motionless on its engines. This comes at a cost, though: When the pilot cuts the power, the craft loses that lift and maneuverability.



Figure 5.1: Thrust vectoring with the F-22 Raptor

To see these thrust vectors, select an external view and turn on the visible force vectors (see **Using the Menu and View**

Options in Chapter 2, beginning on page 7). Give the craft full throttle and pull it into a sharp climb or push it into a sharp dive. Then, watch the thrust vectors tilt up or down, as seen in **Figure 5.1**.

B. The SR-71 Blackbird

The SR-71 Blackbird is the fastest jet aircraft in the world, able to exceed Mach 3 and break 70,000 feet. It still holds several world speed records set in the 1970s and 1980s. Many users wonder why it is, then, that the F-22 has a higher acceleration and top speed than the SR-71 at low altitudes. Simply put, each plane is designed for a different mission and operational envelope. The SR-71 was designed as a spy plane and is absolutely untouchable (even 40 years later) in high-altitude, straight and level flight. In 1977 a Russian MiG-25 (Russia's premier interceptor and attack aircraft) made an attempt to intercept an SR-71 at nearly 70,000 feet. The Russian aircraft completely trashed its engines trying to keep up, though it could momentarily hit Mach 3. The Blackbird simply pulled away. The SR-71 at 50,000 feet or higher will leave any other aircraft in the dust, even the mighty F-22.

Users may notice that even in the SR-71, the craft's indicated airspeed will be very low (on the order of only 100 knots or so). This is expected and is due to the fact that the air at such a high altitude has a very, very low density. Thus, there are very few molecules of air that are getting rammed into the aircraft's instrumentation system, as compared to flying through the very thick air of low altitudes. Once again, the aircraft's gauges display the *indicated* airspeed, not necessarily the *true* airspeed.

Flying the SR-71 is like balancing three checkbooks at once. The pilot must maintain control of the craft's speed, altitude,

and flight controls at once in order to reach the craft's maximum speed of Mach 3 at over 70,000 feet.

C. The B-1 "The Bone"

The B-1 "The Bone" bomber has almost full-span flaps (that is, the flaps cover nearly the full wingspan), leaving very little room for ailerons. Thus, spoilers must be used for roll control, as well as differentially deflecting all-moving stabilators (the horizontal tail surfaces) to aid in roll control. Despite the huge flaps and multiple roll controls, this huge, ungainly bird still has terribly high stall speeds and a limited roll rate due to its high weight. If pilots can get this plane around the sky and down in one piece, they are doing well!

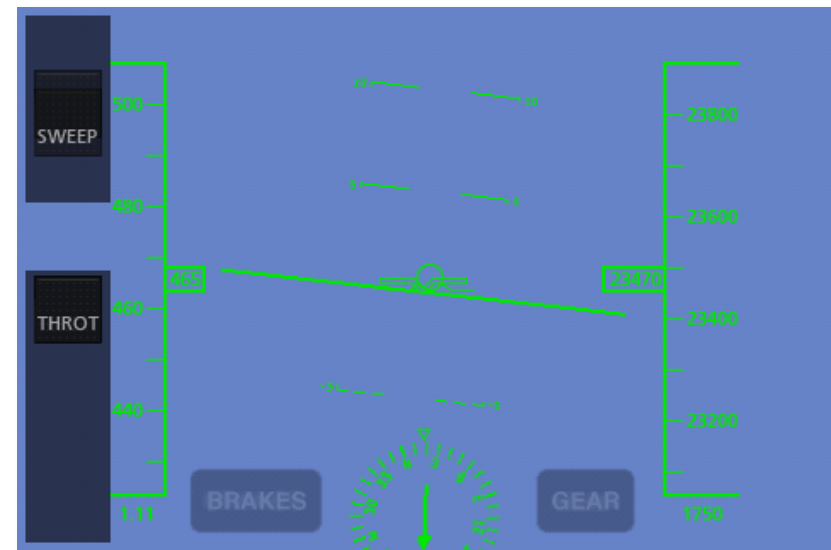


Figure 5.2: Sweeping the B-1's wings back

This aircraft uses variable wing sweep to allow the plane to fly

at incredible speeds. When the wing sweep slider is moved *down* (as in **Figure 5.2**), the wings will slowly move to their aft position.

This causes the center of lift to move aft, forcing the nose down. Thus, the craft must be moving at a very high rate of speed, close to Mach 1 before the wings are swept backwards. Sweep the wings rearward slowly and carefully and let X-Plane automatically add trim to hold the nose up. Move the SWEEP slider a bit (thus moving the wings back a bit) and wait a few seconds as the trim automatically pulls the nose up a bit. When things have stabilized, sweep the wings a bit further and wait for a few more seconds. Do this three or four times to get the wings swept all the way back.

D. The B-2 Spirit

The next aircraft in X-Plane Extreme is the B-2 Spirit, otherwise known as the “Stealth Bomber.” The B-2, quite uniquely, has no tail. At all. There is no vertical stabilizer, no horizontal stabilizer, and no flaps. Instead, ailerons on the wingtips split open to add drag on the left or right side of the plane to give yaw control.

A fly-by-wire system coupled to multiple flight control surfaces makes this aircraft manageable, and really rather nice to fly. Actually, this aircraft is literally unflyable without the flight control computers, which continually make small inputs to keep the plane flying the way (and direction) the pilot commands.

E. The B-52 Stratofortress

The B-52 Stratofortress (informally known as the BUFF—the

Big, Ugly, Fat —) is a huge eight-engined bomber, originally designed during the Cold War to carry nuclear weapons.

This monster of a plane needs about 230 knots (with one-third flaps) to get off the ground, and it has a maximum speed of about 650 miles per hour at 20,000 feet.

F. The X-15

The North American X-15 is a rocket-powered speed demon. With a top speed of Mach 6.72 (4520 miles per hour), it is the fastest manned aircraft in the world. To begin flight, this craft is dropped, uniquely, from the B-52 “mothership.” Its top speed is over double that of the SR-71 (the world’s fastest jet airplane), and its maximum altitude of over 50 miles qualifies its pilots for astronaut status.

The craft’s absurdly high top speed requires a blast shield to be installed over one side of the windshield—without it, the windows would burn up. The X-15 pilots would fly the high speed portion of the mission with the shield on the right side, looking out the left side only. After the craft slowed down (and the left window was sufficiently charred), the pilot would jettison the blast shield and move to the right window in order to land.

When the X-15 is selected from the Settings menu, X-Plane will load up the B-52 to drop it from. Go to the HUD view (if desired) and touch the screen as instructed. Drag the throttle to the top of the screen, take the flaps up, and watch its airspeed “rocket”—that is, until it gains enough altitude, at which point its *indicated* airspeed will drop to maybe 15 knots, while it is *actually* moving at Mach 6.

Watch your fuel gauge while flying this one—at full throttle, it

takes only a couple minutes to go from a full to an empty tank.

G. The XB-70 Valkyrie

The XB-70 was a prototype bomber designed during the 1950s, able to exceed Mach 3 at 70,000 feet. Like the SR-71, it diffuses the vast amounts of heat produced by friction when flying at Mach 3 by circulating fuel through its outer skin.

This high-speed, high-altitude design worked well for avoiding the threat posed by interceptor aircraft. With the advent of Soviet anti-aircraft missiles in the late 1950s, though, this strategy fell out of favor, replaced by low-altitude aircraft that could only be detected (and fired at!) at much shorter distances.

H. The C-130 Hercules

The C-130 is a versatile military transport plane, used across the world as a gunship, airlifter, search-and-rescue craft, and even firefighter. Its six turboprop engines give it a top speed of 320 knots. It holds the record for the longest continuous production run among military aircraft, and the record for the heaviest aircraft to be landed on an aircraft carrier.

Reverse thrust is available in the C-130. As with other reverse thrust-capable aircraft, the throttle slider in these aircraft will sit by default about 1/3 of the way up the screen. Drag it to the bottom of the screen to give the aircraft full backward throttle, or drag it to the top of the screen to give it full forward throttle.

I. Approximate Takeoff Speeds

Table 5.1 lists the approximate takeoff speeds for the aircraft in X-Plane Extreme. Note that it is a good idea to add a few knots to these speeds in order to provide a “speed cushion” that prevents stalling.

Aircraft	Approx. Takeoff Speed (knots)
F-22	115
SR-71	145
B-52	230
B-1	170
B-2	110
X-15	N/A
XB-70	200
C-130	110

Table 5.1: Approximate takeoff speeds for extreme aircraft

II. Regions and Airports

The regions listed below, with their respective airports, are available in the Version 9.52 update of X-Plane Extreme.

The Southern California region spans the coast of California from Imperial Beach in the south to Barstow in the northeast to Edwards Air Force Base in the northwest. It includes San Bernardino International (KSBD), San Diego International (KSAN), and Ontario International (KONT) airports.

The Kathmandu region centers on Tribhuvan International Airport (VNKT), located in the mountains of Nepal.

The Juneau region centers on Juneau International Airport (PAJN). With lots of frigid water and snowy mountains, it makes for a beautiful flight.

The Van Nuys region extends from Mojave in the northeast to

Thousand Oaks in the southwest. Prominent airports include Van Nuys Airport (KVNY) and Bob Hope Airport (KBUR) in Burbank.

The Edwards AFB region spans from Sequoia National Forest in the northwest all the way down to San Bernardino in the southeast. It includes Van Nuys Airport (KVNY) in the southwest, as well as Ontario International Airport (KONT) and, of course, Edwards Air Force Base (KEDW).

The fictitious Canyons region is filled with five airports and lots and lots of canyons. You're virtually guaranteed to have some mountain peaks in view any time you tap the **Random Location** button in the Map screen.

III. Taking Off and Flying

Let's go through the basics of takeoff and flight in X-Plane Extreme's default aircraft, the F-22 Raptor.

First, tap the **BRAKES** button on the lower left of the screen to turn the brakes off. Because of the excessive amount of power available in the Raptor, flaps are not required to take off. Drag the throttle (the scroll bar on the left) slowly all the way to the top. This will give the aircraft full power. Tilt the phone or iPod left and right to steer down the runway (being careful not to hit the plane in front of you), holding the device at about a 45 degree pitch (for a neutral elevator). When the craft reaches about 120 knots (indicated by the scrolling tape on the *left* side of the screen), tilt the device back toward you to raise the nose, and away you go.

Keep in mind that this airplane is *excessively* powerful and that it also uses thrust vectoring—that is, it points its exhaust up and down on each engine independently to aid in roll and pitch

control. The engines produce more than 35,000 pounds of thrust *each* when in full afterburner. Compare that with the F-16 which puts out about 24,000 pounds of thrust *total*. Because the Raptor's engines vector the thrust up and down with the flight controls, yanking the stick back rapidly while on the runway will cause the engine's thrust to slam the tail into the ground and the nose will point excessively high upward. Users in the past have commented that this is not possible, that the Raptor cannot possibly take off in such a short distance. Of course, the plane has *not* really taken off yet—it's just sliding down the runway dragging its tail on the asphalt. Look at the altimeter to determine when the aircraft is actually in the air and climbing.

Once off the ground, tilt the device left and right to steer. Hit the **GEAR** button to raise the landing gear and make sure the FLAP slider is at the top of the screen. Hold the nose up about 30 degrees or so as the plane climbs out. In the climb, both the gear and flaps should be up. Given the amazing power this airplane produces, the throttle can be brought back a bit in order to get out of afterburner mode.

Note that the altitude is displayed on the tape on the right, and the vertical speed is printed right underneath it. The aircraft's speed relative to the speed of sound (its current Mach number) is displayed in the lower left, directly beneath the airspeed indicator. Once again, the craft's *indicated* airspeed may be different from its *true* airspeed due to the design of the instrument itself. This becomes especially important at high altitudes, where there is little to no air hitting against the airspeed measuring device on the body of the craft.

6. Features and Flight in X-Plane Carrier

X-Plane Carrier is the most realistic aerial combat simulator available for the iPhone, iPod Touch, and Pre. At the same time, it is the most realistic carrier operations simulator for the platform and, in our opinion, one of the most fun apps out there.

Your ultimate goal in the sim is to take off from the carrier, destroy your adversary in the air without being shot down yourself, and return to the carrier for landing. After successfully landing, you will receive a score based on your performance. How high how can you score? We have never managed to exceed a 90% here.

