

COMM1 Radio

COMM2 Radio

NAV1 Radio

NAV2 Radio

Distance Measuring Equipment (DME)

Transponder

Automatic Direction Finder (ADF)

Autopilot



Audio Panel

Oil Temperature Gauge

Oil Pressure Gauge

## Magnetic Compass

Altimeter

Altimeter Knob

Airspeed Indicator

Attitude Indicator (AI)



Turn Coordinator and Inclinometer

Very High Frequency Omnidirectional Range/Localizer (VOR/LOC) Indicator

Very High Frequency Omnidirectional Range/Localizer (VOR/LOC) Indicator Knob

Automatic Direction Finder (ADF)

Automatic Direction Finder (ADF) Knob

Vertical Speed Indicator (VSI)

Clock

Clock



Clock

Clock

Clock

Pitch Trim Wheel

Flaps Lever

Strobe light switch

Beacon light switch

Navigation light switch



Taxi light

Landing light switch

Light switch bank: Strobe, Beacon, Navigation, Taxi, Landing

Battery/Alternator Switch

Avionics Power Switch

Pitot Heat Switch

Ignition Switch

Fuel Tank Selector Switch



Carburetor Heat Lever

Throttle Lever

Fuel Mixture Lever

Tachometer

## Fuel Gauges

Course Indicator Knob

Heading Indicator (HI)

Heading Bug Knob



Exhaust Gas Temperature (EGT) Gauge

Fuel Flow Gauge

Auxiliary Fuel Pump Switch

NAV/GPS Switch

Outside Air Temperature Indicator

Airspeed Indicator

Attitude Indicator (AI)

Altimeter



Altimeter Knob

Horizontal Situation Indicator (HSI)

Horizontal Situation Indicator (HSI) Heading Bug Selector

Horizontal Situation Indicator (HSI) Course Index Selector

Turn Coordinator and Inclinometer

Vertical Speed Indicator (VSI)

Very High Frequency Omnidirectional Range/Localizer (VOR/LOC) Indicator

Very High Frequency Omnidirectional Range/Localizer (VOR/LOC) Indicator Knob



Automatic Direction Finder (ADF)

Automatic Direction Finder (ADF) Knob

Battery/Alternator Switch

## Avionics Power Switch

Pitot Heat Switch

Light switch bank: Strobe, Beacon, Navigation, Taxi, Landing

Navigation Lights Switch

Beacon Light Switch



Landing Lights Switch

Strobe Light Switch

Taxi Lights Switch

Fuel Tank Selector Switch

Ignition Switch

Throttle Lever

Fuel Mixture Lever

Pitch Trim Wheel



Flaps Lever

Landing Gear Lever

## Magnetic Compass

Tachometer

COMM1 Radio

COMM2 Radio

NAV1 Radio

NAV2 Radio



Distance Measuring Equipment (DME)

Automatic Direction Finder (ADF)

Autopilot

Audio Panel

Transponder

Oil Temperature Gauge

Oil Pressure Gauge

Manifold Pressure/Fuel Flow Gauge



Cowl Flaps

Propeller Lever

## Fuel Gauges

Exhaust Gas Temperature (EGT) Gauge

Battery Amperage Level Gauge

Airspeed Indicator

Attitude Indicator (AI)

Altimeter



Altimeter Knob

Horizontal Situation Indicator (HSI)

Horizontal Situation Indicator (HSI) Heading Bug Selector

Horizontal Situation Indicator (HSI) Course Index Selector

Turn Coordinator and Inclinometer

Automatic Direction Finder (ADF)

Automatic Direction Finder (ADF) Knob

Very High Frequency Omnidirectional Range/Localizer (VOR/LOC) Indicator



Very High Frequency Omnidirectional Range/Localizer (VOR/LOC) Indicator Knob

Vertical Speed Indicator (VSI)

Left Fuel Tank/Crossfeed Switch

Right Fuel Tank/Crossfeed Switch

Left Engine Ignition Switch

Right Engine Ignition Switch

Battery/Alternator Switch

Avionics Power Switch



Pitot Heat Switch

Light switch bank: Strobe, Beacon, Navigation, Taxi, Landing

Navigation Lights Switch

Landing Lights Switch

Beacon Light Switch

Strobe Light Switch

Taxi Lights Switch

## Throttle Levers



## Fuel Mixture Levers

Pitch Trim Wheel

Flaps Lever

## Magnetic Compass

Left Engine Tachometer

Right Engine Tachometer

Left Oil Temperature Gauge

Right Oil Temperature Gauge



Left Engine Manifold Pressure/Fuel Flow Gauge

Right Engine Manifold Pressure/Fuel Flow Gauge

## Propeller Synchronization Switch

Synchroscope

Left Fuel Boost Switch

Right Fuel Boost Switch

Cowl Flaps Switch

Left Exhaust Gas Temperature (EGT) Gauge



Right Exhaust Gas Temperature (EGT) Gauge

Fuel Gauge, Left Tank

Fuel Gauge, Right Tank

## Propeller Levers

Landing Gear Lever

Rudder Trim Wheel

Left Battery Amperage Level Gauge

Right Battery Amperage Level Gauge



Left Oil Pressure Gauge

Right Oil Pressure Gauge

COMM1 Radio

NAV1 Radio

COMM2 Radio

NAV2 Radio

## Distance Measuring Equipment (DME)

Automatic Direction Finder (ADF) Radio



Autopilot

Audio Panel

Transponder

Airspeed Indicator

Altimeter

Altimeter Knob

Electronic Attitude Direction Indicator (EADI)

Electronic Horizontal Situation Indicator (EHSI)



Electronic Horizontal Situation Indicator (EHSI) Course Index Selector

Electronic Horizontal Situation Indicator (EHSI) Heading Bug Selector

Electronic Horizontal Situation Indicator (EHSI) Selector Panel

Inclinometer

Radio Magnetic Indicator (RMI)

Radio Magnetic Indicator Transfer Button 1

Radio Magnetic Indicator Transfer Button 2

Vertical Speed Indicator (VSI)



Angle of Attack Indicator

Aileron Trim Wheel

Flaps Lever

Landing Gear Lever

Rudder Trim Wheel

## Thrust Levers

Pitch Trim Wheel

## Magnetic Compass



Air Temperature

Left Battery Amperage Level Gauge

Right Battery Amperage Level Gauge

Fuel Level Indicator, Left Tank

Fuel Level Indicator, Right Tank

## Fuel Flow Indicators

Internal Turbine Temperature (ITT) Indicator, Left Engine

Internal Turbine Temperature (ITT) Indicator, Right Engine



Fan Tachometer (RPM N1), Left Engine

Fan Tachometer (RPM N1), Right Engine

Turbine Tachometer (RPM N2)

Left Oil Temperature Indicator

Right Oil Temperature Indicator

Left Oil Pressure Indicator

Right Oil Pressure Indicator

## Avionics Power Switch



Battery/Alternator Switch

Beacon Light Switch

Landing Lights Switch

Navigation Lights Switch

Strobe Light Switch

Taxi Light Switch

Left Fuel/Crossfeed Switch

Right Fuel/Crossfeed Switch



Left Fuel Boost Switch

Right Fuel Boost Switch

Left Engine Start Switch

Right Engine Start Switch

Pitot Heat Switch

Speed Brake Switch

COMM1 Radio

NAV1 Radio



COMM2 Radio

NAV2 Radio

Distance Measuring Equipment (DME)

Automatic Direction Finder (ADF)

Autopilot

Audio Panel

Transponder

Marker Lights



Airspeed Indicator

Altimeter

Altimeter Knob

Electronic Attitude Direction Indicator (EADI)

Inclinometer

Electronic Horizontal Situation Indicator (EHSI)

Electronic Horizontal Situation Indicator (EHSI) Heading Bug Selector

Electronic Horizontal Situation Indicator (EHSI) Course Index Selector



Radio Magnetic Indicator (RMI)

Radio Magnetic Indicator Transfer Button 1

Radio Magnetic Indicator Transfer Button 2

Vertical Speed Indicator (VSI)

## Propeller Synchronization Switch

Synchroscope

Aileron Trim Wheel

## Propeller Levers



Flaps Lever

## Condition Levers

Landing Gear Lever

Rudder Trim Wheel

## Power Levers

Pitch Trim Wheel

## Magnetic Compass

Left Battery Amperage Level Gauge



Right Battery Amperage Level Gauge

Fuel Gauge, Left Tank

Fuel Gauge, Right Tank

Left Internal Turbine Temperature (ITT)/Fuel Flow Gauge

Right Internal Turbine Temperature (ITT)/Fuel Flow Gauge

Left Tachometer and Propeller Tachometer

Right Tachometer and Propeller Tachometer

Left Torque Indicator



Right Torque Indicator

Left Oil Temperature/Oil Pressure Gauge

Right Oil Temperature/Oil Pressure Gauge

## Avionics Power Switch

Battery/Alternator Switch

Beacon Light Switch

Landing Lights Switch

Navigation Lights Switch



Strobe Light Switch

Taxi Light Switch

Left Fuel Tank/Crossfeed Switch

Right Fuel Tank/Crossfeed Switch

Left Engine Start Switch

Right Engine Start Switch

Left Standby Pump Switch

Right Standby Pump Switch



Pitot Heat Switch

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Autopilot

Transponder

[View a related AVI ground lesson.](#)

Review problem areas from the previous lesson.

Review the previous lesson's introductory maneuvers before beginning this lesson.

View the lesson's entry into your Student Logbook.

Go back to the previous lesson.

Skip the current lesson and go on to the next lesson.



Allows you to select a different assignment.

Puts the Virtual Flight Instructor in the copilot's seat.

View the lesson's entry into your Student Logbook.

Shows your departure, en route, and destination weather for this flight assignment.

Shows a map of your flight plan for this assignment. For a detailed description of the buttons at the bottom of this map, click [here](#).

The departure and destination points of the flight plan.

The requested en route altitude.

The en route power setting (for example, 75%).



True Airspeed

The weight of the fuel on board.

The fuel consumption in gallons per hour.

The departure airport.

The distance between departure and destination airports.

The en route time.

The fuel level remaining in the tanks.

A leg is the route between any two checkpoints in the flight plan. Leg #1 is the route from the departure airport to the first checkpoint: either a navigational aid or another airport.



The upcoming checkpoint on the flight plan that corresponds to that leg.

The wind speed and direction for this leg.

The estimated speed over the ground for this leg. Note: Indicated airspeed is displayed on the airspeed indicator.

The distance, in statute miles, of this leg.

The distance remaining in the leg.

The fuel required to complete this leg.

The fuel remaining at the end of this leg.

## **Details**



## **Details**

Choose one of five different aircraft by clicking on the picture of it. A brief list of specifications appears in the textbox. (For more detailed aircraft specs, consult the Pro Pilot 99 Flight Companion.) Click OK to return to the cockpit of the selected airplane.

There are specific operational procedures that must be adhered to every time before and during the execution of certain procedures, from before takeoff to after landing. This dialog is a handy reference for all of these operations.

Click Top Tanks to maximize your fuel loading. The cabin loading will automatically adjust downward, if necessary, to allow for the additional fuel weight.

Check this to automatically control power to the cockpit instruments.

Check this to automatically control power to the navigation and communication radio panels.

Check this to automatically control power to the magnetos (starters for the CitationJet).

Check this to automatically select the fuel tank(s).



Check this to automatically stop the engine(s) when the fuel tanks are empty.

Check this to automatically control the fuel-to-air ratio inside the carburetor.

Check this to automatically adjust the propeller blade angle.

Check this to automatically adjust the synchronization of the two propellers on dual-engine planes.

Enables carburetor icing effects.

Check this to automatically adjust rudder controls with aileron movement.

Check this to enable airspeed affects on all controls.

Check this to enable synchronized throttle movement on multiengine aircraft.



Set the percentage reliability of the Vacuum, Pitot-Static, and Electrical System instruments, as well as the Power Plant. The percentage settings will only affect the instruments/engines checked (otherwise, they remain at 100%). Instruments will freeze at their current state upon failure.

Covers the checked instrument(s) on the Cessna 172 only.

## **Details**

These buttons display the locations of specific navigational aids.

This button shows the frequencies of the navigational aids and airports that are displayed.

Click on either of these, then click on the area of the map that you want to enlarge or reduce.

The move buttons shift the map by increments of roughly 15' (latitude or longitude) per click.

Click this button, then click on an airport (you must be zoomed in far enough) to go to a specific runway. A list of available runways will appear. Click on the specific runway you want, then click Go To and the scenery for that runway will load.