Catapults, guns, guided missiles, and arresting gear are all realistically simulated (more realistically than any other mobile app by far), giving users the ultimate aviation challenges of aircraft carrier operations and aerial combat together in one simulation.

Once you have licked the violent aerial engagements and tricky carrier operations in day, night, clear, cloudy, calm, and windy conditions, battling all different sorts of adversaries in all different sorts of weather at all times of day, there is still multiplayer! This gets really, really fun, of course, because this is the first-ever X-Plane simulation where users can shoot their opponents down to a flaming, horrible death.

Ready to try it?

I. Aircraft

Six aircraft are included with X-Plane Carrier. First is the World

War II-era F4U Corsair, a screaming 350+ mph fighter packing two *thousand* horsepower. This is paired up against the nimble Japanese A6M “Zero”—a much slower, less powerful, but much more maneuverable adversary. Users can fly either plane against the other, experimenting in the advantages of speed versus maneuverability.



Figure 6.1: X-Plane Carrier's F4-U Corsair

Next is the mighty F-4 Phantom II, with over thirty-two *thousand* pounds of thrust, four air-to-air guided missiles, and guns if those fail. This bird flies against the surprisingly fast and agile MiG-21 Fishbed, which puts up an amazing fight with its light weight and tight turns. Users can also take the MiG up against the Phantom II to try the battle from the other side. Which plane is better in the dogfight?

The F-14 Tomcat was introduced by the US Navy as a replacement for the F-4 Phantom II. Here in X-Plane Carrier, it gets pitted against its own replacement—the F/A-18F Super

Hornet. The Super Hornet, a larger redesign of the original F/A-18, is a versatile fighter still in production.

II. Missions

X-Plane Carrier gives the user three different locations to run through two different missions. The first area, San Francisco, California, is used for carrier training—no “bad guys” here. The other two regions, though—Honolulu, Hawaii and Anchorage, Alaska—will feature the enemy aircraft corresponding to whichever plane the user has chosen. That is, users flying the F-4 will have a MiG-21 in their skies, users in an A6M will have an F4U approaching, and so on.

When either of the two combat locations is selected, a slider will appear at the bottom of the Mission tab (found in the settings menu) to modify the skill level of the enemy aircraft. Tap and drag it down to 0% for a push-over, or bring it to 100% to fight against the ultimate ace.

III. Taking Off, Flying, and Landing

To take off from the carrier, a few things must be done in quick succession. First, the throttle slider (labeled 1 in **Figure 6.2** below) must be dragged to the top of the screen. The flaps must be pulled down about half way (using the slider labeled 2 in **Figure 6.2**), and the **BRAKE** button (labeled 3 in **Figure 6.2**) must be tapped to disengage the brakes and activate the catapult propelling the craft off the deck. From there, simply guide the craft down the flight deck and, once clear, pull the nose up and tap the **GEAR** button (labeled 5 in **Figure 6.2** below).

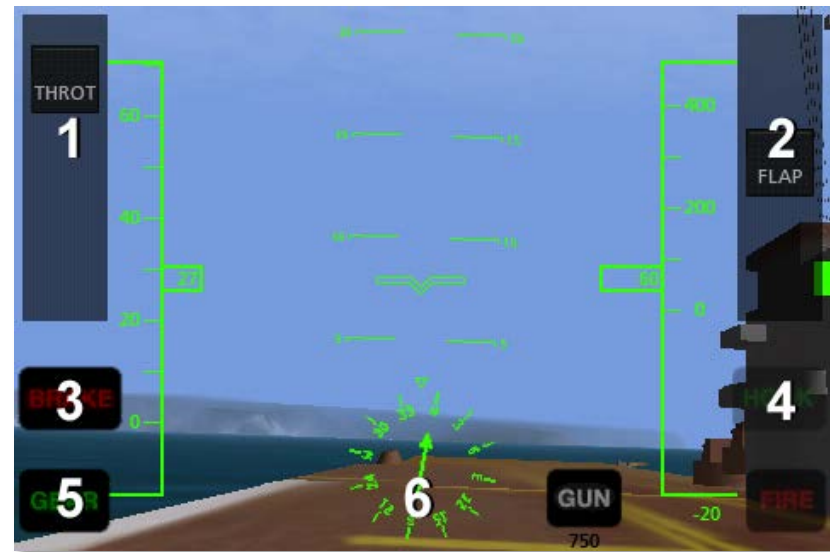


Figure 6.2: X-Plane Carrier's controls

Landing on the carrier is a bit more difficult. First, note that the ADF arrow (found in the middle of the directional gyro, labeled 6 in **Figure 6.2**) always points the way back to the carrier. This is invaluable in setting up an approach to the carrier.

To set up an approach to the WWII carrier used with the F4U (whose landing deck goes straight down the flight deck), a pilot should fly either a 90 or 45 degree intercept (depending on the aircraft's distance) in order to get behind the ship. If the ship is traveling north, and the aircraft is coming from the east with the ship to its north (as in **Figure 6.3**), the pilot will continue on his or her intercept trajectory until the ADF is pointing either 45 or 90 degrees to the right, at which point he or she will turn in toward the landing deck.

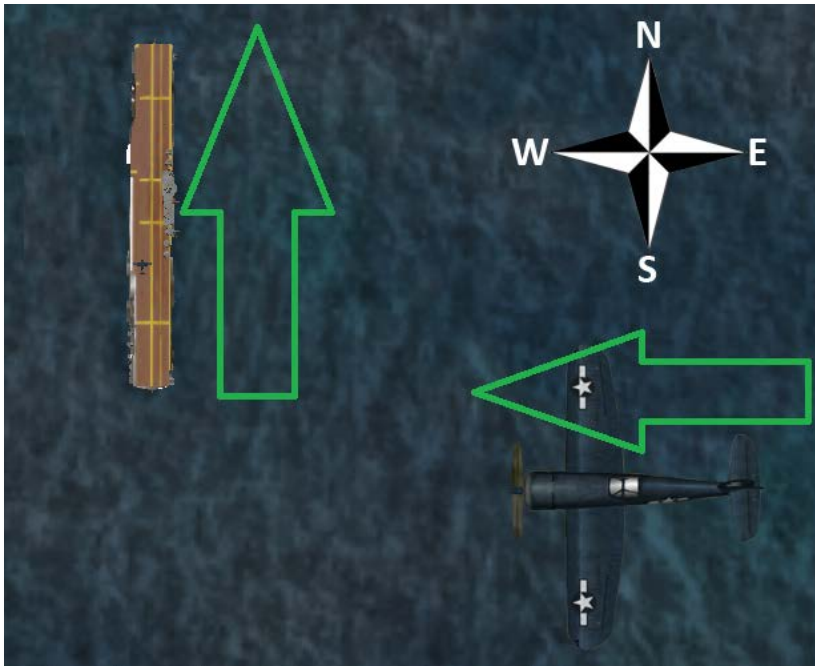


Figure 6.3: Carrier approach diagram

If the carrier is instead the John F. Kennedy-class ship used with the F-4, F-14, and F-18, the landing runway is angled 30 degrees to the port (left) side—it is not straight down the flight deck like in the older carriers. This change was made to prevent the all-too-common overruns that occurred in WWII when a landing plane crashed into the stacked line of planes at the far end of the carrier. A pilot landing on such a carrier must correct for this angling. Using the **Figure 6.3** diagram, the pilot would instead wait until the ADF was pointing either 15 or 60 degrees to the right before turning in for a landing.

When approaching the flight deck to land, a glidepath of about 3.5 degrees is standard. At this time, the tail hook should be lowered by tapping the **HOOK** button (labeled 4 in **Figure 6.2**),

turning it green. This will allow the tail of the aircraft to catch the arresting wires on the deck. These wires will accelerate the craft from well over 100 knots down to zero in little more than a second.

Unlike in a conventional landing, there should be no “flare” before touching down on the carrier. Whereas, say, an airliner would raise its nose up just before touching the runway (thereby ensuring a smooth landing), a carrier approach should maintain a constant glideslope until the craft hits the deck.

Also, rather counter-intuitively, a real fighter pilot must slam the throttle to full the instant that the aircraft touches the deck. This is because, even when the pilot has done everything right, the craft's tail hook can bounce over the arresting wires in what is called a “bolter.” When this happens, the pilot must be ready to get off the deck safely and come around for another try. Don't worry—even when the throttle revs up like this, the arresting wires will still pull the craft down to zero velocity.

To see how the pros do it, check out the following links:

[Video: Carrier Landing—F-4J Phantom II in the Mediterranean Sea](#)¹

[Video: F-14 Carrier Landing](#)²

[Walkthrough: How to land a jet plane on an aircraft carrier](#)³

IV. Combat

Of course, taking off and landing on the carrier are only means

¹<http://www.youtube.com/watch?v=PDMtkwMA75A>

²http://www.metacafe.com/watch/303345/carrier_landing_home_video/

³<http://everything2.com/title/How+to+land+a+jet+plane+on+an+aircraft+carrier>

to an end. The real goal is the dogfight—shooting down the enemy. Each of the aircraft is equipped with a gun, and the modern jets (the F-4, MiG-21, F-14, and F/A-18F) include AIM-9 Sidewinder missiles, too.

A. Combat Basics

Each aircraft's weapons can be fired with the **FIRE** button (labeled 3 in **Figure 6.4** following). To the left of this button is the **GUN** button (labeled 2 in **Figure 6.4**), and beneath this is a number indicating the number of rounds left (676 rounds in **Figure 6.4**). In the jets, there is a corresponding **AIM9** button (labeled 1 in **Figure 6.4**). Tapping this will switch from the guns to the guided missiles, and tapping the **GUN** button will switch back.

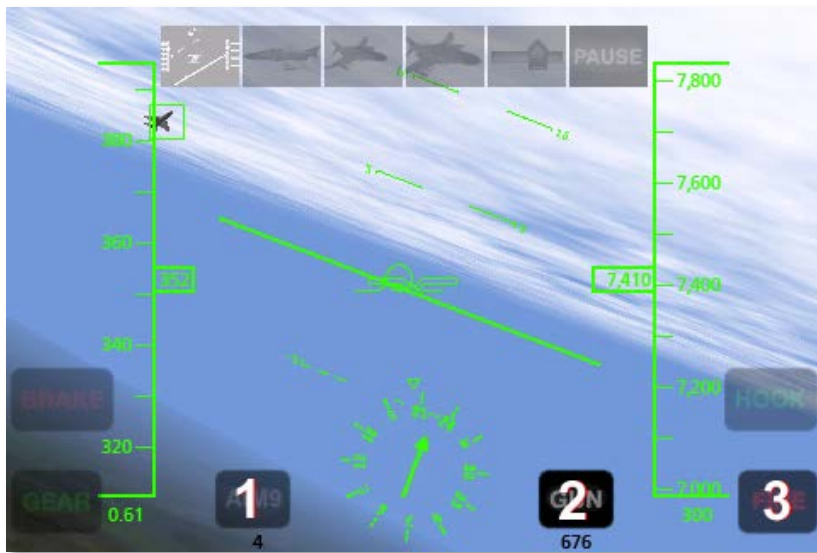


Figure 6.4: X-Plane Carrier's weapon controls

B. Using the Gun

When firing a gun, be sure to lead opponents (called deflection shooting)—fire at where they *will* be, not where they are. Mastering so-called “high deflection shooting” can make the difference between ending a fight quickly and losing it entirely. Whereas the surest shot will always come when a pilot is right on an enemy's tail, a high deflection shot comes from beside or in front of the enemy. In most cases, a pilot has only a split second in which the enemy will cross his or her path of fire, so timing is critical.

C. Using the Missiles

When firing the AIM-9 missiles, they will more or less lock on to an enemy automatically, even when fired from a good distance. While this makes it relatively easy to score a kill on an enemy, that enemy is equipped with the same missiles, so be prepared to jink (rapidly deflect the flight controls into turns in different directions) when the return fire comes.

D. Using the Targeting Reticle

The targeting reticle always follows the enemy's aircraft. If the enemy aircraft is visible on screen, it will appear with a thin green box around it, as in **Figure 6.5** below.

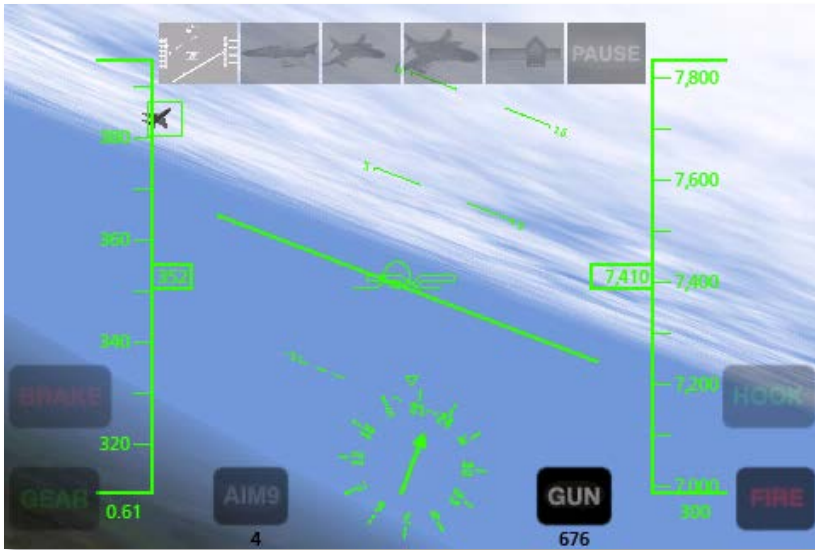


Figure 6.5: An enemy visible on screen



Figure 6.6: An enemy outside the field of view

If, however, the enemy is not visible on screen, the reticle will be “dragged” to the edge of the screen and will appear as a thick green bar on the edge of the screen. For instance, in **Figure 6.6** below, the opponent is on the pilot's left side (the green bar is near the center on the left side of the screen).

The reticle breaks down, though, when the opponent's aircraft is very close to the user's, or when it is directly on the user's tail. In this case, the reticle will bounce around from full left deflection to full right deflection. This is simply a limitation associated with trying to point in three dimensions using a two dimensional display.

E. Strategy

The key to winning a dogfight lies in creating a situation where *your* aircraft's strengths are emphasized and an opponent's weaknesses are exploited. This means trying to force a tight, up-close battle when flying a more maneuverable fighter than the enemy, or aiming for dive-bombs and other tactics requiring speed and weight when flying a faster, larger craft.

Additionally, do not underestimate the value of quick combat maneuvers, such as:

- corkscrews—rolling your craft left or right while continuously varying its pitch
- feints—rolling to one side as though to go into a banked turn (i.e., a turn with the craft on its side, while pulling back on the controls in order to pull “in” to the turn), but

- pushing the nose forward instead
- barrel rolls—often described as “a cross between a roll and a loop” (see **Figure 6.7**).

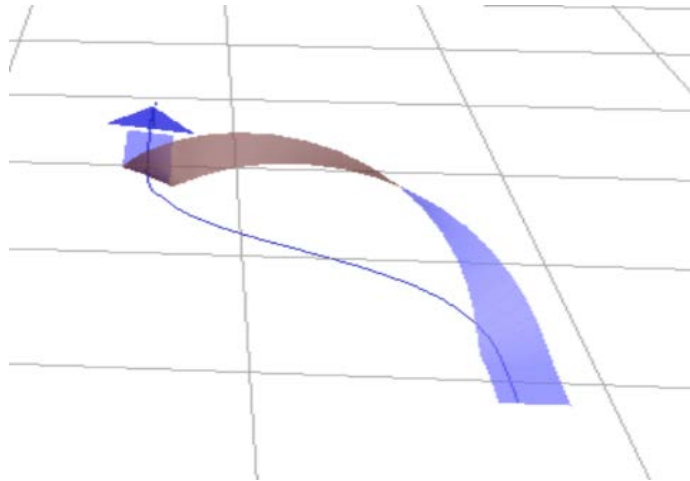


Figure 6.7: Barrel roll diagram

For more information on combat tactics, see the [Dicta Boelcke](#)⁴, a list of tactics developed by WWI ace Oswald Boelcke.

⁴http://en.wikipedia.org/wiki/Dicta_Boelcke

7. Features and Flight in X-Plane Racing

X-Plane Racing is the *first ever* X-Plane application (for any platform, including desktop) with timed race courses that allow users to race against the computer or friends using the multiplayer mode. It is the most polished and optimized mobile version of X-Plane yet, with a great deal of testing done to perfect the AI and multiplayer modes.

X-Plane Racing comes with four regions and six planes, with a race course for each plane in each region, for a total of twenty-four race courses. These courses are presented as “highway-in-the-sky” “hoops” that the user flies through, racing against the clock and the AI’s aircraft. When the course is finished, X-Plane will display the user’s time through the course and the number of hoops missed. Some courses race down river valleys, others through mountain ranges, clouds, deserts, or snow-covered mountains. All the standard settings configurations (described in the section “**The Settings Menu**” of Chapter 2, beginning on page 12) are available, but there is a special twist—rather than just flying alongside another user, multiplayer in X-Plane Racing allows timed trials against an opponent.

To our knowledge, X-Plane Racing has the most realistic flight physics for any aerial racing simulator ever created for any platform.

New tweaks in the X-Plane Racing aircraft include things like visible afterburners, a basic autopilot, and tire skidding sounds that are accurately linked to the street racing-accurate tire physics model. Of course, all of these improvements have also been released for the other X-Plane Mobile apps as a free update.

I. Aircraft

The following aircraft are included in X-Plane Racing:

- F4U Corsair
- P-51 Mustang
- F-4 Phantom II
- F-15 Eagle
- F-86 Sabre
- Gee Bee Super Sportster

The F4U Corsair is a World War II-era high-speed fighter. Because of its taildragger landing gear configuration, it is *very* tricky to land. The pilot must land in a full-stall, nose-high attitude. *Be sure to hold the stick at full aft* (meaning the device is tilted all the way back) on the takeoff roll in this plane in order to hold the tail wheel down for steering authority.

The P-51 Mustang was the premier fighter of the Second World War. It must be taken off and landed with the same technique as the Corsair due to the taildragger landing gear.

Note also that both of these World War II-era, propeller-driven fighters have *very* powerful engines and *very* large propellers. As a result, the torque delivered by the engine and propeller will try to roll the plane to the left. This is most noticeable at very low airspeeds (when taking off, for example), when the aerodynamic forces created by the ailerons to counteract this are at a minimum. Thus, be prepared to roll hard towards the right (by rolling your device right) as the plane lifts off and the wheels are no longer supporting the weight of the airplane on the ground. As the craft’s airspeed builds you will be able to use less and less right aileron to counteract the torque from the propeller and engine.

The F-4 Phantom II, the king of the “Jet Age,” held fifteen world records during the 1960s (listed near the bottom of [this](#)

page⁵), among which were a number of fastest times to altitude, the fastest time across the continental US, and the highest zoom climb. It makes for an incredible ride through the canyons at Mach 1.25.

The F-15 Eagle is the pinnacle of pilot-friendly jet power... *If* the pilot can handle Mach 1.25 between the mountain peaks of Alaska and the other regions.

The F-86 Sabre saw a great deal of action during the Korean War, where it battled the Soviet MiG-15s. In the late 1940s, the Sabre was the fastest jet aircraft in the world, reaching a speed of 570 mph in 1948. It eventually saw speeds as high as 680 mph.

The Gee Bee Model R Super Sportster was the aircraft racing king of the 1930s. With a top speed of nearly 300 mph, it was untouchable in its time. Be careful, though—its small control surfaces make it a bit of an unruly ride!

Table 7.1 lists the approximate takeoff speeds for the aircraft in X-Plane Racing. Note that it is a good idea to add a few knots to these speeds in order to provide a “speed cushion” that prevents stalling.

Aircraft	Approx. Takeoff Speed (knots)
F4U	85
P-51	85
F-4	175
F-15	150
F-86	185
Gee Bee	115

Table 7.1: Approximate takeoff speeds for racing planes

⁵ <http://www.aviation-history.com/mcdonnell/f4.html>

II. Regions and Courses

X-Plane Racing has four flight regions available—Canyons (a fictional area filled with its namesake), Juneau and Anchorage, Alaska, and Provo, Utah.

Within each region are six different race courses—one for each aircraft; changing the aircraft changes the course. Each course is appropriate to the craft—for instance, courses for the F-15 may have 90 degree climbs, followed by an abrupt dive, whereas the P-51 courses, due to limitations of the craft, will not be so extreme. The courses also vary in length, with the jet courses being longest due to their higher speeds.

Note: When a different airport is selected in the Map tab of the Settings menu, the race course will disappear. To bring it back, load the first airport in the list. For example, in the Canyons region, this is done with the button labeled **RAC4 32 takeoff**, which denotes the Race 4 airport, runway 32).

III. Racing

Upon opening X-Plane Racing, the simulator will place the default F-15 Eagle at the end of the runway, facing the course.

Tap the **BRAKES** button in the lower left of the screen to turn the brakes off. While flaps (controlled with the scrolling bar on the right side of the screen) *could* be used to take off, they aren’t required. Instead, drag the throttle, found on the left side of the screen, all the way to the top.

With the throttle at full, tilt the phone/iPod left and right to steer down the runway, holding the device at about a 45 degree pitch (for a neutral elevator).

Note that when flying a taildragger (the P-51 and the F4U), the device needs to be tilted nearly all the way back (for full aft deflection of the flight controls) in order to keep the tail wheel on the ground for control. Additionally, hold a good bit of right aileron to help the aircraft lift off cleanly or else it will roll very sharply to the left as the wheels lift off the ground, possibly crashing and killing the pilot.

When the craft reaches around 150 knots (indicated by the scrolling tape on the *left* side of the screen), tilt the device back toward you to raise the nose, and away you go. Note that less speed will be needed for the piston-engined aircraft (that is, those with a propeller), as they are significantly lighter and designed for slower airspeeds.

With the craft in the air, tilt the phone/iPod left and right to steer, and tilt it forward and back to climb or descend. Once it is safely in the air, hit the **GEAR** button to raise the landing gear. Now the real fun begins. Steer the aircraft through the green squares until you reach the end of the course, at which point X-Plane will give both the user's and the opponent's times and number of "hoops" missed.

You may find it easiest in the F-15 and F-4 to roll inverted as you come up on a mountain range and pull *back* as you clear the ridge to pull hard *up* into the ground (since you're inverted). This will allow you to more easily track the ground as you fly aggressively through the peaks.

For a greater challenge, try changing the time of day and the sky conditions, or lowering the cloud heights and visibility. Low cloud cover (where the hoops are partially obscured) makes things especially interesting!

Also (and this is the hardest part), try and follow the lead aircraft around to a full-stop landing. The last hoop is defined

to be the point at which the lead pilot begins to pull the power back. Use it to judge when you pull your power as well and try and follow him back to the airport. The airports in this application are fictitious and have been placed in blind canyons or at the top of a plateau with very little room left over to get the aircraft stopped under control. Try not to go sliding off of a mountain!

8. Features and Flight in X-Plane Airliner

X-Plane Airliner is designed to simulate airliners and the relatively long range, instrument-capable flights that they perform. It is one of the most powerful apps we have yet released for a mobile platform.

Remember that unfamiliar terms used in this section may be found in the **Glossary of Terms**, beginning on page 64.

X-Plane Airliner gives the user control of throttle, flaps, speedbrakes, and trim—much more control than is available in the X-Plane 9 application's aircraft. Along with the new flight controls, the cockpits of these aircraft are equipped with a full glass EFIS system that displays airspeed, heading, altitude, vertical speed, Mach number, DME, and HSI with localizer and glideslope in the same manner as the real airliners. Additionally, a moving-map glass display gives the user complete situational awareness during flight, just like in real airliners.

Each of X-Plane Airliner's flight regions are hundreds of square miles in size, with enormous numbers of NAVAIDs and airports. The Southern California region, for instance, spans from San Diego clear up to Edwards Air Force Base, accurately laying out airports and NAVAIDs (such as localizers, VORs, and ILSs) as they are situated in the real world.

These large flying areas combined with a large number of airports and NAVAIDs let the user practice relatively long flights in any weather using glass cockpit EFIS instrumentation with moving maps. The airliners can be flown across the scenic terrain of Southern California in nice weather while

enjoying the view, or in hardball IFR conditions using the glass instrumentation to pilot safely through the night.

Note that the autopilot and navigation instruments work as described in Chapter 12, “**Advanced Functions of X-Plane Mobile**,” beginning on page 50.