## **Details**

## **Details**

Click on the desired runway from the list that appears.

This turns on ATC communications that provide you with heading and altitude instructions for departure and approach routes.

Toggles all sounds of air traffic control on and off.

Click the radio button for either Touch-and-Go or Full Stop to set the type of ATC landing communication.

Check this box to set ATC landing communication to acknowledge closed traffic.

Click the radio button for either Left-Hand or Right-Hand to set the ATC traffic pattern communication.



Check this box if you want to hear the automatic readback transmissions of ATC requests.

Check this box to enable the COM 1 radio swap button to automatically tune in the next ATC frequency in the takeoff or landing sequence.

Click this button to repeat the last ATC transmission.

Click this to terminate ATC communications for a takeoff or landing sequence.

Click this button to request a new altitude from ATC.

Click this button to request a different landing runway from ATC.

Click this button to report a go-around or missed approach.

Check this box to listen to other pilots in the surrounding airspace.



Check this box to see other aircraft in the surrounding airspace.

Move the Activity Level slider (click and drag it) toward High to increase the number of virtual pilots and aircraft in the vicinity.

The selection of all navigational aids — VORs, NDBs, ILSs, and Waypoints — requires a similar process. First, you must highlight all of the text in the textbox labeled Enter the first few letters of the VOR you are looking for. Then type in the first few letters of the navaid's abbreviation or full name. Click on the navaid name after it appears in the list.

## **Details**

This allows you to track a VOR and position the aircraft relative to the selected VOR.

Track away from or toward the selected VOR using any radial. Click the radio button next to the course direction, then position the cursor inside the Using Radial textbox and type the magnetic heading of the desired radial.

This adjusts the Omni-Bearing Selector knob to dial in the selected radial on the NAV instrument.

You can position the aircraft any distance to or from the VOR, at any altitude, on any heading. Once all of these are selected, click Go To and the aircraft will be positioned accordingly.



## **Details**

This allows you to track an NDB and position the aircraft relative to the selected NDB.

Track away from or toward the selected NDB using any bearing. Click the radio button next to the course direction, then position the cursor inside the Using Course textbox and type the course of the desired bearing.

This adjusts the ADF compass card so the selected bearing is straight up.

You can position the aircraft any distance to or from the NDB, at any altitude, on any heading. Once all of these are selected, click Go To and the aircraft will be positioned accordingly.

## **Details**

This allows you to position the aircraft relative to the selected ILS.

This heading is preset to align your aircraft with the runway heading. You can change it by clicking inside the textbox and entering a new heading.



Enter the distance from the touchdown point or the from the outer marker, in nautical miles, where you want to begin the approach.

Enter the altitude and heading from where you want to begin the approach. The heading is preset to align with the runway heading. Once all of these are selected, click Go To and the aircraft will be positioned accordingly.

## **Details**

This allows you to position the aircraft relative to the selected Waypoint.

You can position the aircraft any distance to or from the Waypoint, at any altitude, on any heading. Once all of these are selected, click Go To and the aircraft will be positioned accordingly.

## **Details**

## **Details**

You can set the cloud coverage for three different levels, each starting at an altitude you specify and rising to an altitude you specify.



The level begins at this altitude.

The level rises to this altitude.

This is the amount of cloud coverage divided into eighths.

Click and drag the slider bar to adjust the visibility level.

Check this box and, if the weather conditions call for it, any precipitation will show. Keep in mind that this setting adds to the burden on your computer's processor and could slow the simulation.

Check this box to add thunderstorm effects to the weather conditions. Keep in mind that this setting adds to the burden on your computer's processor and could slow the simulation.

Select this option to see the Departure, En Route, and Destination weather conditions for your planned flight. Click Continue to return to the cockpit.

## Visual Flight Rules



## Instrument Flight Rules

Set the en route cruising speed and power.

Each time you click this button, a random weather forecast is generated for all three areas in the weather briefing.

These buttons display the locations of specific navigational aids.

This button shows the frequencies of the navigational aids and airports that are displayed.

Click on either of these, then click on the area of the map that you want to enlarge or reduce.

The move buttons shift the map by increments of roughly 15' (latitude or longitude) per click.

Click this button, then click on an airport, VOR, NDB, or waypoint (you must be zoomed in far enough) to add it to or remove it from the flight plan.



This is a synopsis of all the flight plan information.

Departure and destination points (3-letter designations).

Cruising altitude.

Cruising power.

The weight of the fuel loaded on board prior to starting the engine, in pounds.

The fuel consumption rate in pounds per hour.

True Airspeed

The origin of the flight plan.



Total distance of the current leg in the flight plan.

The total time estimated for the entire trip.

Elapsed trip time upon takeoff clearance.

Total estimated fuel required for the trip.

Closes the loaded flight plan.

## **Details**

## **Details**

Enter the starting date of the flight.



Select the aircraft flown.

Enter the departure airport.

Enter the destination airport.

Enter any noteworthy information about the flight.

Select the aircraft category flown.

Select the conditions flown under.

If you flew solo, select Pilot-in-command. If you flew with a flight instructor, select Dual. If you are logging hours from a cross-country flight assignment, select Cross-country.

Enter the total flying time in hours (example: 8 hours, 15 minutes is entered as 8.25).



This dialog allows you to customize the position of each Sky Camera. Adjust the orientation, distance, and altitude relative to the airplane for all four cameras.

Set any of the five camera positions as the camera in use.

When this box is checked, the view will slowly pan between camera positions when different cameras are selected.

Orientation is referenced by clock positions, with 12 o'clock straight off the nose, and six o'clock straight off the tail of the airplane. Orientation refers to the view from, not the position of the camera. For example, a six o'clock camera orientation sets a view from the nose of the aircraft looking toward the tail.

Altitude refers to the position of the camera relative to the aircraft. For example, a negative altitude will position the camera below the aircraft.

Adjust the distance of the camera from the aircraft.

Sets the scale of the map display.

Shows airport symbols on the GPS map display.



Shows VOR symbols on the GPS map display.

Shows NDB symbols on the GPS map display.

Shows ILS approach symbols on the GPS map display.

Shows waypoint symbols on the GPS map display.

Shows latitude and longitude gridlines on the GPS map display.

Shows route information on the GPS map display.

Shows current course and track information on the GPS map display if a flight plan leg is active.

Shows wind drift on the GPS map display.



Shows other local aircraft on the GPS map display.

Click on the arrow button to the right of this text box to select your name from the list.

Check this box to automatically make entries into the Logbook. View the Logbook by selecting it from the Planning Menu.

Highlight a name from the Pilot's Name list, then click this button to delete it.

This menu shows the maneuvers you have successfully completed. It also lists the cross-country hours flown and your performance ratings.

Pro Pilot 99 Certificate

This window indicates the completion level of each maneuver. A gray checkmark means that you have satisfactorily completed the maneuver. A red X means that you have not satisfactorily completed the maneuver. If there is no mark it means you have not yet attempted the maneuver.

Hours flown with a flight instructor.



Hours flown without a flight instructor.

To improve safety, stay within your aircraft's fuel, load, and performance limits. Also, pay attention to other aircraft on the ground and in the air, and keep safe distances and altitudes at all times. Remember, there are old pilots and there are bold pilots, but there are no old bold pilots.

To improve airmanship, follow assigned routes, maintain assigned headings and altitudes, and understand and accurately perform all maneuvers.

To improve efficiency, don't waste runway, fuel, or altitude. Always use all available runway, never assume you have enough fuel, and always fly at an altitude that allows for a safe, emergency landing.

Check this to receive copilot assistance in the categories that you select below.

The copilot will announce airspeed in 10 knot increments as you roll down the runway.

The copilot handles all calls to ATC.

The copilot suggests what control adjustments to make during flight.



The copilot calls out the altitude you are approaching.

The copilot sets the NAV radios to the appropriate frequencies and calls the heading required to reach a navigation fix.

The copilot handles all aircraft control (yoke, throttle, flaps, etc...)

All of the options shown here will enhance the graphical experience of *Pro Pilot 99*, but may lead to a slower frame rate on some machines. Experiment with various settings to achieve an acceptable frame rate while maximizing the scenery as you fly. The Alternate tab allows you to create alternate graphic settings, which can be toggled on with the Use Alternate Graphics option.

This turns off all detail options and minimizes the scenery.

This turns on all detail options and maximizes the scenery.

The alternate tab allows you to quickly change to a pre-selected detail set with a single click of the mouse (after the initial setup).

This affects the brightness inside and outside the cockpit. Click once on the slider bar and drag it to the new setting.



Click and drag the slider bar to increase or decrease the sound volume of the instructor, engine, ATC, or cockpit sound effects. Mute turns off the selected sound.

Turns off all sounds.

Check this box to toggle the joystick/yoke control on. When off, the keyboard becomes the flight controller.

Click and drag the slider to adjust how far the ailerons move given a corresponding movement of the joystick. The lower the setting, the greater the left and right movement of the joystick that is required to affect a turn.

Click and drag the slider to adjust how far the rudder moves given a corresponding movement of the rudder wheel on the joystick. The lower the setting, the greater the left and right movement of the wheel that is required to affect a turn.

Click and drag the slider to adjust how far the elevator moves given a corresponding movement of the joystick. The lower the setting, the greater the up and down movement of the joystick that is required to affect a pitch change.

Dead space is the amount of movement that has no affect when moving the joystick from a centered position. This slider widens and narrows the dead space.

UTC Time sets the cockpit clock to Universal Coordinated Time or Greenwich Mean Time. Manual Local Time allows you to set the cockpit clock to any U.S. time zone. Automatic Local Time automatically sets the cockpit clock to the time zone you're in.



Select the time zone that you want the cockpit clock to read (you must first select Manual Local Time as the Time Mode).

This resets the date and time to your computer's internal clock settings.

# *Pro Pilot '99 Online Manual*

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**Introduction: Three Kinds of Help**

**Using the Online Manual**

**Quick Start**

**The Cockpit and Instrument Panels**

**The *Pro Pilot '99* Menus**

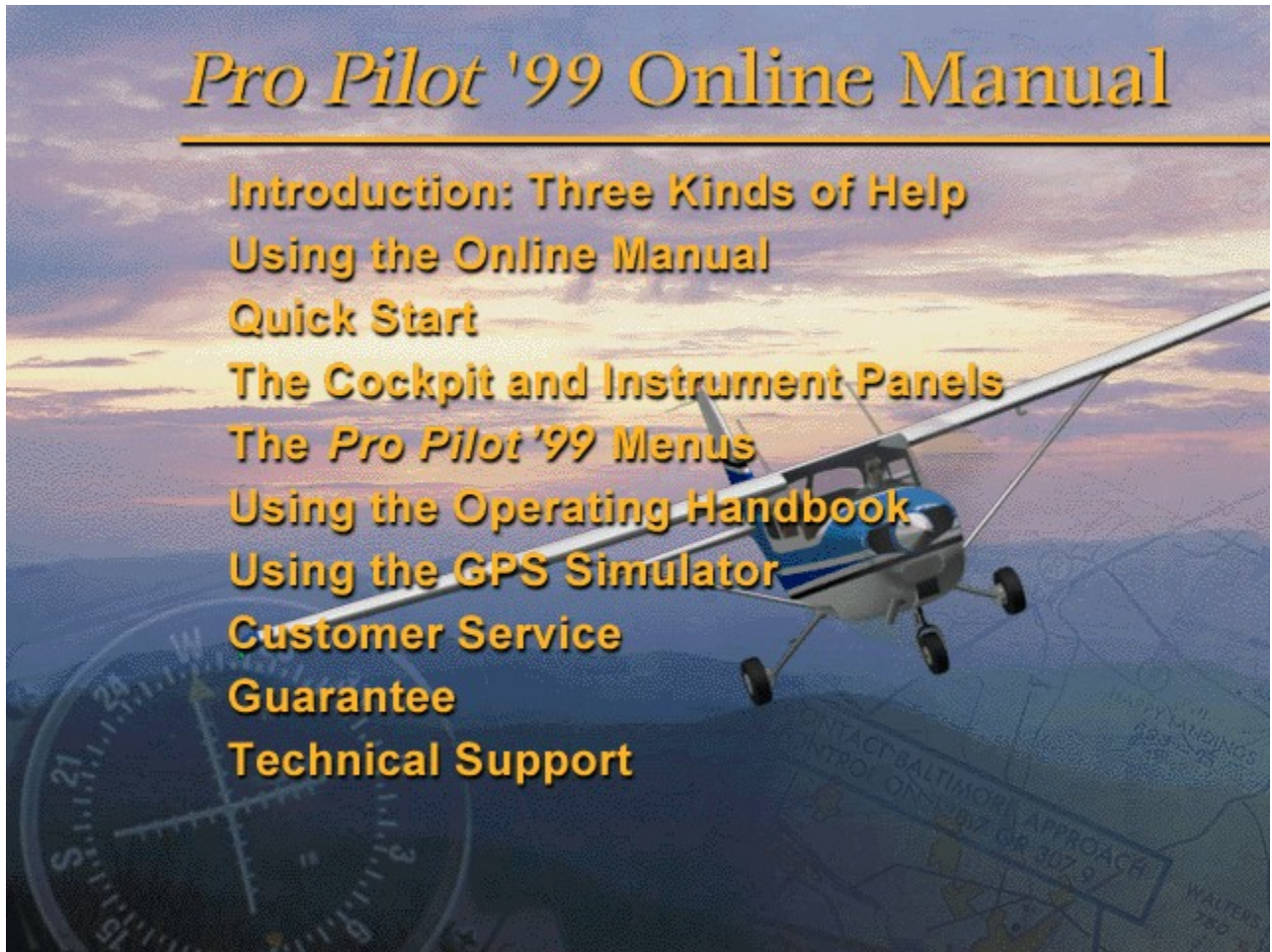
**Using the Operating Handbook**

**Using the GPS Simulator**

**Customer Service**

**Guarantee**

**Technical Support**



# Introduction: Three Kinds of Help

As if being a pilot in command of an airplane weren't challenging enough, you'll also need a good understanding of the options you can select that will make flying *Pro Pilot 99* a more enjoyable experience. This online manual primarily serves as a reference to the instrumentation on board each aircraft, as well as the menus found along the top of the screen within the simulation.

Suppose you are a beginning pilot who doesn't remember how to read a particular instrument. Or suppose you are an experienced pilot, but have never flown a plane with an Electronic Horizontal Situation Indicator (EHSI). The section in this online help system that covers instrumentation will help when you find yourself in unfamiliar cockpit surroundings.

## Three Kinds of Help

### Right-Click Inside the Cockpit

The definition of every item inside the cockpit is just a right-mouse-click away. Right-click on an item to pop-up its name. Then left-click on the name to jump to the topic within the online manual that explains the item in detail.

### The ? Button

All of the dialog boxes in *Pro Pilot 99* display this button in the upper right corner of the window. Click it once (the cursor will change to a question mark), then click on the item within the dialog box that you don't understand. A pop-up textbox will appear that explains the item in question. If the explanation is too lengthy to fit within a pop-up box, only the word "Details" appears. Click on "Details" to jump to the section within this online manual that explains the item.

*Note: only those items that are not self-explanatory have been programmed for this pop-up help.*

### Online Manual

This online manual is designed to help you navigate your way through the many dialog boxes and menus that serve to set up your entire *Pro Pilot 99* flight experience. Refer to this online manual for descriptions of every menu item and option within the simulation.

You'll also find telephone numbers, mailing addresses, and Web site addresses for [customer service](#) and [technical support](#) in this manual in case you encounter installation or program difficulties. For a guide on using this online manual, click [here](#).

# Using the Online Manual

## **The Toolbar Buttons**

To look for a specific word or phrase in the text, click on the Help Topics button and click the Find tab. The first time you do this, you will go through a two-step set-up process. Keep the database minimized when that option comes up, then the Find dialog box is displayed. Follow the dialog box instructions to conduct your search. Use the Options key in this dialog box to further refine your search.

Any red highlighted text you see is a hypertext “jump” to a related article: simply click on the red highlighted text to go to the related topic. To return along the path of your jumps, click the Back button.

You may print the topic currently displayed by clicking the Print button.

Topics are organized in a particular sequence. For instance, all of the setup topics are part of a browse sequence. To move back and forth through topics in a sequence, click on the Browse arrow buttons, [<<] and [>>].

The manual opens with a Contents screen outlining the major sections and articles. You can return to the Contents screen from anywhere in the manual by clicking the Contents button at the upper right.

## **Online Manual Pull-Down Menus**

### ***File***

Open – open another help file.

Print Topic – prints current topic. You can also click the Print button in the top toolbar.

Exit – exits the on-line manual.

### ***Edit***

Copy – copies the text from the current topic onto the pasteboard.

Annotate – allows you to write a note and leave it on the current topic. The note is indicated by a green paper clip just before the first text in the topic.

### ***Bookmark***

Define – allows you to create a bookmark, which appears on this pull-down menu. You may then jump directly to the bookmark from anywhere in the manual by selecting it from the menu.

### ***Options***

Keep Help On Top – these choices allow you to move the Help window to the front or behind the game window.

Default

On Top

Not On Top

Display History Window –from this list, you can go directly to any previous topic by double-clicking it.

Font – these choices allow you to set the font size in this manual.

Small

Normal

Large

Use System Colors – reduces the number of colors used by this manual to 16.

**Help**

Using The On-Line Manual – takes you to this topic.

Version – displays the Microsoft Windows Help Compiler and *Pro Pilot 99* version information.

To “scroll” through long articles in any topic, click on the scroll bar or the Up/Down arrows at right, or use your [Pg Up] and [Pg Dn] keys.

Whether you're a seasoned pilot or an enthusiastic novice, the best way to learn more about *Pro Pilot 99* is to simply get up in the air and start flying. Here are instructions for getting off the ground in a hurry.

## How to take off in the Cessna 172P, 172R, or Bonanza

- Press **Z**, **F**, **F**, **S**, and **X** to start your engine and avionics system.
- Make sure your aircraft is pointed down the runway, and increase the throttle to 100% by pressing **backspace** or using the throttle control on your joystick.
- As the aircraft accelerates, it should lift off the ground on its own. If this doesn't happen, pull back gently on the joystick as you approach the end of the runway.
- If you are flying the Bonanza, press **G** to raise the landing gear once you are in the air.

## How to take off in the Baron, Super King Air, or CitationJet

- Press **8**, **Z**, **F**, **S**, and **X** to start your engines and avionics system.
- Make sure your aircraft is pointed down the runway, and increase the throttle to 100% by pressing **backspace** or using the throttle control on your joystick.
- As the aircraft accelerates, it should lift off the ground on its own. If this doesn't happen, pull back gently on the joystick as you approach the end of the runway.
- Once you are in the air, press **G** to raise the landing gear.

## Why won't my engine start?

- Make sure you have turned the master switch on (press **Z**).
- Make sure that your fuel switch is not set to OFF.
- If you're flying the Cessna 172R Skyhawk, make sure you have turned the fuel pump on.
- Make sure your mixture is set to FULL RICH (press **keypad \***).

# The Cockpit and Instrument Panels

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## The Cockpit View

Cessna 172P / 172R Skyhawk Instruments

Beechcraft Bonanza V35 Instruments

Beechcraft Baron B58 Instruments

Beechcraft Super King Air B200 Instruments

Cessna CitationJet Model 525 Instruments





# The Cockpit View

The default view in *Pro Pilot 99* is from the pilot's seat inside the cockpit. This view can be changed from the [Views Menu](#) and by using the keyboard commands (see the Quick Reference Card).

Access a definition of each instrument by right clicking on it. A pop-up appears with the name of the instrument. Click on the underlined text within the pop-up to access detailed information about the instrument from this online manual.

## Cessna 172P / 172R Skyhawk

### Airspeed Indicator

*Note: Refer to the Aircraft Specifications in the Pro Pilot 99 Flight Companion for specific information about the 172's airspeed indicator.*



The airspeed indicator uses the ram air from the pitot tube, compares it with the static air pressure and converts it to Indicated Airspeed which is displayed on your airspeed indicator. Modern airspeed indicators show knots on the outer scale and mph on the inner scale. There are three definitions of airspeed:

**Indicated Airspeed.** This is what the needle points to on the instrument and is the dynamic pressure sensed by the pitot system.

**Calibrated Airspeed.** The [pitot tube](#) may receive dynamic pressure differently at different angles of attack. Calibrated airspeed is indicated airspeed corrected for instrument error. A table in the airplane's operating manual shows the actual error at different airspeeds. Calibrated and indicated airspeeds can be used interchangeably for instrument flight.

**True Airspeed.** This is the indicated airspeed corrected for density altitude. The airspeed indicator is calibrated for standard conditions at sea level. As altitude and temperature increase, air pressure is reduced. Because this instrument measures dynamic pressure, true airspeed drops as altitude and pressure increase. This means that the indicated airspeed drops in relation to true airspeed as altitude or temperature increase.

Generally, true airspeed is 2% higher than indicated for each 1,000 ft of altitude. True airspeed is entered on the flight plan and if it varies by more than 5% or 10 knots (whichever is greater), you should report to ATC.

### Attitude Indicator (AI)



The attitude indicator is also called the artificial horizon. It shows the relationship of the nose and wings to the horizontal plane. All movements of the flight controls, such as changing pitch or bank, are done by direct reference to this instrument.

The first 30° of bank are shown on the bank index in 10° increments. Then there is a tick mark for 60° and 90° banks. Pitch attitude is named by reference to the center dot in the airplane symbol, as one dot above the horizon, two dots below the horizon, etc...

Note that a bank indicated on this instrument doesn't necessarily translate as a turn. A plane in a forward slip with one wing low, for instance, will appear as a bank on the attitude indicator even though it is not turning. Likewise, a plane in slow flight with a nose-up attitude will appear nose high on the indicator, although this does not translate to a climb. In fact, a plane in descent can appear nose-high on the attitude indicator, so be careful about how you interpret this instrument.

## Altimeter



The Kollsman window within the instrument face shows the pressure plane setting which is adjusted with the knob at the lower left of the instrument. Click and hold to the left or right of this knob to increase and decrease the pressure setting. The altimeter setting at an airport is the local barometric pressure adjusted to sea level, not the actual atmospheric pressure at the station. Therefore, if the Kollsman setting is the current sea level pressure, then the altimeter reads your altitude above sea level.

Standard sea level pressure is 29.92 inches of mercury. At higher altitudes, there is less air above you, so the pressure is less. Atmospheric pressure decreases by one inch of mercury with every 1,000 feet of altitude. At Denver on a standard day, where the altitude is 5,000 feet, the barometer reads 24.92", or five inches below standard sea level pressure. Adjusted to the standard sea level pressure however, the correct altimeter (Kollsman) setting is 29.92, just as it is anywhere else.

Controllers are required to give the local altimeter setting at least once while you are in their sectors. Prior to IFR flight, however, it is important to input the correct altimeter setting and compare the altimeter reading to the local field elevation. The difference should be no more than 75 feet, although there are exceptions to this.

If pressure drops during flight, the altimeter will read higher without an appropriate adjustment to the altimeter setting. This means you would descend to maintain a certain indicated altitude. Pressure can change by several inches over a long flight, and without the appropriate adjustment to the altimeter setting, you could find yourself at a dangerously low altitude. There is a saying about pressure drops that goes: "From high to low, look out below."

Likewise, an increase in pressure will result in a lower indicated altitude and would cause you to climb to maintain an indicated altitude. *Enter the new altimeter setting each time a controller provides it.*

There are five definitions of altitude that pilots need to understand:

**Indicated Altitude** – the number read off the altimeter. This should agree with true altitude if the altimeter setting is accurate and there is no instrument error.

**True Altitude** – actual height above mean sea level (MSL). This is used by all aircraft below 18,000 ft and is the basis for IFR separation.

**Absolute Altitude** – the height above the terrain. The aneroid altimeter cannot measure this. Only a radar altimeter can, as well as your own direct observation.

**Pressure Altitude** – the height above the pressure plane, which is where the pressure is 29.92". The pressure plane is also called the standard datum plane and is equal to true altitude on a standard day. To determine the pressure altitude, enter 29.92 as the altimeter setting and read the indicated altitude.

**Density Altitude** – this is pressure altitude corrected for non-standard temperature. It is a computed value that accounts for temperature and pressure variations. At the 29.92" pressure plane, 15° C is the standard temperature. On a standard day, this temperature decreases predictably with increases in altitude (it's usually colder in the mountains, right). When the temperature varies from this standard, aircraft performance is affected.

Higher temperatures and altitudes reduce air density and decrease aircraft performance. Lift decreases so airplanes need a longer takeoff roll, have a slower rate of climb, and have slower indicated airspeeds on hot days and at higher elevations.

Density altitude is found by using a computer or a density altitude chart as shown below. It is the basis for calculating true airspeed which you show on IFR flight plans.