I. Aircraft

The following aircraft are included in X-Plane Airliner:

- Boeing 777
- Boeing 747
- Boeing 737
- Airbus A380
- Boeing 787
- McDonnell Douglas MD-88
- Airbus A320
- Boeing 757
- Aérospatiale-BAC Concorde

The Boeing 777 is the standard for modern airliner design and efficiency, while the 747 is a double-decker, four-engine craft, known as the original “Jumbo Jet.”

The Airbus A380 is the world's largest airplane (nicknamed the Super Jumbo), complete with two passenger decks and fly-by-wire controls. It was entered in to service as recently as 2007.

The Boeing 787 Dreamliner is a new carbon-fiber, high-bypass, ultra-efficient airliner due to enter service in late 2010.

The McDonnell Douglas MD-88 and the Boeing 737 are twin-engine, medium-range craft that are (relatively) small. The Airbus A320 is slightly larger than the 737 and was designed to challenge both it and Boeing's 727 on the market. With its

narrow body and medium size, the Boeing 757 is of a similar design also.

The iconic Aérospatiale-BAC Concorde is one of two supersonic commercial airliners ever flown. Its ability to cruise at Mach 2 at 60,000 feet allowed it to make the trip from New York to London in under three hours. Note that the Concorde has *no flaps or speedbrakes*—when you’re descending for a landing, you’ll have to plan very well to come in at a proper speed.

Reverse thrust capabilities are available in all of the X-Plane Airliner aircraft. As with other reverse thrust-capable aircraft, the throttle slider in these jets will sit by default about 1/3 of the way up the screen. Drag it to the bottom of the screen to give the aircraft full backward throttle, or drag it to the top of the screen to give it full forward throttle.

Table 8.1 lists the approximate takeoff speeds for the aircraft in X-Plane Airliner. Note that it is a good idea to add a few knots to these speeds in order to provide a “speed cushion” that prevents stalling.

Aircraft	Approx. Takeoff Speed (knots)
Boeing 747	155
Boeing 777	140
Boeing 737	120
Airbus A380	170
Boeing 787	150
McDonnell Douglas MD-88	120
Airbus A320	130
Boeing 757	120
Aérospatiale-BAC Concorde	190

Table 8.1: Approximate takeoff speeds for airliners

II. Regions and Airports

X-Plane Airliner includes six flight regions.

The Southern California region spans the coast of California from Imperial Beach in the south to Barstow in the northeast to Edwards Air Force Base in the northwest. It includes San Bernardino International (KSBD), San Diego International (KSAN), and Ontario International (KONT) airports.

The New York region contains nearly all of New York City in the northeast and reaches down past Trenton, New Jersey in the southwest. Prominent airports include La Guardia Airport, John F. Kennedy International Airport, and Trenton Mercer Airport (KTTN), though there are over a hundred total airports in the region.

The Anchorage, Alaska region lies about a hundred miles to the west of Boswell Bay and features Ted Stevens Anchorage International Airport (PANC).

The Seattle-Tacoma region stretches from Everett, Washington in the northeast down to Olympia, Washington in the southwest. It contains Seattle-Tacoma International Airport (KSEA), Bremerton National Airport (KPWT), and McChord Air Force Base (KTCM).

The Chicago region reaches from Kankakee, Illinois in the south to Milwaukee, Wisconsin in the north along the Lake Michigan shore. Prominent airports include Kenosha Regional Airport (KENW), Chicago Executive Airport (KPWK), Chicago O'Hare International Airport (KORD), and Chicago Midway International Airport (KMDW).

The Miami region spans from Tavernier in the south, to North Miami Beach in the northeast, to Marco Island in the

northwest. It encompasses all of Everglades National Park.

III. Taking Off and Flying

Flying the aircraft in X-Plane Airliner is quite different from flying, say, the X-Plane 9 craft. The airliners are much, much heavier than the other planes, and thus require a great deal more lift to get off the ground. For pilots who are used to flying, say, the Cirrus Vision from X-Plane 9, these ungainly planes will feel very sluggish.

Let's walk through the flight of X-Plane Airliner's default aircraft, the Boeing 747. We'll begin at the Southern California region's default airport, Ontario International Airport (KONT).

First, tap the **BRAKES** button to toggle the brakes off (labeled 1 in **Figure 8.1** following). Drag the **FLAP** slider (labeled 2 in **Figure 8.1**) about one third of the way down. Pulling in the flaps like this will provide some extra lift to get the aircraft off the ground more quickly. Next, drag the **THROT** slider (labeled 3 in **Figure 8.1**) all the way to the top of the screen, thus giving the craft full throttle.

When the aircraft reaches about 160 knots (per the airspeed indicator, labeled 4 in **Figure 8.1**), gently tilt the phone or iPod back in order to pull the craft's nose off the ground.

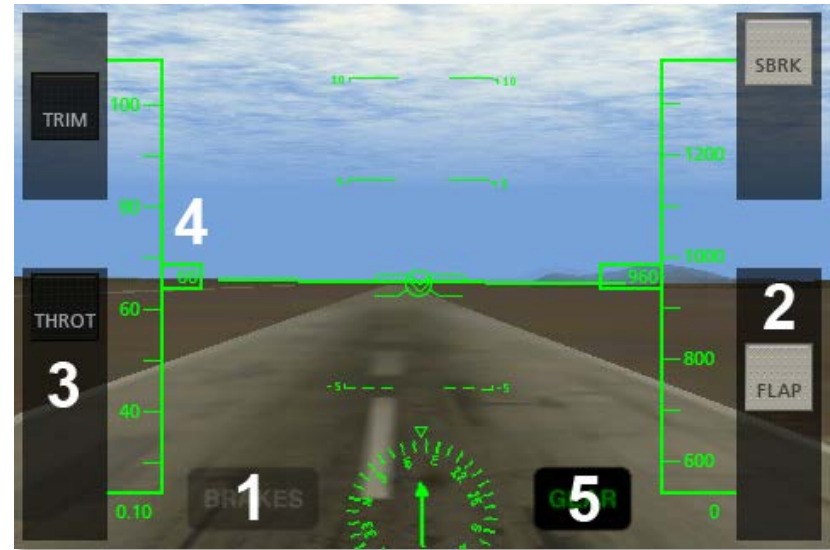


Figure 8.1: Taking off in the Boeing 747

Keep climbing at a shallow pitch (say, about 5 degrees) for a few seconds in order to get away from the ground, then gently raise the plane's nose up to about 15 degrees. Tap the **GEAR** button (labeled 5 in **Figure 8.1**) to toggle the gear up, then bring the **FLAP** slider back to the top of the screen, per **Figure 8.2** below. Setting the flaps back to neutral like this will minimize the drag on the craft as it climbs.

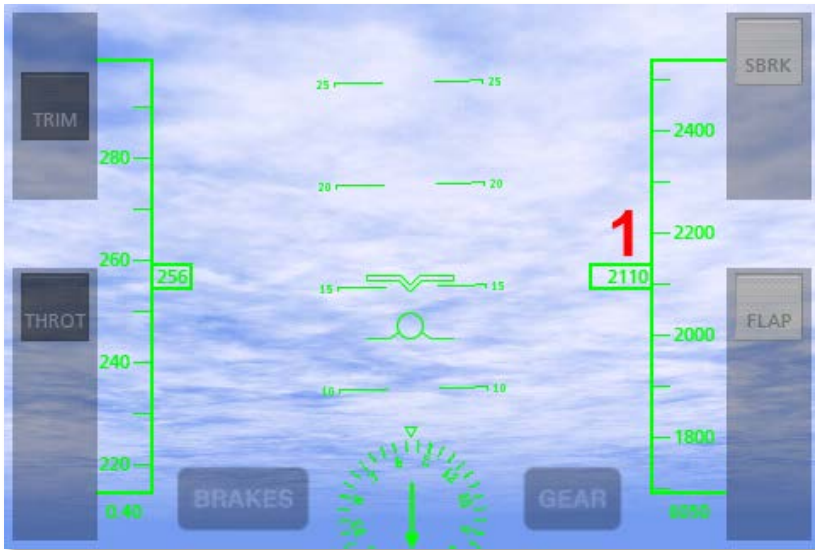


Figure 8.2: The altimeter in the HUD view

Continue climbing until the desired altitude is reached (as indicated by the altimeter, labeled 1 in **Figure 8.2** above). At that point, level the nose off and bring the throttle down to about three quarters of its maximum.

Use the trim control to hold the desired pitch of the nose. For instance, to hold the nose up, drag the TRIM slider down a bit. To hold the nose down, drag the TRIM slider up a bit. This is ergonomically equivalent to using a real trim wheel, which the pilot rolls up to push the nose down, or down to pull the nose up.

In order to maintain control of the 747, be sure to always keep its speed above 140 knots as an absolute minimum. Holding a more comfortable speed of 170 or 180 knots is desirable.

Now let's discuss landing the 747. Approaches to the runway can be easily practiced by tapping the **Final** button from the

Map screen (found in the Settings menu—see **The Settings Menu** in Chapter 2, on page 12). This will set the plane in the air, lined up with the indicated airport while still a few miles away.

When the desired airport is in sight and the aircraft is lined up with it, it's time to begin the approach in earnest. The key to the approach is to gradually slow the craft down while also gradually descending to the level of the airport.

Ideally, the airplane will have slowed down to just above its stall speed at the point that it touches down. In the 747, this means its speed should be gradually decreasing on the approach so that the instant before it touches down, it is traveling at about 150 knots. In order to slow to this speed, it will be necessary to slowly back the throttle down and pull in full flaps (by dragging the FLAP slider to the bottom of the screen). The speedbrake may also be required—drag it down to decrease the aircraft's speed without affecting the craft's pitch.

In the descent, pitch the nose downward between 3 and 5 degrees. This will provide a shallow, controlled descent. In the seconds before the aircraft touches down, raise the nose *up* to about 7 degrees. This will cause the *back* wheels to touch down first, creating a very smooth landing.

Once flying has been mastered using the manual controls, try flying with the autopilot or landing using an ILS, both of which are described in Chapter 12, **Advanced Functions of X-Plane Mobile**.

9. Features and Flight in X-Plane Glider

X-Plane Glider is the first X-Plane Mobile app to feature gliders—from towing, to soaring, to setting down for a landing.

The simulator comes with four aircraft—two unpowered gliders, one powered glider, and a Cessna 172 (used as a towplane for the unpowered gliders).

When flying the unpowered gliders, users start out on their runway of choice, right behind the towplane. Turning off the brakes gives the tow pilot the go ahead to take off, pulling the glider with it to altitude. Once the craft has been successfully towed to altitude, the real fun begins—gliding!

In addition to accurately simulating the physics of the aircraft, X-Plane Glider simulates ridge lift, the phenomenon of wind blowing up and over the mountains, climbing or descending to follow the contours of the terrain.

Innsbruck, Austria and five other gorgeous flight regions are provided, letting the user soar across all manner of amazing terrain with steep, tall mountains, watching the wind indicator in the lower left to monitor the wind direction and speed, then hunting for the perfect mountain slope at a right angle to that wind, pushing the air up into a free elevator for a ride to altitude!

Like the other X-Plane Mobile apps, Glider supports multiplayer! Users can go sailing with their friends, working on formation flying in gliders. Just use the **Random Start** button on the Map screen to start in the air—the other user will appear as an icon in the bottom-center of the screen, allowing the pilots to meet up. For even more fun, *one* user can get in the Cessna 172 and tow the other person aloft! With one user

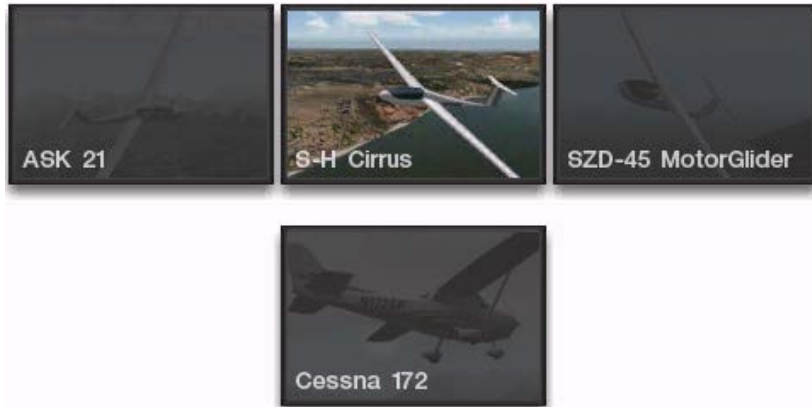
acting as the towplane, and the other as the glider, the pair can have fun finding the perfect place to soar.