## Turn Coordinator and Inclinometer



The turn coordinator consists of the bank indicator (the miniature airplane) and the slip-skid indicator (the floating ball). The bank indicator shows two hash marks that indicate standard left and right turns. In instrument flight, all turns are made at a rate of 3° per second. At this standard rate, a complete 360° turn is made in two minutes. Smaller turns (5-10° heading changes) require a less-than-standard rate turn.

In a coordinated turn, the airplane's weight (earthward force) and centrifugal force (the force exerted toward the outside of the turn) are balanced so that the resultant force is directed straight through the floor of the cockpit. A centered ball confirms a coordinated turn. A ball on the inside of a turn (plane banked right, ball to the right of center) means the turn is slipping. This means the plane isn't turning fast enough for the degree of bank. Apply rudder pressure to increase the turn rate.

A ball on the outside of a turn (plane banked right, ball to the left of center) means the turn is skidding. This means the plane is turning too fast for the degree of bank. Relieve rudder pressure to decrease the turn rate.

The attitude indicator provides information about angle of bank. The turn coordinator provides rate-of-turn information.

## Heading Indicator (HI)



The heading indicator, or directional gyro, operates on an internal gyroscope that provides accurate heading information *once it is set to the correct heading using the magnetic compass*. This should be done by the pilot prior to taxiing. Click (and hold) to the left or right of the knob at the lower left edge of the instrument to rotate the indicator clockwise and counterclockwise. The airplane's heading then appears at the top of the instrument.

Consult the heading indicator as you approach a runway to confirm its heading. This is especially useful in circling approaches.

The heading bug (pointer) on the heading indicator is set to a desired heading for the autopilot to hold. It can also be used as a reminder to stop turning when flying manually. When tracking a VOR or localizer, and the course is set on the OBS, the heading bug can be adjusted to reflect the wind correction required to stay on course. To adjust it, click (and hold) to the left or right of the knob at the lower right edge of the instrument to rotate the bug clockwise and counterclockwise.

## Vertical Speed Indicator (VSI)



The Vertical Speed Indicator (VSI) is a pressure instrument that measures the rate of climb or descent via a combination of static and ambient pressure. In level flight, the instrument reads zero. The needle will indicate immediately any change in vertical speed (the trend), but the rate displayed tends to lag behind what is actually happening except in sustained climbs, descents, and level flight. Don't rely on the VSI for pitch information especially when the pitch is constantly changing, such as in turbulent weather.

## Automatic Direction Finder (ADF)



The Automatic Direction Finder (ADF) is used to track NDBs. The Non-Directional Beacon is a form of navigation that allows you to fly between two locations using ground-based transmitters and aircraft receivers.

The NDB itself is a ground-based radio transmitter which the aircraft uses as a navaid, and which instrument-rated pilots use to locate airports during instrument approaches. Sometimes even AM radio stations are used as NDB transmitters.

An NDB emits a continuous radio signal, which ADF picks up, assuming it is within range of the signal. Like the VOR, every NDB, assuming it is in working order, is identified by an audible Morse code signal, which is broadcast continuously over the NDB's frequency. NDB frequencies lie between 190 kHz and 535 kHz. The Morse code ID and the frequency of every NDB is displayed on aeronautical charts.

*Note: A second NAV instrument (NAV 2) can be toggled on to replace the ADF on the Cessna 172 panel by pressing ALT + N.*

### VOR/LOC Indicator (NAV1)



The NAV instrument is used in VOR/DME navigation primarily as an indicator of the airplane's position relative to a referenced radial on a VOR. It is also used to track localizers during ILS approaches.

The VOR receiver equipment inside of an airplane consists of an audio panel, [a NAV radio](#), a [DME](#) (distance measuring equipment) radio, and the NAV instrument.

On the 172, you can display a second NAV instrument in place of the ADF by holding the [Alt] key and pressing [N]. This becomes your NAV 2. To use either NAV instrument, first tune the [NAV radio](#) (NAV 1 radio for the NAV 1 instrument; NAV 2 radio for the NAV 2 instrument) to the correct frequency of the VOR.

The NAV instrument tells you where the airplane is in relation to the VOR. The Omni Bearing Selector (OBS), located at the bottom left of the NAV, is used to dial in the radial being referenced on the VOR. Click and hold on either side of the OBS knob to rotate the compass card clockwise and counterclockwise. To make changes in smaller increments, click only once. As the OBS is turned, the compass rose inside the NAV instrument rotates. The number at the top of the

instrument shows the radial being referenced for navigation.

The vertical white bar at the center of the compass rose is the Course Deviation Indicator (CDI), also known as the “needle.” This shows where the airplane is in relation to a selected VOR radial or localizer. The needle moves as the OBS is adjusted. The “T” (to) and “F” (from) flags show the relationship of the airplane to the selected radial and the VOR.

The horizontal white bar at the center of the compass rose is the glide slope indicator. This shows the position of the aircraft relative to the glide slope on an ILS approach.

For more information on VOR navigation, please reference the chapter on navigation in the *Pro Pilot 99 Flight Companion*.

*Note: A second NAV instrument (NAV 2) can be toggled on to replace the ADF on the Cessna 172 panel by pressing ALT + N.*

## Clock



A standard digital clock that measures hours, minutes and seconds, and displays time in a 24-hour format. Time is a critical factor in IFR planning and flying. Altitude, heading changes and distance covered are all affected by time, so the clock and the corresponding instruments become integral.

Simulation time can be adjusted in the [Date & Time](#) dialog under the Options menu.

## Tachometer



The tachometer measures the speed of the engine in revolutions per minute (rpm). The hours of operation are indicated on the number dial at the center of the tachometer. Tach time is measured by the number of engine revolutions, not by elapsed time, so an hour of engine time may not equal an hour of clock time. Only near the cruise setting will the two be equal. At slower speeds, the tach time is slower than the clock time, and vice versa at higher speeds.

## Magnetic Compass



This is a magnet with an attached face that allows you to read from 0 to 360 degrees. The magnet aligns itself with the Magnetic North Pole and the plane turns around it. Every 30 degrees the face shows the number of the heading minus the zero (i.e., 60 degrees appears as 6). The number aligned with the lubber line, the vertical white line on the face of the compass, indicates

the reading.

### **Fuel Tank Selector Switch**

Set the switch to feed fuel from either the left (L), right (R), or both (B) fuel tanks. (O) is off. Click to either side of the switch to turn it left and right.

### **Ignition Switch**

This switch starts your engine by allowing electricity to flow from the battery to the starter(s). O = off; R = right; L = left; B = both; S = start. Click to either side of the switch to turn it left and right.

### **Battery/Alternator Switch**

Provides power to the electrical instruments, electrical environmental systems and the lights. Click on the top and bottom of this switch to turn it on and off.

### **Avionics Power Switch**

Provides electricity to the avionics radios. This should always be off when powering up. Click on the top and bottom of this switch to turn it on and off.

### **Pitot Heat Switch**

The pitot tube is part of the pitot-static system that drives the [airspeed indicator](#), [altimeter](#), and [vertical speed indicator](#). It is located outside the airplane and is therefore subject to moisture, namely snow and ice. Pitot heat should be used anytime you expect to encounter outside moisture and the outside air temperature is 0° C or colder. Click on the top and bottom of this switch to turn it on and off.

### **Strobe Lights Switch**

These are two, high-intensity, flashing white lights located on the wingtips. They should only be turned on just prior to takeoff roll and turned off shortly after landing. Click above and below this switch to flip it on and off.

### **Beacon Light Switch**

This is the single flashing red light on top of the vertical stabilizer above the rudder. Click above and below this switch to flip it on and off.

### **Navigation Lights Switch**

The navigation lights are located in the wing tips and in the vertical stabilizer fairing. Click above and below this switch to flip it on and off.

### **Taxi/Landing Light Switches**

The taxi and landing lights are collocated in the lower engine fairing on the 172P and in the leading edge of the left wing, near the center of the span on the 172R. Click above and below these switches to turn them on and off.

### **Fuel Pump Switch (172R only)**

This switch turns on the auxiliary fuel pump.

### **Carburetor Heat Lever (172P only)**

Allows heated air to enter the carburetor to help prevent carburetor icing. Unheated air is used when this control is off (down). Click and hold above this lever to open carb heat. Click and hold below it to close carb heat.



### Throttle Lever

Click and hold above this lever to open throttle (increase power). Click and hold below it to close throttle (decrease power).

### Fuel Mixture Lever

The mixture control regulates the ratio of gasoline to air entering the fuel distribution system; push it forward (click and hold above it) to increase, or enrich, the mixture; back (click and hold below it) to decrease, or lean, the amount of fuel in relationship to the amount of air.

### Elevator Trim Wheel

Trims the elevator trim tabs to relieve you from having to maintain a continuous pressure on the control yoke in order to keep the elevator in its proper position. These trim tabs are mounted on the elevator and can be adjusted to counteract the aerodynamic forces that apply pressure to the elevator when the aircraft is flown in an unbalanced flight condition. Click (and hold) at the top of this trim wheel to pitch the nose down. Click at the bottom of it to pitch the nose up.

### Flaps Lever

Wing flaps are hinged, movable panels installed on the inboard trailing edges of the wings. They may be extended downward into the airflow beneath the wings to provide greater lift and more drag, so that the aircraft can descend or climb at a steeper angle or at a slower airspeed. Flaps permit a slower landing speed, thereby decreasing the required landing distance. They may also be used to shorten takeoff distance and provide a steeper climb path.

The 172 has four flaps settings: none, 10°, 20°, and 30°. Click at the bottom of the flaps control to lower flaps; click above it to raise flaps.

### Distance Measuring Equipment (DME)



The DME tells a pilot how far the airplane is from a VOR at ground level. In other words, if you're flying at an altitude of 6,000 ft directly over the VOR, the distance indicator will never show less than one mile. The DME radio is tuned to the desired VOR in the same manner as the NAV radio. The DME radio then emits the Morse code for the tuned VOR. The panel shows the distance in nautical miles (NM) to the VOR; the ground speed of the airplane in knots (KT); and the number of minutes to the station (MN).

There are buttons for three settings: the N1 button sets the DME to the NAV 1 radio; N2 is the NAV 2 radio; and Hold keeps the DME on the last selected frequency even if the NAV frequency selectors are subsequently changed. Click on any button with your mouse to depress it.

### Audio Panel



The audio panel allows the pilot to aurally identify the radio signals received by the navigation equipment. It also allows the pilot to listen to the broadcasts received by the communications radios.

**Blue “O” Light.** When the plane passes through the outer marker signal, the blue outer marker light flashes and the audio panel emits a steady, low-tone series of beeps at the rate of two per second. The tones are audible only if the Marker button is depressed.

**Amber “M” Light.** When the plane passes through the middle marker signal, the amber middle marker light flashes and the audio panel emits an alternating long and short, high-pitch series of beeps at the rate of 95 pairs per minute. The tones are audible only if the Marker button is depressed.

**White “I” Light.** This is reserved for inner, back course, and fan markers. The tones are audible only if the Marker button is depressed.

**COM 1 & 2 Buttons.** These activate the COM 1 and COM 2 audio panels. Either COM radio is used to tune in automatic terminal information service (ATIS), and to communicate with various control centers, flight service stations or other facilities during flight.

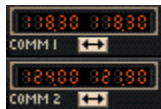
**NAV 1 & 2 Buttons.** These activate the NAV 1 and NAV 2 audio panels. Once you have the proper frequencies tuned into the NAV radios, you can identify the signal by listening for the Morse code identifier through this portion of the audio panel. The Morse code ID is transmitted once every 15 seconds.

**DME Button.** This allows the pilot to identify the DME signal he/she is receiving with the DME radio. Morse code IDs are broadcast once per minute. The tones are higher pitched than that of the VORs for easier identification of like identifiers.

**Marker Button.** This enables the pilot to hear audio signals from the outer, middle, and inner marker beacons.

**ADF Button.** This enables the pilot to hear the signals, and IDs, from tuned NDBs.

## COM1 & 2 Radios



The COM 1 & 2 radios are 360-channel transceivers that receive and transmit at frequencies between 118.00 and 135.96 megahertz (MHz) with 50 kilohertz (kHz) separation. They are used to tune in automatic terminal information service (ATIS), and to communicate with various control centers during instrument flight.

The Standby Frequency button (double-headed arrow) toggles the frequency displayed on the right with the frequency displayed on the left.

To set a frequency on standby (the one displayed on the right), click and hold to the left of the decimal point to adjust megahertz. Click and hold to the right of the decimal point to adjust kilohertz (in 50 kHz increments). Note: you cannot adjust the active frequency (the one displayed on the left).

## NAV 1 & 2 Radios



The NAV 1 and 2 radios are 200-channel radios that receive frequencies between 108.00 and 117.95 megahertz (MHz) with 50 kilohertz (kHz) separation. These radios are used to tune in and identify VOR or ILS frequencies.

The Standby Frequency button (double-headed arrow) toggles the frequency displayed on the right with the frequency displayed on the left.

To set a frequency on standby (the one displayed on the right), click and hold to the left of the decimal point to adjust megahertz. Click and hold to the right of the decimal point to adjust kilohertz (in 50 kHz increments). Note: you cannot adjust the active frequency (the one displayed on the left).

The IDT button identifies the Morse code signal of the selected VOR. The BRG button identifies the bearing that has been selected on the VOR.

### ADF Radio



The ADF radio works in conjunction with the ADF instrument to track NDBs. Once you've tuned an NDB's frequency on the radio, the needle on the ADF instrument should point to the NDB station.

The Standby Frequency button (double-headed arrow) toggles the frequency displayed on the right with the frequency displayed on the left.

To set a frequency on standby (the one displayed on the right), click and hold on the frequency display to adjust kilohertz. Note: you cannot adjust the active frequency (the one displayed on the left).

The IDT button identifies the Morse code signal of the selected NDB.

### Transponder



The transponder is an electronic piece of equipment used to identify your aircraft, flight number, altitude, and your unique, four-digit transponder squawk code on the air traffic control radar screen. When requested by ATC to "Squawk xxxx...", make sure the requested squawk code is displayed, then press the IDT (identify) button.

To set a squawk code, click and hold on the code display. The two left digits and the two right digits can be adjusted separately. To squawk VFR, simply press the VFR button and the 1200 code will appear.

FLxxx is the flight level at which you are flying.

## Autopilot Panel



**AP Button.** When the Autopilot button is pressed, Autopilot is engaged. It is on when the AP light is displayed.

**D/U Button.** This rocker switch electrically trims the pitch up (U) or down (D).

**ALT Button.** This allows the Autopilot to hold the current altitude. It is on when the ALT light is displayed.

**HDG Button.** This allows the Autopilot to follow a selected heading. First, set a heading on either the HSI or Heading Indicator. Press the Autopilot button (AP), then press this button and the Autopilot will turn the airplane to the selected heading. It is on when the HDG light is displayed.

**NAV Button.** This allows the Autopilot to track a VOR. First, set the frequency of the VOR and the radial bearing to be tracked on the NAV 1 radio. Press the Autopilot button (AP), then press this button. The Autopilot will turn the airplane to intercept the radial at a 45° angle. Once the radial is intercepted, Autopilot then tracks the radial. It is on when the NAV light is displayed.

**APR Button.** This allows Autopilot to track an ILS approach. Enter the ILS frequency on the NAV 1 radio, press the Autopilot button (AP), and then press this button. The Autopilot will turn the airplane to intercept the localizer. Approach is on when the APR light is displayed. Once the Autopilot has intercepted the localizer, glide slope seek is active. Then, when the glide slope is intercepted, the Autopilot will "capture" it and follow it for the approach.

**BC Button.** This allows the Autopilot to track an ILS back course approach. The back course is the 180-degree opposite of the ILS approach. The glide slope cannot be tracked on a back course approach. Enter the ILS frequency on the NAV 1 radio, press the Autopilot button (AP), and then press this button. The Autopilot will turn the airplane to intercept the localizer on the back course. Back course is on when the BC light is displayed.

## Fuel Gauges

These gauges show the amount of fuel remaining in the left and right tanks.

## Oil Temperature Gauge

This gauge shows the engine oil temperature.

## Oil Pressure Gauge

Probably the most important engine instrument on board; registers the oil pressure in pounds per square inch; should reach normal operating value within 30 seconds of engine start.

## NAV / GPS Switch (172R only)



Toggles between NAV and GPS.

**Outside Air Temperature Indicator (172R only)**



Displays outside air temperature in either Celsius or Fahrenheit.

**Exhaust Gas Temperature (EGT) Gauge (172R only)**

The EGT measures the temperature of the exhaust gas exiting the engine through the exhaust manifold. It is used to indirectly determine the proper fuel mixture at higher altitudes.

**Fuel Flow Gauge (172R only)**

This gauge indicates the fuel flow in gallons per hour.

## Beechcraft Bonanza V35

### Airspeed Indicator

*Note: Refer to the Aircraft Specifications in the Pro Pilot 99 Flight Companion for specific information about the Bonanza's airspeed indicator.*



The airspeed indicator uses the ram air from the pitot tube, compares it with the static air pressure and converts it to Indicated Airspeed which is displayed on your airspeed indicator. Modern airspeed indicators show knots on the outer scale and mph on the inner scale. There are three definitions of airspeed:

**Indicated Airspeed.** This is what the needle points to on the instrument and is the dynamic pressure sensed by the pitot system.

**Calibrated Airspeed.** The [pitot tube](#) may receive dynamic pressure differently at different angles of attack. Calibrated airspeed is indicated airspeed corrected for instrument error. A table in the airplane's operating manual shows the actual error at different airspeeds. Calibrated and indicated airspeeds can be used interchangeably for instrument flight.

**True Airspeed.** This is the indicated airspeed corrected for density altitude. The airspeed indicator is calibrated for standard conditions at sea level. As altitude and temperature increase, air pressure is reduced. Because this instrument measures dynamic pressure, true airspeed drops as altitude and pressure increase. This means that the indicated airspeed drops in relation to true airspeed as altitude or temperature increase.

Generally, true airspeed is 2% higher than indicated for each 1,000 ft of altitude. True airspeed is entered on the flight plan and if it varies by more than 5% or 10 knots (whichever is greater), you should report to ATC.

### Attitude Indicator (AI)



The attitude indicator is also called the artificial horizon. It shows the relationship of the nose and wings to the horizontal plane. All movements of the flight controls, such as changing pitch or bank, are done by direct reference to this instrument.

The first 30° of bank are shown on the bank index in 10° increments. Then there is a tick mark for 60° and 90° banks. Pitch attitude is named by reference to the center dot in the airplane symbol, as one dot above the horizon, two dots below the horizon, etc...

Note that a bank indicated on this instrument doesn't necessarily translate as a turn. A plane in a forward slip with one wing low, for instance, will appear as a bank on the attitude indicator even though it is not turning. Likewise, a plane in slow flight with a nose-up attitude will appear nose high on the indicator, although this does not translate to a climb. In fact, a plane in descent can appear nose-high on the attitude indicator, so be careful about how you interpret this instrument.

## Altimeter



The Kollsman window within the instrument face shows the pressure plane setting which is adjusted with the knob at the lower left of the instrument. Click and hold to the left or right of this knob to increase and decrease the pressure setting. The altimeter setting at an airport is the local barometric pressure adjusted to sea level, not the actual atmospheric pressure at the station. Therefore, if the Kollsman setting is the current sea level pressure, then the altimeter reads your altitude above sea level.

Standard sea level pressure is 29.92 inches of mercury. At higher altitudes, there is less air above you, so the pressure is less. Atmospheric pressure decreases by one inch of mercury with every 1,000 feet of altitude. At Denver on a standard day, where the altitude is 5,000 feet, the barometer reads 24.92", or five inches below standard sea level pressure. Adjusted to the standard sea level pressure however, the correct altimeter (Kollsman) setting is 29.92, just as it is anywhere else.

Controllers are required to give the local altimeter setting at least once while you are in their sectors. Prior to IFR flight, however, it is important to input the correct altimeter setting and compare the altimeter reading to the local field elevation. The difference should be no more than 75 feet, although there are exceptions to this.

If pressure drops during flight, the altimeter will read higher without an appropriate adjustment to the altimeter setting. This means you would descend to maintain a certain indicated altitude. Pressure can change by several inches over a long flight, and without the appropriate adjustment to the altimeter setting, you could find yourself at a dangerously low altitude. There is a saying about pressure drops that goes: "From high to low, look out below."

Likewise, an increase in pressure will result in a lower indicated altitude and would cause you to climb to maintain an indicated altitude. *Enter the new altimeter setting each time a controller provides it.*

There are five definitions of altitude that pilots need to understand:

**Indicated Altitude** – the number read off the altimeter. This should agree with true altitude if the

altimeter setting is accurate and there is no instrument error.

**True Altitude** – actual height above mean sea level (MSL). This is used by all aircraft below 18,000 ft and is the basis for IFR separation.

**Absolute Altitude** – the height above the terrain. The aneroid altimeter cannot measure this. Only a radar altimeter can, as well as your own direct observation.

**Pressure Altitude** – the height above the pressure plane, which is where the pressure is 29.92". The pressure plane is also called the standard datum plane and is equal to true altitude on a standard day. To determine the pressure altitude, enter 29.92 as the altimeter setting and read the indicated altitude.

**Density Altitude** – this is pressure altitude corrected for non-standard temperature. It is a computed value that accounts for temperature and pressure variations. At the 29.92" pressure plane, 15° C is the standard temperature. On a standard day, this temperature decreases predictably with increases in altitude (it's usually colder in the mountains, right). When the temperature varies from this standard, aircraft performance is affected.

Higher temperatures and altitudes reduce air density and decrease aircraft performance. Lift decreases so airplanes need a longer takeoff roll, have a slower rate of climb, and have slower indicated airspeeds on hot days and at higher elevations.

Density altitude is found by using a computer or a density altitude chart as shown below. It is the basis for calculating true airspeed, which you show on IFR flight plans.

### Turn Coordinator and Inclinometer



The turn coordinator consists of the bank indicator (the miniature airplane) and the slip-skid indicator (the floating ball). The bank indicator shows two hash marks that indicate standard left and right turns. In instrument flight, all turns are made at a rate of 3° per second. At this standard rate, a complete 360° turn is made in two minutes. Smaller turns (5-10° heading changes) require a less-than-standard rate turn.

In a coordinated turn, the airplane's weight (earthward force) and centrifugal force (the force exerted toward the outside of the turn) are balanced so that the resultant force is directed straight through the floor of the cockpit. A centered ball confirms a coordinated turn. A ball on the inside of a turn (plane banked right, ball to the right of center) means the turn is slipping. This means the plane isn't turning fast enough for the degree of bank. Apply rudder pressure to increase the turn rate.

A ball on the outside of a turn (plane banked right, ball to the left of center) means the turn is skidding. This means the plane is turning too fast for the degree of bank. Relieve rudder pressure to decrease the turn rate.

The attitude indicator provides information about angle of bank. The turn coordinator provides rate-of-turn information.

### Horizontal Situation Indicator (HSI)





The Horizontal Situation Indicator (HSI) is a combined heading indicator and VOR display. It comprises a course index (yellow arrow), a heading bug (red pointer), a Course Deviation Indicator (yellow bar), a glide slope deviation indicator (white line scale on sides of compass rose), and a TO-FROM indicator (small white triangle near center of compass rose). The red HDG flag is a power off indicator. The red NAV flag indicates that no navaid is tuned in for the VOR.

The knob to the lower left is the Omni-Bearing Selector (OBS). It is used to adjust the course index. The knob to the lower right is the heading selector knob. It is used to adjust the heading bug. Click (and hold) to the left or right of the OBS to rotate the course index clockwise and counterclockwise. Click (and hold) to the left or right of the heading selector knob at the lower right edge of the instrument to rotate the heading bug clockwise and counterclockwise. To make adjustments in smaller increments, click only once.

The VOR display tells you where the airplane is in relation to the VOR. Use the OBS to dial in the radial being referenced on the VOR. To use the VOR display, first tune the [NAV 1 radio](#) to the correct frequency of the VOR.

The Course Deviation Indicator (CDI), also known as the “needle,” shows where the airplane is in relation to the selected VOR radial or localizer. Note: it is not visible if aligned with the course index.

The TO/FROM indicator shows the relationship of the airplane to the selected radial and the VOR.

The glide slope deviation indicator shows whether you are above or below the glide slope on an ILS approach.

Consult the heading indicator as you approach a runway to confirm its heading. This is especially useful in circling approaches.

The heading bug on the heading indicator is set to a desired heading for the autopilot to hold. It can also be used as a reminder to stop turning when flying manually. When tracking a VOR or localizer, and the course is set on the OBS, the heading bug can be adjusted to reflect the wind correction required to stay on course.

For more information on VOR navigation, please reference the chapter on navigation in the *Pro Pilot 99 Flight Companion*.