Figure 9.1: A glider being towed away from the runway

I. Aircraft

X-Plane Glider gives users the choice of four aircraft: a Schleicher ASK 21 composite trainer, a high performance Schempp-Hirth Cirrus, a PZL Bielsko SZD-45 Ogar powered glider, or a Cessna 172.



II. Flight Regions

X-Plane Glider includes six regions.

The Big Bear region extends from Big Bear City Airport (L35) in the south up to Barstow, California in the north, and includes Twentynine Palms Airport (KNXP).

The Juneau region centers on Juneau International Airport (PAJN). With lots of frigid water and snowy mountains, it makes for a beautiful flight.

Santa Catalina Island forms the center of the Catalina region, with Long Beach and Los Angeles in the north. Prominent airports include Catalina Airport (KAVX) and Los Angeles International Airport, as well as an aircraft carrier located just north of Catalina Island.

The detailed Innsbruck, Austria region includes Innsbruck Airport (LOWI). The city of Innsbruck, nestled as it is in the valley of the Inn River and surrounded by mountains, is an ideal spot to take off from.

The Provo region is bordered by Salt Lake City International Airport in the northwest, with the Strawberry Reservoir and Uinta National Forest in its southeastern corner.

The fictitious Canyons region is filled with five airports and lots and lots of canyons. You're virtually guaranteed to have some mountain peaks in view any time you tap the **Random Location** button in the Map screen.

III. Taking Off and Flying

When starting out in one of the two unpowered gliders (the ASK 21 or the Cirrus), the simulator puts the craft on the runway behind the Cessna towplane. The towplane's engine is running, and it's ready to go. Releasing the glider's brakes (by tapping the **BRAKE** button) commands the towplane to take off, dragging the user's craft with it.

When flying the Schempp-Hirth Cirrus, the gear should be raised (using the **GEAR** button) once the craft is off the ground. This enables the user to squeeze every last bit of performance from the glider.

The towplane, once in flight, will take the glider as high as the user likes, and while being carried up, the glider will have to hold formation behind it as it pulls the glider to altitude. Tapping the **HOOK** button located in the bottom center of the screen will release the line between the aircraft, allowing the glider to soar freely.

Notice, of course, that until the **HOOK** button has been pressed, the tow rope connecting the two aircraft is attached to the towplane's tail and the glider's nose. X-Plane models the real physics of this situation, so if the glider pulls left, right, up, or down, it will drag the towplane's tail in that direction. This could result in simply pulling the plane off course, or ultimately in dragging the plane into a stall or spin. If that happens, things will get very complicated very quickly—the towplane (which will likely be crashing) will be dragging the glider with it! The dynamics of the resulting crash are... interesting.

According to the [FAA handbook for gliders](http://www.faa.gov/library/manuals/aircraft/glider_handbook/)⁶, a glider pilot should keep the glider in one of two positions when being towed to altitude. It should either be in a “low tow” position, wherein the glider is just below the wake from the towplane, or it should be in a “high tow” position, just above the wake from the towplane. Hold this position carefully to keep from dragging the towplane around!

Taking off in the SZD-45 (the powered glider) is like taking off in any other plane—run the throttle all the way up, pull in a little bit of flaps, then pull back at around 50 knots. Then, once the glider reaches altitude (with the flaps up, of course), drag the throttle slider back down to idle and soar like any other glider!

A glider pilot must watch the wind and the slope of the terrain carefully to hold inside the *upward-moving* currents of air, using the lift of the air flowing *up* the mountain slope to hold the craft aloft. With a good 25-knot wind set in the simulator, the user can get a nice, free elevator ride to 10,000 feet when flying along the windward side of a nice, steep mountain. This is called ridge lift.

Unique to the gliders is an instrument called the *total energy*

⁶http://www.faa.gov/library/manuals/aircraft/glider_handbook/

variometer. If it is *beeping*, then the aircraft is in a nice updraft from the air following the terrain. Circling in that area will let the glider ride the climbing air to altitude! When the variometer is emitting a *steady* tone, the craft is in *descending* air—the glider has been blown to the wrong side of the mountain, and a crash will follow soon if the user does not find a way out of that area!

Now, to land the glider, simply circle down to runway level. The trick is to approach the runway with just enough speed to set the craft down safely. Remember, the speedbrakes can help slow the craft down (as in the upper right corner in **Figure 9.2**), but if it doesn't have enough speed to reach the landing strip, the glider has no way of generating thrust.

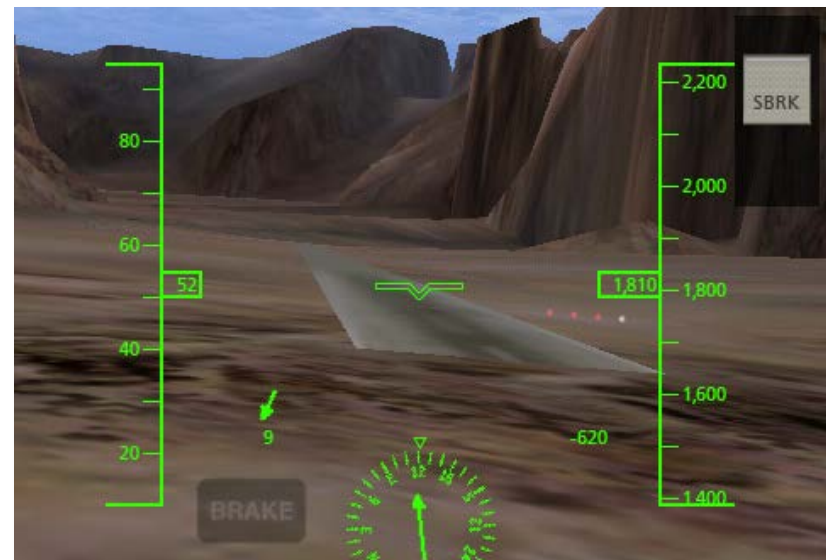


Figure 9.2: Approaching the runway in a glider

Additionally, note that the ADF (automatic direction finder) in the bottom center of the screen always points toward the

nearest airport. For instance, in **Figure 9.3**, the glider would need to turn nearly 180 degrees to be pointing toward the nearest airport.

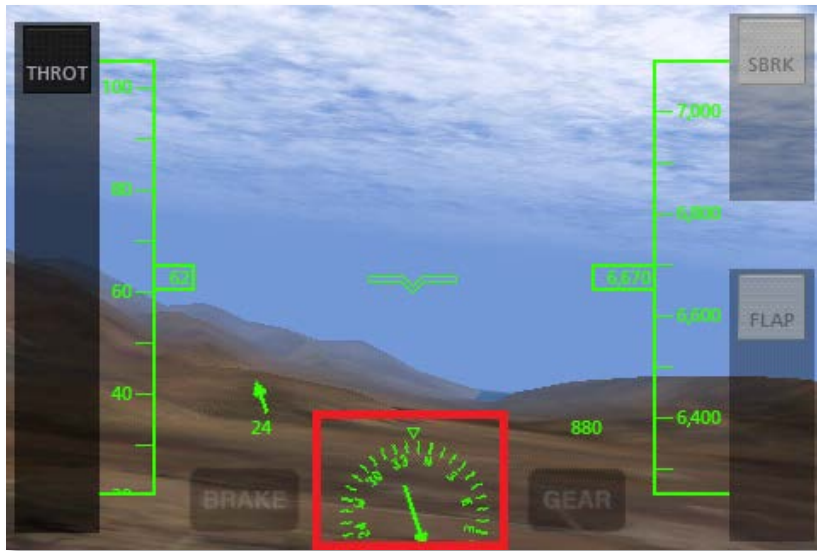


Figure 9.3: The ADI, pointing toward the nearest airport

10. Features and Flight in X-Plane Airshow

X-Plane Airshow is unique among the X-Plane apps in that it allows users to define a “flight routine,” then fly in formation with a recording of that routine. This sounds simple enough, but airshow flying is some of the most difficult in the world—both in X-Plane and in real life. When you finish flying the routine, the simulator will score you based on how tightly you held the formation.

X-Plane Airshow includes all the standard X-Plane Mobile features, including time of day, weight and balance, and weather controls, as well as multiplayer.

X-Plane Airshow is *extremely* challenging. How high can you score?

I. Aircraft

The following aircraft are included in X-Plane Airshow:

- F4U Corsair
- P-51 Mustang
- F-86 Sabre
- F-4 Phantom II
- F-15 Eagle
- F/A-18F Super Hornet

The F4U Corsair is a World War II-era, high-speed fighter, packing over 2,000 horsepower. Because of its taildragger landing gear configuration, it is *very* tricky to land. The pilot must land in a full-stall, nose-high attitude. *Be sure to hold the stick at full aft* (meaning the device is tilted all the way back)

on the takeoff roll in this plane in order to hold the tail wheel down for steering authority.

The P-51 Mustang was the premier fighter of the Second World War. It must be taken off and landed with the same technique as the Corsair due to the taildragger landing gear.

Note also that both of these World War II-era, propeller-driven fighters have *very* powerful engines and *very* large propellers. As a result, the torque delivered by the engine and propeller will try to roll the plane to the left. This is most noticeable at very low airspeeds (when taking off, for example), when the aerodynamic forces created by the ailerons to counteract this are at a minimum. Thus, be prepared to roll hard towards the right (by rolling your device right) as the plane lifts off and the wheels are no longer supporting the weight of the airplane on the ground. As the craft’s airspeed builds you will be able to use less and less right aileron to counteract the torque from the propeller and engine.

The F-4 Phantom II, the king of the “Jet Age,” held fifteen world records during the 1960s (listed near the bottom of [this page](#)⁷), among which were a number of fastest times to altitude, the fastest time across the continental US, and the highest zoom climb.

The F-15 Eagle is a tactical fighter designed to maintain air superiority for the United States in the years following the Vietnam War. With a maximum speed over Mach 2.5 at altitude, it has proven a very successful design.

The F-86 Sabre saw a great deal of action during the Korean War, where it battled the Soviet MiG-15s. In the late 1940s, the Sabre was the fastest jet aircraft in the world, reaching a speed of 570 mph in 1948. It eventually saw speeds as high

⁷ <http://www.aviation-history.com/mcdonnell/f4.html>

as 680 mph.

The F/A-18F Super Hornet is a larger redesign of the original F/A-18, built originally to replace the Navy's F-14 Tomcats. It is a versatile fighter still in production.

Table 10.1 lists the approximate takeoff speeds for the X-Plane Airshow aircraft.

Aircraft	Approx. Takeoff Speed (knots)
F4U	85
P-51	85
F-86	185
F-4	175
F-15	150
F/A-18F	200

Table 10.1: Approximate takeoff speeds for airshow planes

II. Flight Regions

X-Plane Airshow comes with six flight regions.

The Southern California region spans the coast of California from Imperial Beach in the south to Barstow in the northeast to Edwards Air Force Base in the northwest. It includes San Bernardino International (KSBD), San Diego International (KSAN), and Ontario International (KONT) airports.

The Juneau region centers on Juneau International Airport (PAJN). With lots of frigid water and snowy mountains, it makes for a beautiful flight.

Santa Catalina Island forms the center of the Catalina region, with Long Beach and Los Angeles in the north. Prominent

airports include Catalina Airport (KAVX) and Los Angeles International Airport, as well as an aircraft carrier located just north of Catalina Island.

The detailed Innsbruck, Austria region includes Innsbruck Airport (LOWI). The city of Innsbruck, nestled as it is in the valley of the Inn River and surrounded by mountains, is an ideal spot to take off from.

The Provo region is bordered by Salt Lake City International Airport in the northwest, with the Strawberry Reservoir and Uinta National Forest in its southeastern corner.

The fictitious Canyons region is filled with five airports and lots and lots of canyons.

III. Flying an Airshow

To fly an airshow routine, first pick an aircraft and fly a routine, starting at the airport of your choosing. This routine can be as simple as taking off, turning around, and coming in for a landing. (Note that the ADF in the bottom center of your screen will always point the way to the nearest airport.)

After flying the routine, open the Settings menu (per the section “**The Settings Menu**” in Chapter 2, on page 12) and tap the **Save This Flight** button, seen in **Figure 10.1**. When you do so, the button will change to read “Your flight is saved.”