## Vertical Speed Indicator (VSI)



The Vertical Speed Indicator (VSI) is a pressure instrument that measures the rate of climb or descent via a combination of static and ambient pressure. In level flight, the instrument reads zero. The needle will indicate immediately any change in vertical speed (the trend), but the rate displayed tends to lag behind what is actually happening except in sustained climbs, descents, and level flight. Don't rely on the VSI for pitch information especially when the pitch is constantly changing, such as in turbulent weather.

### Automatic Direction Finder (ADF)



The Automatic Direction Finder (ADF) is used to track NDBs. The Non-Directional Beacon is a form of navigation that allows you to fly between two locations using ground-based transmitters and aircraft receivers.

The NDB itself is a ground-based radio transmitter, which the aircraft uses as a navaid, and which instrument-rated pilots use to locate airports during instrument, approaches. Sometimes even AM radio stations are used as NDB transmitters.

An NDB emits a continuous radio signal, which ADF picks up, assuming it is within range of the signal. Like the VOR, every NDB, assuming it is in working order, is identified by an audible Morse code signal, which is broadcast continuously over the NDB's frequency. NDB frequencies lie between 190 kHz and 535 kHz. The Morse code ID and the frequency of every NDB is displayed on aeronautical charts.

To use the ADF, first tune the NDB's frequency on the [ADF radio](#). The needle should point to the NDB. Use the selector knob to the lower left of the ADF to rotate the compass card to your current heading.

### VOR/LOC Indicator (NAV 2)



On the Bonanza, the HSI is the NAV 1 instrument. The NAV 2 instrument is used for VOR/DME navigation as an indicator of the airplane's position relative to a referenced radial on a VOR. It is also used to indicate the position of the airplane relative to a localizer on an ILS approach.

The VOR receiver equipment inside of an airplane consists of an audio panel, [a NAV radio](#), a [DME](#) (distance measuring equipment) radio, and the NAV instrument.

To use the NAV 2 instrument, first tune the [NAV 2 radio](#) to the correct frequency of the VOR.

The NAV instrument tells you where the airplane is in relation to the VOR. The Omni Bearing Selector (OBS), located at the bottom left of the NAV, is used to dial in the radial being referenced on the VOR. Click and hold on either side of the OBS knob to rotate the compass card clockwise and counterclockwise. To make changes in smaller increments, click only once. As the OBS is turned, the compass rose inside the NAV instrument rotates. The number at the top of the instrument shows the radial being referenced for navigation.

The vertical white bar at the center of the compass rose is the Course Deviation Indicator (CDI), also known as the “needle.” This shows where the airplane is in relation to a selected VOR radial or localizer. The needle moves as the OBS is adjusted. The “T” (to) and “F” (from) flags show the relationship of the airplane to the selected radial and the VOR.

The horizontal white bar at the center of the compass rose is the glide slope indicator. This shows the position of the aircraft relative to the glide slope on an ILS approach.

For more information on VOR navigation, please reference the chapter on navigation in the *Pro Pilot 99 Flight Companion*.

### Clock



A standard digital clock that measures hours, minutes and seconds, and displays time in a 24-hour format. Time is a critical factor in IFR planning and flying. Altitude, heading changes and distance covered are all affected by time, so the clock and the corresponding instruments become integral.

Simulation time is automatically set to your system clock on program startup.

### Manifold Pressure/Fuel Flow Gauge



The left side of this gauge indicates the pressure inside the engine manifold in “Hg. The right side indicates the fuel flow in pounds per hour.

### Tachometer



The tachometer measures the speed of the engine in revolutions per minute (rpm). The hours of operation are indicated on the number dial at the center of the tachometer. Tach time is measured by the number of engine revolutions, not by elapsed time, so an hour of engine time may not equal an hour of clock time. Only near the cruise setting will the two be equal. At slower speeds, the tach time is slower than the clock time, and vice versa at higher speeds.

### Magnetic Compass



This is a magnet with an attached face that allows you to read from 0 to 360 degrees. The magnet aligns itself with the Magnetic North Pole and the plane turns around it. Every 30 degrees the face shows the number of the heading minus the zero (i.e., 60 degrees appears as 6). The number aligned with the lubber line, the vertical white line on the face of the compass, indicates the reading.

### Fuel Tank Selector Switch

Set the switch to feed fuel from either the left (L) or right (R) fuel tanks. When the switch is centered, fuel is off. Click to either side of the switch to flip it.

### Ignition Switch

This switch starts your engine by allowing electricity to flow from the battery to the magneto(s). O = off; R = right; L = left; B = both; S = start. Click to either side of the switch to flip it left and right.

### Battery/Alternator Switch

Provides power to the electrical instruments, electrical environmental systems and the lights. Click above and below this switch to turn it on and off.

### Avionics Power Switch

Provides electricity to the avionics radios. This should always be off when powering up. Click above and below this switch to flip it on and off.

### Pitot Heat Switch

The pitot tube is part of the pitot-static system that drives the [airspeed indicator](#), [altimeter](#), and [vertical speed indicator](#). It is located outside the airplane and is therefore subject to moisture, namely snow and ice. Pitot heat should be used anytime you expect to encounter outside moisture and the outside air temperature is 0° C or colder. Click on the top and bottom of this switch to turn it on and off.

### Strobe Lights Switch

These are two, high-intensity, flashing white lights located on the wingtips. They should only be turned on just prior to takeoff roll and turned off shortly after landing. Click above and below this switch to flip it on and off.

### Beacon Light Switch

This is the single flashing red light on top of the vertical stabilizer above the rudder. Click above and below this switch to flip it on and off.

### **Navigation Lights Switch**

The navigation lights are located in the wing tips and in the vertical stabilizer fairing. Click above and below this switch to flip it on and off.

### **Taxi/Landing Light Switches**

The taxi light is located on the nose gear. The landing light is located in the lower engine fairing. Click above and below these switches to turn them on and off.

### **Cowl Flaps**

This sets the cowling flaps to any position so that the cylinder head temperature can be regulated. Click above this knob to open cowling flaps. Click below it to close cowling flaps.

### **Throttle Lever**

Push the throttle forward (up) to open and increase power; back (down) to close and decrease power.

### **Propeller Lever**

This adjusts the propeller blade pitch. The higher the pitch, the greater the “bite” on the propeller which translates to greater thrust. Click and hold above this lever to increase pitch. Click and hold below it to decrease pitch.

### **Fuel Mixture Lever**

The mixture control regulates the ratio of gasoline to air entering the fuel distribution system; push it forward (click and hold above it) to increase, or enrich, the mixture; back (click and hold below it) to decrease, or lean, the amount of fuel in relationship to the amount of air.

### **Elevator Trim Wheel**

Trims the elevator trim tabs to relieve you from having to maintain a continuous pressure on the control yoke in order to keep the elevator in its proper position. These trim tabs are mounted on the elevator and can be adjusted to counteract the aerodynamic forces that apply pressure to the elevator when the aircraft is flown in an unbalanced flight condition.

### **Landing Gear Lever**

This raises and lowers the landing gear. The green lights indicate that the gear is down. The red light indicates that the landing gear is in transition. Click above this lever to raise the gear. Click below it to lower the gear.

### **Flaps Lever**

Wing flaps are hinged, movable panels installed on the inboard trailing edges of the wings. They may be extended downward into the airflow beneath the wings to provide greater lift and more drag, so that the aircraft can descend or climb at a steeper angle or at a slower airspeed. Flaps permit a slower landing speed, thereby decreasing the required landing distance. They may also be used to shorten takeoff distance and provide a steeper climb path.

The Bonanza has three flaps settings: up, approach, and down. Click at the bottom of the flaps control to lower flaps; click above it to raise flaps.

## Distance Measuring Equipment (DME)



The DME tells a pilot how far the airplane is from the VOR at ground level. In other words, if you're flying at an altitude of 6,000 ft directly over the VOR, the distance indicator will never show less than one mile. The DME radio is tuned to the desired VOR in the same manner as the NAV radio. The DME radio then emits the Morse code for the tuned VOR. A panel shows the distance in nautical miles to the VOR. Depending on the equipment, it will also show the number of minutes to the station, and the ground speed of the airplane in knots.

On certain DME radios, there are switches for three settings: the N1 setting shows that the DME is set to the NAV 1 radio; N2 is the NAV 2 radio; and Hold keeps the DME on the last selected frequency even if the NAV frequency selectors are subsequently changed.

## Audio Panel



The audio panel allows the pilot to aurally identify the radio signals received by the navigation equipment. It also allows the pilot to listen to the broadcasts received by the communications radios.

**Blue "O" Light.** When the plane passes through the outer marker signal, the blue outer marker light flashes and the audio panel emits a steady, low-tone series of beeps at the rate of two per second. The tones are audible only if the Marker button is depressed.

**Amber "M" Light.** When the plane passes through the middle marker signal, the amber middle marker light flashes and the audio panel emits an alternating long and short, high-pitch series of beeps at the rate of 95 pairs per minute. The tones are audible only if the Marker button is depressed.

**White "I" Light.** This is reserved for inner, back course, and fan markers. The tones are audible only if the Marker button is depressed.

**COM 1 & 2 Buttons.** These activate the COM 1 and COM 2 audio panels. Either COM radio is used to tune in automatic terminal information service (ATIS), and to communicate with various control centers, flight service stations or other facilities during flight.

**NAV 1 & 2 Buttons.** These activate the NAV 1 and NAV 2 audio panels. Once you have the proper frequencies tuned into the NAV radios, you can identify the signal by listening for the Morse code identifier through this portion of the audio panel. The Morse code ID is transmitted once every 15 seconds.

**DME Button.** This allows the pilot to identify the DME signal he/she is receiving with the DME radio. Morse code IDs are broadcast once per minute. The tones are higher pitched than that of the VORs for easier identification of like identifiers.

**Marker Button.** This enables the pilot to hear audio signals from the outer, middle, and inner marker beacons.

**ADF Button.** This enables the pilot to hear the signals, and IDs, from tuned NDBs.

### COM 1 & 2 Radios



The COM 1 & 2 radios are 360-channel transceivers that receive and transmit at frequencies between 118.00 and 135.96 megahertz (MHz) with 50 kilohertz (kHz) separation. They are used to tune in automatic terminal information service (ATIS), and to communicate with various control centers during instrument flight.

The Standby Frequency button (double-headed arrow) toggles the frequency displayed on the right with the frequency displayed on the left.

To set a frequency on standby (the one displayed on the right), click and hold to the left of the decimal point to adjust megahertz. Click and hold to the right of the decimal point to adjust kilohertz (in 50 kHz increments). Note: you cannot adjust the active frequency (the one displayed on the left).

### NAV 1 & 2 Radios



The NAV 1 and 2 radios are 200-channel radios that receive frequencies between 108.00 and 117.95 megahertz (MHz) with 50 kilohertz (kHz) separation. These radios are used to tune in and identify VOR or ILS frequencies. They also control the navigation functions of the [HSI instrument](#).

The Standby Frequency button (double-headed arrow) toggles the frequency displayed on the right with the frequency displayed on the left.

To set a frequency on standby (the one displayed on the right), click and hold to the left of the decimal point to adjust megahertz. Click and hold to the right of the decimal point to adjust kilohertz (in 50 kHz increments). Note: you cannot adjust the active frequency (the one displayed on the left).

The IDT button identifies the Morse code signal of the selected VOR. The BRG button identifies the bearing that has been selected on the VOR.

### ADF Radio



The ADF radio works in conjunction with the ADF instrument to track NDBs. Once you've tuned

an NDB's frequency on the radio, the needle on the ADF instrument should point to the NDB station.

The Standby Frequency button (double-headed arrow) toggles the frequency displayed on the right with the frequency displayed on the left.

To set a frequency on standby (the one displayed on the right), click and hold on the frequency display to adjust kilohertz. Note: you cannot adjust the active frequency (the one displayed on the left).

The IDT button identifies the Morse code signal of the selected NDB.

## Transponder



The transponder is an electronic piece of equipment used to identify your aircraft, flight number, altitude, and your unique, four-digit transponder squawk code on the air traffic control radar screen. When requested by ATC to "Squawk xxxx...", make sure the requested squawk code is displayed, then press the IDT (identify) button.

To set a squawk code, click and hold on the code display. The two left digits and the two right digits can be adjusted separately. To squawk VFR, simply press the VFR button and the 1200 code will appear.

FLxxx is the flight level at which you are flying.

## Autopilot



**AP Button.** When the Autopilot button is pressed, Autopilot is engaged. It is on when the AP light is displayed.

**D/U Button.** This rocker switch electrically trims the pitch up (U) or down (D).

**ALT Button.** This allows the Autopilot to hold the current altitude. It is on when the ALT light is displayed.

**HDG Button.** This allows the Autopilot to follow a selected heading. First, set a heading on either the HSI or Heading Indicator. Press the Autopilot button (AP), then press this button and the Autopilot will turn the airplane to the selected heading. It is on when the HDG light is displayed.

**NAV Button.** This allows the Autopilot to track a VOR. First, set the frequency of the VOR and the radial bearing to be tracked on the NAV 1 radio. Press the Autopilot button (AP), then press this button. The Autopilot will turn the airplane to intercept the radial at a 45° angle. Once the radial is intercepted, Autopilot then tracks the radial. It is on when the NAV light is displayed.

**APR Button.** This allows Autopilot to track an ILS approach. Enter the ILS frequency on the NAV 1 radio, press the Autopilot button (AP), and then press this button. The Autopilot will turn the airplane to intercept the localizer. Approach is on when the APR light is displayed. Once the Autopilot has intercepted the localizer, glide slope seek is active. Then, when the glide slope is intercepted, the Autopilot will "capture" it and follow it for the approach.



**BC Button.** This allows the Autopilot to track an ILS back course approach. The back course is the 180-degree opposite of the ILS approach. The glide slope cannot be tracked on a back course approach. Enter the ILS frequency on the NAV 1 radio, press the Autopilot button (AP), and then press this button. The Autopilot will turn the airplane to intercept the localizer on the back course. Back course is on when the BC light is displayed.

### **Fuel Gauges**

These gauges show the amount of fuel remaining in the left and right tanks.

### **Exhaust Gas Temperature (EGT) Gauge**

The EGT measures the temperature of the exhaust gas exiting the engine through the exhaust manifold. It is used to indirectly determine the proper fuel mixture at higher altitudes.

### **Battery Amperage Level Gauge**

This shows whether electricity is flowing into or out of the battery. A reading toward “C” indicates that the battery is being charged. A reading toward “D” indicates that the battery is being discharged.

### **Oil Temperature Gauge**

This gauge shows the engine oil temperature.

### **Oil Pressure Gauge**

Probably the most important engine instrument on board; registers the oil pressure in pounds per square inch; should reach normal operating value within 30 seconds of engine start.

## Beechcraft Baron B58

### Airspeed Indicator

*Note: Refer to the Aircraft Specifications in the Pro Pilot 99 Flight Companion for specific information about the Baron's airspeed indicator.*



The airspeed indicator uses the ram air from the pitot tube, compares it with the static air pressure and converts it to Indicated Airspeed which is displayed on your airspeed indicator. Modern airspeed indicators show knots on the outer scale and mph on the inner scale. There are three definitions of airspeed:

**Indicated Airspeed.** This is what the needle points to on the instrument and is the dynamic pressure sensed by the pitot system.

**Calibrated Airspeed.** The pitot tube may receive dynamic pressure differently at different angles of attack. Calibrated airspeed is indicated airspeed corrected for instrument error. A table in the airplane's operating manual shows the actual error at different airspeeds. Calibrated and indicated airspeeds can be used interchangeably for instrument flight.

**True Airspeed.** This is the indicated airspeed corrected for density altitude. The airspeed indicator is calibrated for standard conditions at sea level. As altitude and temperature increase, air pressure is reduced. Because this instrument measures dynamic pressure, true airspeed drops as temperature and altitude increases. This means that the indicated airspeed drops in relation to true airspeed as altitude and temperature increase.

Generally, true airspeed is 2% higher than indicated for each 1,000 ft of altitude. True airspeed is entered on the flight plan and if it varies by more than 5% or 10 knots (whichever is greater), you should report to ATC.

### Attitude Indicator (AI)



The **attitude indicator** is also called the artificial horizon. It shows the relationship of the nose and wings to the horizontal plane. All movements of the flight controls, such as changing pitch or bank, are done by direct reference to this instrument.

The first 30° of bank are shown on the bank index in 10° increments. Then there is a tick mark for 60° and 90° banks. Pitch attitude is named by reference to the center dot in the airplane symbol, as one dot above the horizon, two dots below the horizon, etc...

Note that a bank indicated on this instrument doesn't necessarily translate as a turn. A plane in a forward slip with one wing low, for instance, will appear as a bank on the attitude indicator even though it is not turning. Likewise, a plane in slow flight with a nose-up attitude will appear nose high on the indicator, although this does not translate to a climb. In fact, a plane in descent can appear nose-high on the attitude indicator, so be careful about how you interpret this instrument.

## Altimeter



The Kollsman window within the instrument face shows the pressure plane setting which is adjusted with the knob at the lower left of the instrument. The altimeter setting at an airport is the local barometric pressure adjusted to sea level, not the actual atmospheric pressure at the station. Therefore, if the Kollsman setting is the current sea level pressure, then the altimeter reads your altitude above sea level.

Standard sea level pressure is 29.92 inches of mercury. At higher altitudes, there is less air above you, so the pressure is less. Atmospheric pressure decreases by one inch of mercury with every 1,000 feet of altitude. At Denver on a standard day, where the altitude is 5,000 feet, the barometer reads 24.92", or five inches below standard sea level pressure. Adjusted to the standard sea level pressure however, the correct altimeter (Kollsman) setting is 29.92, just as it is anywhere else.

Controllers are required to give the local altimeter setting at least once while you are in their sectors. Prior to IFR flight, however, it is important to input the correct altimeter setting and compare the altimeter reading to the local field elevation. The difference should be no more than 75 feet, although there are exceptions to this.

If pressure drops during flight, the altimeter will read higher without an appropriate adjustment to the altimeter setting. This means you would descend to maintain a certain indicated altitude. Pressure can change by several inches over a long flight, and without the appropriate adjustment

to the altimeter setting, you could find yourself at a dangerously low altitude. There is a saying about pressure drops that goes: “From high to low, look out below.”

Likewise, an increase in pressure will result in a lower indicated altitude and would cause you to climb to maintain an indicated altitude. *Enter the new altimeter setting each time a controller provides it.*

There are five definitions of altitude that pilots need to understand:

**Indicated Altitude** – the number read off the altimeter. This should agree with true altitude if the altimeter setting is accurate and there is no instrument error.

**True Altitude** – actual height above mean sea level (MSL). This is used by all aircraft below 18,000 ft and is the basis for IFR separation.

**Absolute Altitude** – the height above the terrain. The aneroid altimeter cannot measure this. Only a radar altimeter can, as well as your own direct observation.

**Pressure Altitude** – the height above the pressure plane, which is where the pressure is 29.92”. The pressure plane is also called the standard datum plane and is equal to true altitude on a standard day. To determine the pressure altitude, enter 29.92 as the altimeter setting and read the indicated altitude.

**Density Altitude** – this is pressure altitude corrected for non-standard temperature. It is a computed value that accounts for temperature and pressure variations. At the 29.92” pressure plane, 15° C is the standard temperature. On a standard day, this temperature decreases predictably with increases in altitude (it’s usually colder in the mountains, right). When the temperature varies from this standard, aircraft performance is affected.

Higher temperatures and altitudes reduce air density and decrease aircraft performance. Lift decreases so airplanes need a longer takeoff roll, have a slower rate of climb, and have slower indicated airspeeds on hot days and at higher elevations.

Density altitude is found by using a computer or a density altitude chart as shown below. It is the basis for calculating true airspeed, which you show on IFR flight plans.

## Turn Coordinator and Inclinometer



The **turn coordinator** consists of the bank indicator (the miniature airplane) and the slip-skid indicator (the floating ball). The bank indicator shows two hash marks that indicate standard left and right turns. In instrument flight, all turns are made at a rate of 3° per second. At this standard rate, a complete 360° turn is made in two minutes. Smaller turns (5-10° heading changes) require a less-than-standard rate turn.

In a coordinated turn, the airplane’s weight (earthward force) and centrifugal force (the force exerted toward the outside of the turn) are balanced so that the resultant force is directed straight through the floor of the cockpit. A centered ball confirms a coordinated turn. A ball on the inside of a turn (plane banked right, ball to the right of center) means the turn is slipping. This means the plane isn’t turning fast enough for the degree of bank. Apply rudder pressure to increase the turn rate.

A ball on the outside of a turn (plane banked right, ball to the left of center) means the turn is skidding. This means the plane is turning too fast for the degree of bank. Relieve rudder pressure to decrease the turn rate.

The attitude indicator provides information about angle of bank. The turn coordinator provides rate-of-turn information.

### Horizontal Situation Indicator (HSI)



The Horizontal Situation Indicator (HSI) is a combined heading indicator and VOR display. It comprises a course index (yellow arrow), a heading bug (red pointer), a Course Deviation Indicator (yellow bar), a glide slope deviation indicator (white line scale on sides of compass rose), and a TO-FROM indicator (small white triangle near center of compass rose). The red HDG flag is a power off indicator. The red NAV flag indicates that no navaid is tuned in for the VOR.

The knob to the lower left is the Omni-Bearing Selector (OBS). It is used to adjust the course index. The knob to the lower right is the heading selector knob. It is used to adjust the heading bug. Click (and hold) to the left or right of the OBS to rotate the course index clockwise and counterclockwise. Click (and hold) to the left or right of the heading selector knob at the lower right edge of the instrument to rotate the heading bug clockwise and counterclockwise. To make adjustments in smaller increments, click only once.

The VOR display tells you where the airplane is in relation to the VOR. Use the OBS to dial in the radial being referenced on the VOR. To use the VOR display, first tune the [NAV 1 radio](#) to the correct frequency of the VOR.

The Course Deviation Indicator (CDI), also known as the “needle,” shows where the airplane is in relation to the selected VOR radial or localizer. Note: it is not visible if aligned with the course index.

The TO/FROM indicator shows the relationship of the airplane to the selected radial and the VOR.

The glide slope deviation indicator shows whether you are above or below the glide slope on an ILS approach.

Consult the heading indicator as you approach a runway to confirm its heading. This is especially useful in circling approaches.

The heading bug on the heading indicator is set to a desired heading for the autopilot to hold. It can also be used as a reminder to stop turning when flying manually. When tracking a VOR or localizer, and the course is set on the OBS, the heading bug can be adjusted to reflect the wind correction required to stay on course.

For more information on VOR navigation, please reference the chapter on navigation in the *Pro Pilot 99 Flight Companion*.

## Vertical Speed Indicator (VSI)



The Vertical Speed Indicator (VSI) is a pressure instrument that measures the rate of climb or descent via a combination of static and ambient pressure. In level flight, the instrument reads zero. The needle will indicate immediately any change in vertical speed (the trend), but the rate displayed tends to lag behind what is actually happening except in sustained climbs, descents, and level flight. Don't rely on the VSI for pitch information especially when the pitch is constantly changing, such as in turbulent weather.

## Automatic Direction Finder (ADF)



The Automatic Direction Finder (ADF) is used to track NDBs. The Non-Directional Beacon is a form of navigation that allows you to fly between two locations using ground-based transmitters and aircraft receivers.

The NDB itself is a ground-based radio transmitter, which the aircraft uses as a navaid, and which instrument-rated pilots use to locate airports during instrument approaches. Sometimes even AM radio stations are used as NDB transmitters.

An NDB emits a continuous radio signal, which ADF picks up, assuming it is within range of the signal. Like the VOR, every NDB, assuming it is in working order, is identified by an audible Morse code signal, which is broadcast continuously over the NDB's frequency. NDB frequencies lie between 190 kHz and 535 kHz. The Morse code ID and the frequency of every NDB is displayed on aeronautical charts.

## VOR/LOC Indicator (NAV 2)



On the Baron, the HSI is the NAV 1 instrument. The NAV 2 instrument is used for VOR/DME navigation as an indicator of the airplane's position relative to a referenced radial on a VOR. It is also used to indicate the position of the airplane relative to a localizer on an ILS approach.

The VOR receiver equipment inside of an airplane consists of an audio panel, [a NAV radio](#), a [DME](#) (distance measuring equipment) radio, and the NAV instrument.

To use the NAV 2 instrument, first tune the [NAV 2 radio](#) to the correct frequency of the VOR.

The NAV instrument tells you where the airplane is in relation to the VOR. The Omni Bearing Selector (OBS), located at the bottom left of the NAV, is used to dial in the radial being referenced on the VOR. Click and hold on either side of the OBS knob to rotate the compass card clockwise and counterclockwise. To make changes in smaller increments, click only once. As the OBS is turned, the compass rose inside the NAV instrument rotates. The number at the top of the instrument shows the radial being referenced for navigation.