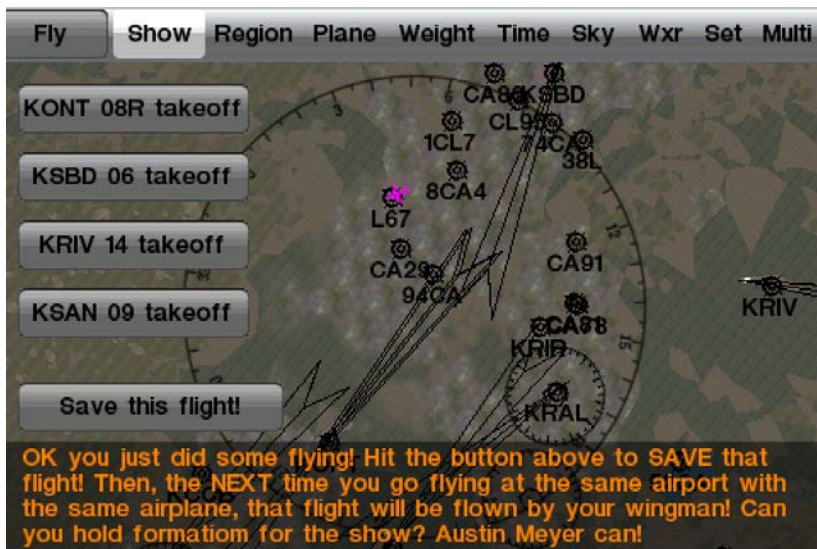


Figure 10.1: The **Save This Flight** button

With the flight saved, take off from the same airport using the same aircraft. For instance, if you just finished a flight from Southern California's default airport, tap the **KONT 08R takeoff** button. The simulator will put you on the runway you indicated, with a copy of your aircraft just ahead of you. This plane will fly the exact path at the exact speeds that you flew just a moment ago. This time, though, your goal is to hold formation with this aircraft.

For a high score, indicating you flew in tight formation, stay within 10 meters of the plane flying the recorded routine, with only a small angular error.

11. Features and Flight in X-Plane Seaplane

X-Plane Seaplane is the first X-Plane Mobile app to focus on water operations. All five aircraft included with the app are amphibious, so they can handle taking off and landing on the water as well as on paved runways.

X-Plane Seaplane features not only airplanes, but also the Sikorsky SH-3 Sea King amphibious helicopter, which adds a new kind of challenge to the simulator. Can you hover over the water and descend for a smooth landing in the helicopter?

X-Plane Seaplane's flight and water dynamics are, of course, realistic, and the new water rendering is pretty impressive. The swimming and flying challenges in this app make for a lot of fun!

I. Aircraft

The following three aircraft are included in the initial version of X-Plane Seaplane:

- the Canadair Bombardier 415, a twin-engine water bomber,
- the Republic RC-3 Seabee, a tiny, post-WWII, all-metal plane with a "pusher" propeller,
- the Grumman Goose, a versatile, twin-engine, eight-person transport,
- the Sikorsky SH-3 Sea King, a popular all-weather, search-and-rescue helicopter, and
- the Cessna 172, outfitted with amphibious floats.

Table 11.1 lists the approximate takeoff speeds for the

airplanes X-Plane Seaplane.

Aircraft	Approx. Takeoff Speed (knots)
Canadair Bombardier 415	100
Republic RC-3 Seabee	60
Grumman Goose	75
Cessna 172	65

Table 11.1: Approximate takeoff speeds for seaplanes

II. Flight Regions

X-Plane Seaplane includes six flight regions.

The Honolulu, Hawaii region features Kahului Airport (PHOG) and Lanai Airport (PHNY), set in the beautiful terrain of the Hawaiian Islands.

The Southern California region spans the coast of California from Imperial Beach in the south to Barstow in the northeast to Edwards Air Force Base in the northwest. It includes San Bernardino International (KSBD), San Diego International (KSAN), and Ontario International (KONT) airports.

Santa Catalina Island forms the center of the Catalina region, with Long Beach and Los Angeles in the north. Prominent airports include Catalina Airport (KAVX) and Los Angeles International Airport, as well as an aircraft carrier located just north of Catalina Island.

The San Francisco region spans from San Rafael in the northwest, to Concord in the northeast, to Santa Cruz in the south.

The Anchorage, Alaska region lies about a hundred miles to the west of Boswell Bay and features Ted Stevens Anchorage International Airport (PANC).

The Boswell Bay region features prominently Boswell Bay and a large portion of Prince William Sound, located in southeastern Alaska.

III. Flying Water Operations

Flying the airplanes in X-Plane Seaplane is fairly straightforward. We will walk through the steps to taking off and landing the Bombardier 415 and Cessna 172 here. Note that, due to the radical difference in the flight of the Sea King helicopter, its flight is described in the [X-Plane Helicopter manual](http://www.x-plane.com/files/manuals/X-Plane_Helicopter_manual.pdf)⁸.

In the Map tab of the Settings menu, tap the **Water Takeoff** button. This will place your aircraft in a random water location.

To takeoff, first tap the **BRAKES** button to turn them off. Drag the throttle slider (located on the left side of the screen) to the top of its travel to give the craft full throttle. Drag the flaps slider (located on the right of the screen) about a third of the way down the screen. As your speed ramps up, don't be surprised to see your indicated airspeed rise and fall rapidly as your plane bounces around on the waves.

When the indicated airspeed reaches about 100 knots in the Bombardier or about 60 knots in the 172, gently tilt the device back toward you to pull the craft off the water. Hold an upward pitch of about 5 degrees as you climb away from the water.

At this point, drag the flaps slider back up to the top of the screen. When you reach the altitude you want, drag the throttle slider to about three-quarters of its range to cruise.

To land on the water, approach it with a shallow glideslope, with the plane's nose pointed down about 7 degrees. The flaps should gradually be pulled in, with full flaps deployed in the last hundred feet or so from the water. Likewise, the throttle should gradually be backed down. At the moment the aircraft touches the water, it should be just above its stalling speed, with full flaps and zero throttle.

Note that even if you have managed the approach and landing perfectly, you might still bounce a bit upon touching the water. This is just a function of having a buoyant aircraft setting down on a moving body of water.

⁸ http://www.x-plane.com/files/manuals/X-Plane_Helicopter_manual.pdf.zip

12. Advanced Functions of X-Plane Mobile

I. Flying an Approach Using the Instrument Panel

All of the airplanes in the mobile X-Plane applications, with the exception of the fighters, have basic navigation radios and instruments built into them, and all of these are used in more or less the same way. We will go through an example for flying an ILS approach (that is, an approach using an instrument landing system) in the Southern California region in the X-Plane 9 and X-Plane Airliner applications, but similar steps can be used for any airport in any application.

Note that instrument navigation is not for the faint of heart. X-Plane Mobile is as realistic a flight simulator as possible, and navigation is no exception. This section is by no means a complete guide to airplane navigation (there are plenty of 400-page books available that claim that), but it will go into quite a bit of detail. We will discuss a great deal of side information needed to fly *all* approaches, but we will always come back and relate it to flying the example approach into San Bernardino International (found in the Southern California region of X-Plane 9 and X-Plane Airliner).

Note: This chapter assumes prior familiarity with the workings of the view options and the Settings menu, as well as with the standard flight instruments. All of this is described in Chapter 2, **Getting Acquainted with the Simulator**, beginning on page 5.

To fly an instrument approach, users will first need to know the local navigational aid (NAVAID) frequencies. To find this, tap the center of the screen to make the various menu options appear, then click the Settings button (highlighted in red

in Figure 12.1).

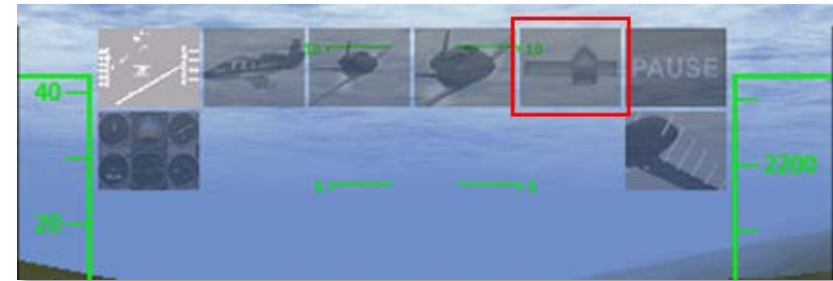


Figure 12.1: The Settings button

The map in the window that appears shows the ILS, LOC, VOR, and VORTAC frequencies for the area. Zoom in and out of the map by placing two fingers on the screen and dragging them farther apart (to zoom in) or closer together (to zoom out). To pan the map, place one finger on the map and drag it, and to rotate it, place two fingers onto the map and twist them in a circular motion.

Let's discuss the specifics of each of these types of navigational aids (NAVAIDs).

A. Types of NAVAIDs

The earliest type of navigation modeled in X-Plane Mobile is based on VOR signals (that is, signals from a very high frequency omnidirectional range transmitter). VOR transmitters work by sending a series of 360 discrete little carrier tones on a main frequency. Each of these carriers is oriented along a different radial from the station, one of 360 just like on a compass rose. Thus, when one is flying along and tunes in the main VOR frequency, one then fine tunes the navigation display to tell which of the 360 radials the aircraft is flying and

also whether the transmitter station is in front of or behind the plane.

In the X-Plane Mobile maps, a VOR beacon is labeled as in **Figure 12.2**.



Figure 12.2: A VOR beacon in the X-Plane Mobile maps

A specific type of VOR, a VOR-DME, combines the lateral guidance (that is, guidance left and right) of a VOR with the distance guidance of a DME (distance measuring equipment). In X-Plane Mobile, this is labeled as in **Figure 12.3**.



Figure 12.3: A VOR-DME beacon

Another type of VOR beacon, a VORTAC, is also found throughout the X-Plane maps. This is a transmitter that combines both VOR and TACAN (or tactical

air navigation) provides special information to military pilots similar to a civilian VOR. However, for our purposes, this is functionally identical to a VOR-DME. A VORTAC in X-Plane is labeled as in **Figure 12.4**.



Figure 12.4: A VORTAC beacon

A LOC (or localizer) transmitter provides guidance to the centerline of a runway. It works by sending out two signals on the same channel, one of which modulates at 90 Hz and the other of which modulates at 150 Hz. One of these signals is sent out slightly to the left of the runway, while the other sent out slightly to the right of it. If an aircraft is picking up more of the tone modulated at 150 Hz, it is off to the left. If it is picking up more of the tone modulated at 90 Hz, it is off to the right. The course deviation indicator (or CDI) in the instrument panel then indicates this so that the pilot can correct it. When both tones are being received in equal amounts, the craft is lined up with the physical centerline of the runway. In X-Plane Mobile, a LOC transmitter is marked as in **Figure 12.5**.



Figure 12.5: A LOC beacon

An ILS (or instrument landing system) combines the functionality of a localizer, which provides lateral guidance, with a glideslope transmitter, which provides vertical guidance to the runway. The glideslope beacon functions similarly to the localizer, sending out two tones that have the same frequency, but different modulations. The difference is that the glideslope tells the plane that it is either too high or too low for its distance from the runway. The pilot uses this information to push the craft's nose up or down as needed. The ILS will allow a pilot to fly on instruments only to a point that is a half mile from the end of the runway at 200 feet (depending on the category of the ILS) above the ground. If the runway cannot be clearly seen at that point the pilot is prevented from executing a normal landing. If this happens, the pilot in real life is required to fly a "missed approach" and climb back to altitude in order to try again or go somewhere else.

In X-Plane Mobile, an ILS transmitter is marked as in Figure 12.6.

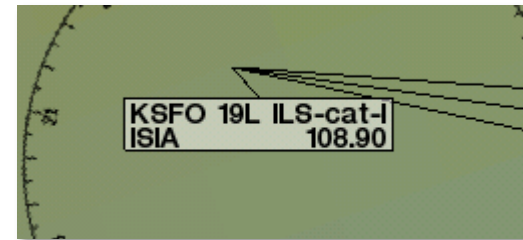


Figure 12.6: An ILS beacon

For our example approach, we'll be flying into San Bernardino International Airport (KSBD, found in the Southern California region). Zooming into the map screen near this airport shows that the ILS signal is coming from runway 06 (as seen in Figure 12.7). Not coincidentally, there is a button here in the map screen to put the aircraft on a final approach to this runway. As seen in Figure 12.7, the frequency we need to tune for KSBD's runway 06 is 109.30.

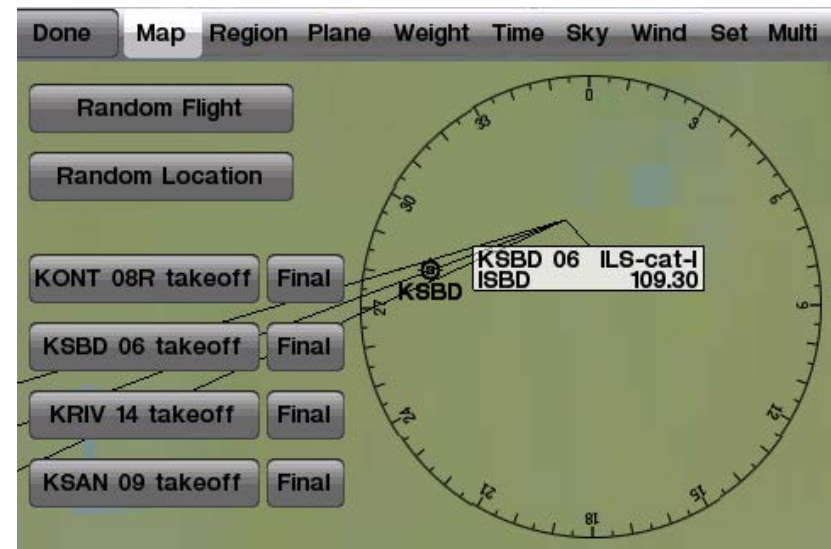


Figure 12.7: Getting a radio frequency from the Map screen

B. Navigation Instruments

Before we begin, let's review the instruments used in navigation. This section assumes familiarity with the panel view as described in the section "The Panel View in Depth" in Chapter 2, beginning on page 9.

i. Instruments in the Piston-Engined Aircraft



Figure 12.8: Navigation instruments in the steam gauge panel

Figure 12.8 above is the panel view in X-Plane's piston-engined aircraft (that is, the craft with propellers) after scrolling down to view the navigation radios. The horizontal situation indicator (or HSI—the most important instrument in navigating approaches like this) is marked with a 1. The broken yellow

arrow going across its face is called the course deviation indicator (or CDI). Each end of the CDI touches the directional gyro, which indicates the aircraft's heading. The yellow rectangles on the outside of the directional gyro are the glideslope indicators. We'll discuss the HSI more in a moment.

Below the HSI are the navigation radios. The NAV 1 radio is marked with a 2 in Figure 12.8, and the NAV 2 radio is marked with a 4. Between the two is the navigation source selector switch (marked with a 3).

To navigate using any of the previously listed NAVAIDs (VOR, LOC, ILS, etc.), that NAVAID's frequency must first be tuned in to one of the navigation radios. It doesn't matter which radio is used as long as it is selected with the source selector switch. The two knobs on each radio are used to tune them. The knob on the left is used to tune the integer (or "counting number") portion of the frequency. The knob on the right is used to tune the decimal portion of the frequency.

For instance, imagine we want to fly the ILS into San Bernardino International airport using the NAV 2 radio in Figure 12.9.



Figure 12.9: Tuning the NAV 2 radio

We found in the "Types of NAVAIDs" section that the KSBD ILS is transmitting at 109.30 Hz. Of course, we *could* use the NAV 1 radio that's already tuned to that frequency, but that would defeat the purpose of the example!

To tune the NAV 2 radio down to 109.30 Hz, we will first tap *below* its left knob six times. This will bring the frequency to 109.20. From here, we'll tap *above* its right knob twice, bringing it up to the required 109.30.

With that done, we need to make sure the navigation source selector switch is set to the radio we want to use. In **Figure 12.9**, it is set to NAV 1. We will tap it once to switch it over to NAV 2. At this point, we are all set to fly San Bernardino International's ILS using our NAV 2 radio.

With the navigation radio set, assuming we are on an approach to the ILS we just tuned (which can be done using the KSB06 **Final** button found on the Map screen), the CDI should begin to move. Remember that the CDI (course deviation indicator) is the broken yellow arrow found in the OBI.

For instance, in **Figure 12.10**, the center bar of the CDI has moved to the left of the rest of the arrow. This indicates that the *aircraft* has moved to the *right* of the localizer course (recall that the localizer portion of the ILS is responsible for guiding the craft left and right). To get back on course, the aircraft needs to turn left—in other words, it needs to follow the line on the CDI.

Also note the glideslope indicators, the two rectangular yellow bars along the outside of the heading indicator. They are rather high above the center of their travel in **Figure 12.10**. In order to stay on the glideslope, the aircraft will need to pull its nose up—in other words, it needs to follow the glideslope indicators. When those rectangular yellow bars are in the center of their travel, the craft is right on course.



Figure 12.10: The CDI in the piston-engined aircraft

Let's talk about the OBS, the omni-bearing selector. In **Figure 12.11**, this is the knob with a red box around it. This knob is used to turn the CDI to point to a specific heading.



Figure 12.11: The OBS

For example, if we looked at a navigational chart for San Bernardino International Airport (or use an airport database like [AirNav](#)), we would see that runway 06 that we're flying into

has a magnetic heading of 057. It would be a good idea to use the OBS to turn the CDI so that it points at 57 (or a little less than 60) heading. That way, when the craft was directly on course, the CDI would be pointing straight up.

Tap above the OBS to turn it clockwise, and tap below it to turn it counterclockwise.

That's all the knowledge required to begin flying an instrument approach in a piston-engined aircraft. Let's now discuss the instruments used in jet-engined craft. Users not interested in the jets should skip ahead to the "Flying the Approach" section, beginning on page 57.

ii. Instruments in the Jet-Engined Aircraft



Figure 12.12: Navigation instruments in the EFIS panel

Figure 12.12 above shows the panel view as seen in X-Plane Mobile's jets. The attitude indicator is marked with a 1. In addition to displaying the aircraft's pitch and roll attitude, this instrument combines functionality from the horizontal situation indicator, or HSI. This HSI serves the same function as the one in the piston-engined aircraft panel; it simply displays the information differently.

The course deviation indicator (CDI) portion of the HSI is represented by the vertical purple line in **Figure 12.12**. It is in the center of the artificial horizon, meaning that the aircraft is lined up almost perfectly with the physical centerline of the runway. The glideslope indicator portion of the HSI is represented by the horizontal purple line. In **Figure 12.12**, the line was a bit above the aircraft's nose, indicating that the craft needed to pull up slightly in order to intercept the glideslope.

Below the attitude indicator is the directional gyro. This, like the CDI and glideslope indicator, is normally a part of the HSI. In the interest of conserving screen space, the CDI and glideslope indicator have been moved to the attitude indicator. This leaves room on the screen for about a third of the directional gyro to be visible.

The directional gyro works like a compass in that it indicates the aircraft's heading. For instance, in **Figure 12.13**, the craft has a heading of 059 (note that the arrow is pointing just a little to the left of the six, representing 060).



Figure 12.13: The directional gyro in the EFIS display

If we looked at a navigational chart for San Bernardino International Airport (or use an airport database like [AirNav](#)), we would see that runway 06 that we're flying into has a magnetic heading of 057. This means that, according to **Figure 12.13**, we are pointed two degrees to the right of the runway.



Figure 12.14: The OBS for the EFIS

In **Figure 12.14** above, the panel's moving map is marked with a 1. The green bar on this map is identical to the yellow CDI from the panel of the piston-engined aircraft. Because it performs the same function as the CDI in the jet panel's

attitude indicator (and because its function was described in the “**Instruments in the Piston-Engined Aircraft**” section above), we won't describe it here.

Important to note, though, are the light blue airports indicated in this map (for example, L67, KSBD, and L12 from **Figure 12.14**). The locations of these airports are shown relative to the aircraft, which is represented as the white triangle in the center of the map.

Localizers are represented on the moving map as purple triangles for pilots to fly down. Recall from the “**Types of NAVAIDS**” section that a localizer provides the lateral (left and right) guidance in an instrument landing system (ILS).

When flying a localizer, the pilot starts at the widest part of these triangles. The center line of the triangle is the desired course and the right and left edges correspond to full scale right and left deflections of the course deviation indicator. This means that this is the width that one could fly to either side of the CDI's center line and still get accurate guidance. The path comes to a point at the end of the approach (corresponding to the end of the runway). Consequently, it gets much more difficult to stay on course at the end of the approach because a very small deviation off course will give the pilot a full scale deflection on the CDI. So, pilots fly into the fat part of the arrow and, hopefully, right down the center line, keeping the CDI centered the whole time by making progressively smaller and smaller corrections left and right to keep the needle centered.

Additionally, note that the knob labeled 2 in **Figure 12.14** (marked OBS) provides the same function as the OBS in the piston-engined aircraft. In this case, it will rotate the green CDI found in the moving map to line up with whatever heading the pilot specifies—for our example approach to San Bernardino International, we would want it pointing a little to the left of the

6 found at the top of the map (for a heading of 057).

Finally, the knob marked 3 in **Figure 12.14** controls the level of zoom in the moving map. Tap to the left of it to zoom in, or tap to the right to zoom out.

As the navigation radios work identically in the jet-engined aircraft as in those with piston engines, we will not describe them again here.

C. Flying the Approach

Now that we've discussed the different types of NAVAIDs in the mobile X-Plane applications, as well as how to use the navigation instruments in all the aircraft, let's begin flying the actual approach.

For our example instrument approach, we'll be flying into San Bernardino International Airport (KSBD), which is found in both X-Plane Airliner and X-Plane 9. It is near the northeast corner of the Southern California region. According to the map (shown in **Figure 12.15**), KSBD has an ILS navigation system. This means that an instrument approach to the airport can take advantage of both horizontal (left and right) and vertical (up and down) guidance, thanks to the ILS's localizer and glideslope beacon, respectively. The map shows that the ILS frequency for runway 06 is 109.30.

For simplicity's sake, rather than taking off from one airport and flying to San Bernardino, press the **Final** button for KSBD runway 06 (marked with a red box in **Figure 12.15**).

Now that we're on the approach, select the instrument panel view. Slide the panel up using your finger to see the NAV (navigation) radios. Tune one of the radios to the desired ILS

frequency (in this case, 109.30). Make sure that the radio that was tuned is also selected with the navigation source selector switch. For instance, if the NAV 1 radio is tuned to 109.30, the source selector also needs to be pointing to NAV 1.



Figure 12.15: The button to set up a final approach to KSBD

In the real world, we would look at an approach plate to determine what heading we should be flying to get to the runway. As not everyone has a set of approach plates for southern California, the [AirNav database](#) can be consulted for the heading. Scrolling down on that web page to the Runway Information section reveals that Runway 06 has a magnetic heading of 057. Additionally, the page lists the runway's elevation as 1084.6 feet above sea level. This information will become very important once we get close to the runway, for obvious reasons!

With this information, click above or below the OBS knob until the CDI is pointing to 057 degrees, as shown in **Figure 12.16**.

On the left is the HSI in the piston-engined aircraft, and on the right is the moving map in the jets. While this step is not absolutely necessary, it does make it easier to follow the CDI.

Note that in **Figure 12.16**, the CDI (a yellow arrow in piston-engined craft, green in jets) is pointing just a little to the left of the "6," denoting a heading of 060.



Figure 12.16: Tuning the CDI for the approach

At this point, the CDI will begin to wander left or right to indicate which direction the craft needs to move in order to point down the centerline of the runway. Aim *toward* the deflection to intercept the localizer course; when the CDI wanders right, point the aircraft's nose right, and so on.

Additionally, the glideslope indicator will begin to move. If its needles are *above* the center of the instrument then the craft needs to fly *up*, and if they are *below* the center of the instrument, it needs to fly *down* to intercept the glideslope. The goal is to keep the localizer CDI centered to stay on the

localizer, and the glideslope CDI centered to stay on the glideslope.

For example, in **Figure 12.17** below, the CDI is deflected a little to the left (indicating the craft needs to turn to the left) and the glideslope indicators are quite high (indicating that the aircraft needs to raise its nose a good deal).



Figure 12.17: Reading the glideslope and CDI

In **Figure 12.18** below, the CDI is deflected to the right (indicating the aircraft needs to bank to the right) and the glideslope indicator is high (indicating the craft needs to raise its nose).



Figure 12.18: Reading the glideslope and CDI in the EFIS display

Follow the guidance of the localizer and glideslope until the craft reaches an altitude of about 300 feet above the runway. Remember from when we looked up the runway information on AirNav that its elevation is 1084.6 feet; therefore, our key altitude will be 1385 feet. When the aircraft's altimeter reads 1385, tap the center of the screen and select the HUD view.

At this point, if everything was done correctly, the runway will be right in front of the aircraft. If the landing itself was managed properly, the aircraft will be at its stalling speed plus 30% with the gear and flaps down (remember that gear, flaps, and throttle are still visible in the panel view) as it comes in for a landing. In the Cirrus Vision, this is about 90 knots. In the Cessna 172, it's about 65 knots, and in the Boeing 747, it's about 140 knots.

II. Using the Autopilot

The autopilot is one of the most asked about features in X-

Plane—indeed, in real-world planes, too. The fact is that many real aircraft owners never take the time to learn to use their autopilots. The basic autopilot functions available in the mobile X-Plane applications, however, are really not too difficult to understand *once the user has taken the time* to learn about them.

In a real aircraft, there are three levels of autopilot functionality:

- Off, with no autopilot functions active,
- On, where the autopilot servos take over the flight controls and fly the airplane, and
- Flight Director, where the autopilot displays a set of "wings" on the attitude indicator to show the pilot where to fly.

If the pilot follows the flight director wings perfectly, the airplane will behave just like when it has the autopilot servos on. If the pilot does not follow the wings, it will be as if the autopilot were off completely.

The X-Plane Mobile applications do *not* have this flight director mode. Therefore, whenever the autopilot is switched on (using the switch at the top of the panel view, highlighted in **Figure 12.19**), it will automatically take control of the flight controls.



Figure 12.19: The autopilot switch

A. Available Autopilot Functions

The following functions are available in many of the X-Plane Mobile aircraft, including most of those with jet engines.

i. ROLL and PTCH

These are the **roll** and **pitch hold** modes, respectively. When the autopilot is switched on, these two are turned on automatically. They will hold the current roll and pitch attitudes of the aircraft. For example, if the craft has its nose pitched down ten degrees and is in a five degree left bank when the autopilot is switched on, **ROLL** and **PTCH** modes will hold this ten degree down, five degree left attitude. These modes are shown in **Figure 12.20**.



Figure 12.20: ROLL and PTCH modes activated

ii. ATHR

This is the **auto-throttle** button. When this button is pressed,

the autopilot will attempt to maintain the craft's *current* airspeed by increasing or decreasing the throttle. It will *not*, however, attempt to control the craft's speed using any other method, such as pitching the nose up or down or adding or subtracting flaps. Therefore, the auto-throttle will be able to put the throttle anywhere between its maximum or minimum, but it will *not* be able to maintain an excessively high or low airspeed (such as one obtained by pitching the nose excessively low or high).

The **ATHR** is turned on (as indicated by its button being lit yellow) in **Figure 12.21**.



Figure 12.21: ATHR mode activated

In **Figure 12.21**, the auto-throttle is set to hold 108 knots (indicated by the number in green located above the ticking

airspeed tape). The craft's current airspeed is 101 knots. It is not uncommon for the auto-throttle to stay a few knots above or below the set speed like this.

With the **ATHR** button pressed, the other autopilot functions can be disengaged by turning the autopilot power switch to off. This allows the pilot to pitch and roll the craft freely while the auto-throttle maintains the same speed.

Also, note that when **auto-throttle** mode is engaged, it will start the throttle at its minimum, then slowly bring the throttle up to the point where it holds the selected airspeed. This results in a drop of around ten knots when the **ATHR** button is first pressed, but this drop in speed is not permanent.

iii. HDG

This is the **heading hold** button. Pressing this button will set the autopilot to follow the heading currently displayed on the directional gyro (recall that the directional gyro is the partial circle found at the bottom of the left EFIS display). It will follow this heading by rolling the aircraft left and right. For this reason, when the **HDG** button is pressed, **heading hold** mode will replace **roll hold** mode.

For instance, in **Figure 12.22**, the **HDG** button was pressed when the craft was pointed at heading 314 (indicated by the number in green by the directional gyro). Since a heading of 270 is due west, and a heading of 360 (or 0) is due north, the autopilot will be flying the aircraft northwest.



Figure 12.22: HDG mode engaged

iv. HOLD

This is the **altitude hold** button. Pressing this button will cause the autopilot to hold the current altitude by pitching the nose up or down. This mode automatically replaces **pitch hold** mode.

For instance, in **Figure 12.23**, the **HOLD** button was pressed when the craft was at an altitude of 24,730 feet (indicated by the number in green above the ticking altitude tape). Since the craft is currently at an altitude of 24,850 feet, the autopilot will gently (and momentarily) nose the craft down before leveling off.



Figure 12.23: HOLD mode engaged

13. Tech Support

The only technical issues that X-Plane customer support has yet encountered with the X-Plane Mobile applications is caused by the hardware exceeding its RAM allocation.

Many users leave their iPod or iPhone on for literally months at a time (the hardware appears to be off when in fact it is in standby mode). In some cases, this can cause too much “garbage” to be stored in the RAM. The X-Plane app is so demanding on the hardware that it comes within 2% of crashing *every device every time* it is launched. If the “garbage” isn’t cleaned out of the RAM periodically by restarting the device, it is possible that X-Plane will exceed the available RAM, causing a crash or a loss of flight control (where the aircraft doesn’t respond to the tilting of the device).

To perform a reboot of the iPhone/iPod, hold the top power button down for three seconds, then use your finger to slide the power switch on the screen to off. Leave the unit off for two to three minutes before turning it back on.

The issues described above happen very infrequently, and in all cases are fixable by restarting.

For additional assistance, please e-mail info@x-plane.com or call 913-269-0976 (Central Standard Time).

Glossary of Terms

Altitude: An aircraft's altitude is its height above sea level.

CDI: Course Deviation Indicator. This instrument (found in the OBI or HSI) displays which direction the aircraft needs to turn in order to intercept the VOR course.

DME: Distance Measuring Equipment. An instrument used in navigation which measures distance using the delay between the sending and receiving of a radio signal. Aircraft use this to determine their distance from a fixed NAVAID.

Drag: The aerodynamic force (created by a fluid such as air flowing around an object) that slows the object's motion.

EFIS: Electronic Flight Instrument System. A flight instrument system (found in an aircraft's panel) with electronic displays rather than the mechanical gauges of a standard panel. In X-Plane Mobile, such displays are found in jet-engined aircraft.

Glideslope: The angle at which an aircraft approaches (or needs to approach) a runway; often used when discussing navigation by instruments.

Heading: An aircraft's heading is the direction that its nose is pointing.

HSI: Horizontal Situation Indicator. This instrument is found in the jet-engined craft in X-Plane, in the left side of the panel. It serves the same function as an OBI—that is, it indicates course deviation.

IFR: Instrument Flight Rules. The procedure for flying an aircraft based solely on the craft's instrument panel.

Environmental conditions requiring such flight (such as the poor visibility on a rainy day) are referred to as IFR conditions. This is contrasted with VFR conditions (those operating under visual flight rules).

ILS: Instrument Landing System. A ground-based system for guiding approaching aircraft into the runway via radio signals.

Indicated airspeed: The presumed airspeed of a craft as determined by measuring the pressure acting on a little tube attached to the craft which points into the wind. This differs from true airspeed in situations where the air has very little density (for example, at 80,000 feet in an SR-71 Blackbird or in orbit in the Space Shuttle).

Lift: The aerodynamic force (created by a fluid such as air flowing around an object) that pushes an object upward.

Localizer: A localizer is part of an instrument landing system (ILS). It serves as a guide to the centerline of the runway.

Mach speed: The speed of sound through the air. Mach's number actually describes the speed of sound through any fluid (that is, liquid or gas). In application to aeronautics, though, it is implied that the fluid is air. Note that this number is dependent on a number of factors, such as temperature, humidity, and pressure. Generally, "Mach 1" is cited as 768 miles per hour (the speed of sound at sea level in dry air at 68° Fahrenheit).

NAVAID: A navigation aid transmitter (in X-Plane, either a VOR or ILS) which is used as a reference when flying. These are often found near or on an airport. Pilots often fly from NAVAID to NAVAID on long flights, as a VOR is useable from about 50 miles away.

Pitch: Movement of the aircraft's nose up or down (see the image in the “**Flight Dynamics**” section of the manual on page 66).

Roll: Movement of the aircraft's body along the line formed by its body; in an airplane, this is easily seen as the dip or rise of the wings. See the image in the “**Flight Dynamics**” section of the manual on page 66.

Rotor: The rotating part of a helicopter that generates the craft's lift; similar in appearance to an oversized airplane propeller, though different in its operation.

RPM: Rotations per minute; a way of measuring the speed of a rotor or propeller. In a helicopter, the RPM of both the main rotor and the tail rotor are held constant.

Rudder pedals: Foot pedals in an airplane used to steer the plane down the runway and to control its yaw motion in flight (that is, the wagging of its tail left or right). Because the mobile devices do not simulate rudder pedals (as they have only two axes for input rather than three), X-Plane will automatically control the rudder pedals in an attempt to stabilize the craft's yaw motion.

Speed: The change in the position of an object over time; unlike velocity, speed does not take into account the direction of the object's movement.

Thrust vector: The direction in which the engine or rotor's thrust is going; for a helicopter sitting on a helipad with its controls at neutral, this is straight down.

Thrust vectoring: The ability of helicopters and some other aircraft (such as the Harrier or the F-22) to change the direction of the thrust from its engines/rotors.

Update: To update a piece of software is to convert it to a newer version. In the X-Plane Mobile applications, this is done by following the instructions in the “**Updating the X-Plane Apps**” section of Chapter 2, beginning on page 16. This should be done every couple months or so in order to take advantage of new features in the simulator.

Velocity: The combination of an object's speed and the direction of its movement; for example, an aircraft might have a vertical velocity of 500 feet per minute (meaning it moves upward at a rate of 500 feet per minute) or a vertical velocity of -500 feet per minute (meaning it moves downward at 500 feet per minute).

Vertical speed/vertical velocity: The rate at which the aircraft is gaining or losing altitude, typically given in feet per minute.

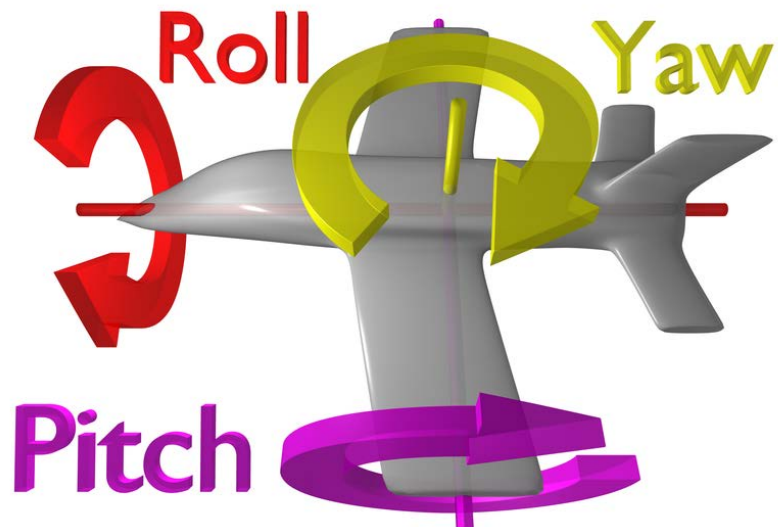
VFR: Visual Flight Rules. Flying done using a combination of the pilot's view of the outside world and the aircraft's instruments. Environmental conditions permitting such flight (such as a sunny day with 10 mile visibility) are referred to as VFR conditions.

VOR navigation: Very High Frequency Omnidirectional Range navigation; this is navigation based on radio signals sent out by a VOR beacon. Airplanes (such as the propeller-based craft in X-Plane) often track these signals using an Horizontal Situation Indicator, or HSI.

Yaw: Movement of the aircraft's body left or right, most easily pictured as a wagging of the aircraft's tail. See the image in the “**Flight Dynamics**” section of the manual on page 66.

Flight Dynamics

The image below illustrates the pitch, roll, and yaw axes of an airplane (which also apply to helicopters).



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