The vertical white bar at the center of the compass rose is the Course Deviation Indicator (CDI), also known as the "needle." This shows where the airplane is in relation to a selected VOR radial or localizer. The needle moves as the OBS is adjusted. The "T" (to) and "F" (from) flags show the relationship of the airplane to the selected radial and the VOR.

The horizontal white bar at the center of the compass rose is the glide slope indicator. This shows the position of the aircraft relative to the glide slope on an ILS approach.

For more information on VOR navigation, please reference the chapter on navigation in the *Pro Pilot 99 Flight Companion*.

## Clock



A standard digital clock that measures hours, minutes and seconds, and displays time in a 24-hour format. Time is a critical factor in IFR planning and flying. Altitude, heading changes and distance covered are all affected by time, so the clock and the corresponding instruments become integral.

Simulation time is automatically set to your system clock on program startup.

## Manifold Pressure/Fuel Flow Gauge



The left side of this gauge indicates the pressure inside the engine manifold in "Hg. The right side indicates the fuel flow in pounds per hour.

## Tachometer



The tachometer measures the speed of the engine in revolutions per minute (rpm). The hours of operation are indicated on the number dial at the center of the tachometer. Tach time is measured by the number of engine revolutions, not by elapsed time, so an hour of engine time may not equal an hour of clock time. Only near the cruise setting will the two be equal. At slower speeds, the tach time is slower than the clock time, and vice versa at higher speeds.

## Synchroscope



This indicates whether the propellers are synchronized. If it is rotating, the propellers are not synchronized. Use the [Prop Sync Switch](#) to turn on synchronization.

## Magnetic Compass



This is a magnet with an attached face that allows you to read from 0 to 360 degrees. The magnet aligns itself with the Magnetic North Pole and the plane turns around it. Every 30 degrees the face shows the number of the heading minus the zero (i.e., 60 degrees appears as 6). The number aligned with the lubber line, the vertical white line on the face of the compass, indicates the reading.

## Fuel Tank/Crossfeed Switches

Set the switches to either on (O) or cross-feed (X) if required. When the switches are centered, fuel is off. Click to either side of the switches to flip them.

## Ignition Switches

These switches start your engines by allowing electricity to flow from the battery to the starter(s). O = off; R = right; L = left; B = both; S = start. Click to either side of the switches to flip them left and right.

## Battery/Alternator Switch

Provides power to the electrical instruments, electrical environmental systems and the lights. Click above and below this switch to turn it on and off.



### **Avionics Power Switch**

Provides electricity to the avionics radios. This should always be off when powering up. Click above and below this switch to flip it on and off.

### **Pitot Heat Switch**

The pitot tube is part of the pitot-static system that drives the [airspeed indicator](#), [altimeter](#), and [vertical speed indicator](#). It is located outside the airplane and is therefore subject to moisture, namely snow and ice. Pitot heat should be used anytime you expect to encounter outside moisture and the outside air temperature is 0° C or colder. Click above and below this switch to flip it on and off.

### **Strobe Lights Switch**

These are two, high-intensity, flashing white lights located on the wingtips. They should only be turned on just prior to takeoff roll and turned off shortly after landing. Click above and below this switch to flip it on and off.

### **Beacon Light Switch**

This is the single flashing red light on top of the vertical stabilizer above the rudder. Click above and below this switch to flip it on and off.

### **Navigation Lights Switch**

The navigation lights are located in the wing tips and in the vertical stabilizer fairing. Click above and below this switch to flip it on and off.

### **Taxi/Landing Light Switches**

The taxi light is located on the nose gear. The landing lights are located in each wing tip. Click above and below these switches to turn them on and off.

### **Cowl Flaps Switch**

This sets the cowling flaps to any position so that the cylinder head temperature can be regulated. Click above this knob to open cowling flaps. Click below it to close cowling flaps.

### **Throttle Lever**

Click and hold above this lever to open throttle (increase power). Click and hold below it to close throttle (decrease power). The left lever controls the left engine; the right lever controls the right engine.

### **Propeller Lever**

This adjusts the propeller blade pitch. The higher the pitch, the greater the “bite” on the propeller which translates to greater thrust. Click and hold above these levers to increase pitch. Click and hold below them to decrease pitch.

### **Fuel Boost Switches**

These switches allow additional fuel to flow into the carburetors for added horsepower during takeoffs. Click above or below these switches to flip them on and off.

### **Propeller Synchronization Switch**

This synchronizes the rpm of both propellers on this dual-engine aircraft for smoother, quieter flight.

When the [synchroscope](#) is stationary, the propellers are synchronized. Click above or below this switch to flip it on and off.

### Fuel Mixture Lever

The mixture control regulates the ratio of gasoline to air entering the fuel distribution system; push it forward (click and hold above it) to increase, or enrich, the mixture; back (click and hold below it) to decrease, or lean, the amount of fuel in relationship to the amount of air.

### Elevator Trim Wheel

Adjusts the elevator trim tabs to relieve you from having to maintain a continuous pressure on the control yoke in order to keep the elevator in its proper position. These trim tabs are mounted on the elevator and can be adjusted to counteract the aerodynamic forces that apply pressure to the elevator when the aircraft is flown in an unbalanced flight condition. Click (and hold) at the top of this trim wheel to pitch the nose down. Click at the bottom of it to pitch the nose up.

### Rudder Trim Wheel

Adjusts the rudder trim tabs to relieve you from having to maintain a continuous pressure on the rudder pedals in order to keep the plane on a desired heading. These trim tabs are mounted on the rudder and can be adjusted to counteract the aerodynamic forces that apply pressure to the rudder when the aircraft is flown in an unbalanced flight condition. Click (and hold) to the left of this trim wheel to yaw the plane left. Click to the right of it to yaw the plane right.

### Landing Gear Lever

This raises and lowers the landing gear. The green lights indicate that the gear is down. The red light indicates that the landing gear is in transition. Click above this lever to raise the gear. Click below it to lower the gear.

### Flaps Lever

Wing flaps are hinged, movable panels installed on the inboard trailing edges of the wings. They may be extended downward into the airflow beneath the wings to provide greater lift and more drag, so that the aircraft can descend or climb at a steeper angle or at a slower airspeed. Flaps permit a slower landing speed, thereby decreasing the required landing distance. They may also be used to shorten takeoff distance and provide a steeper climb path.

The Baron has three flaps settings: up, approach, and down. Click at the bottom of the flaps control to lower flaps; click above it to raise flaps.

### Distance Measuring Equipment (DME)



*Note: The entire radio stack can be toggled with a set of engine gages by pressing the [Tab] key.*

The DME tells a pilot how far the airplane is from a VOR at ground level. In other words, if you're flying at an altitude of 6,000 ft directly over the VOR, the distance indicator will never show less than one mile. The DME radio is tuned to the desired VOR in the same manner as the NAV radio. The DME radio then emits the Morse code for the tuned VOR. The panel shows the distance in nautical miles (NM) to the VOR; the ground speed of the airplane in knots (KT); and the number

of minutes to the station (MN).

There are buttons for three settings: the N1 button sets the DME to the NAV 1 radio; N2 is the NAV 2 radio; and Hold keeps the DME on the last selected frequency even if the NAV frequency selectors are subsequently changed. Click on any button with your mouse to depress it.

## Audio Panel



*Note: The entire radio stack can be toggled with a set of engine gages by pressing the [Tab] key.*

The audio panel allows the pilot to aurally identify the radio signals received by the navigation equipment. It also allows the pilot to listen to the broadcasts received by the communications radios.

**Blue “O” Light.** When the plane passes through the outer marker signal, the blue outer marker light flashes and the audio panel emits a steady, low-tone series of beeps at the rate of two per second. The tones are audible only if the Marker button is depressed.

**Amber “M” Light.** When the plane passes through the middle marker signal, the amber middle marker light flashes and the audio panel emits an alternating long and short, high-pitch series of beeps at the rate of 95 pairs per minute. The tones are audible only if the Marker button is depressed.

**White “I” Light.** This is reserved for inner, back course, and fan markers. The tones are audible only if the Marker button is depressed.

**COM 1 & 2 Buttons.** These activate the COM 1 and COM 2 audio panels. Either COM radio is used to tune in automatic terminal information service (ATIS), and to communicate with various control centers, flight service stations or other facilities during flight.

**NAV 1 & 2 Buttons.** These activate the NAV 1 and NAV 2 audio panels. Once you have the proper frequencies tuned into the NAV radios, you can identify the signal by listening for the Morse code identifier through this portion of the audio panel. The Morse code ID is transmitted once every 15 seconds.

**DME Button.** This allows the pilot to identify the DME signal he/she is receiving with the DME radio. Morse code IDs are broadcast once per minute. The tones are higher pitched than that of the VORs for easier identification of like identifiers.

**Marker Button.** This enables the pilot to hear audio signals from the outer, middle, and inner marker beacons.

**ADF Button.** This enables the pilot to hear the signals, and IDs, from tuned NDBs.

## COM1 & 2 Radios



*Note: The entire radio stack can be toggled with a set of engine gages by pressing the [Tab] key.*

The COM 1 & 2 radios are 360-channel transceivers that receive and transmit at frequencies between 118.00 and 135.96 megahertz (MHz) with 50 kilohertz (kHz) separation. They are used to tune in automatic terminal information service (ATIS), and to communicate with various control centers during instrument flight.

The Standby Frequency button (double-headed arrow) toggles the frequency displayed on the right with the frequency displayed on the left.

To set a frequency on standby (the one displayed on the right), click and hold to the left of the decimal point to adjust megahertz. Click and hold to the right of the decimal point to adjust kilohertz (in 50 kHz increments). Note: you cannot adjust the active frequency (the one displayed on the left).

## NAV1 & 2 Radios



*Note: The entire radio stack can be toggled with a set of engine gages by pressing the [Tab] key.*

The NAV 1 and 2 radios are 200-channel radios that receive frequencies between 108.00 and 117.95 megahertz (MHz) with 50 kilohertz (kHz) separation. These radios are used to tune in and identify VOR or ILS frequencies. They also control the navigation functions of the [HSI instrument](#).

The Standby Frequency button (double-headed arrow) toggles the frequency displayed on the right with the frequency displayed on the left.

To set a frequency on standby (the one displayed on the right), click and hold to the left of the decimal point to adjust megahertz. Click and hold to the right of the decimal point to adjust kilohertz (in 50 kHz increments). Note: you cannot adjust the active frequency (the one displayed on the left).

The IDT button identifies the Morse code signal of the selected VOR. The BRG button identifies the bearing that has been selected on the VOR.

## ADF Radio



*Note: The entire radio stack can be toggled with a set of engine gages by pressing the [Tab] key.*

The ADF radio works in conjunction with the ADF instrument to track NDBs. Once you've tuned

an NDB's frequency on the radio, the needle on the ADF instrument should point to the NDB station.

The Standby Frequency button (double-headed arrow) toggles the frequency displayed on the right with the frequency displayed on the left.

To set a frequency on standby (the one displayed on the right), click and hold on the frequency display to adjust kilohertz. Note: you cannot adjust the active frequency (the one displayed on the left).

The IDT button identifies the Morse code signal of the selected NDB.

## Transponder



*Note: The entire radio stack can be toggled with a set of engine gages by pressing the [Tab] key.*

The transponder is an electronic piece of equipment used to identify your aircraft, flight number, altitude, and your unique, four-digit transponder squawk code on the air traffic control radar screen. When requested by ATC to “Squawk xxxx...”, make sure the requested squawk code is displayed, then press the IDT (identify) button.

To set a squawk code, click and hold on the code display. The two left digits and the two right digits can be adjusted separately. To squawk VFR, simply press the VFR button and the 1200 code will appear.

FLxxx is the flight level at which you are flying.

## Autopilot



*Note: The entire radio stack can be toggled with a set of engine gages by pressing the [Tab] key.*

**AP Button.** When the Autopilot button is pressed, Autopilot is engaged. It is on when the AP light is displayed.

**D/U Button.** This rocker switch electrically trims the pitch up (U) or down (D).

**ALT Button.** This allows the Autopilot to hold the current altitude. It is on when the ALT light is displayed.

**HDG Button.** This allows the Autopilot to follow a selected heading. First, set a heading on either the HSI or Heading Indicator. Press the Autopilot button (AP), then press this button and the Autopilot will turn the airplane to the selected heading. It is on when the HDG light is displayed.

**NAV Button.** This allows the Autopilot to track a VOR. First, set the frequency of the VOR and the radial bearing to be tracked on the NAV 1 radio. Press the Autopilot button (AP), then press this button. The Autopilot will turn the airplane to intercept the radial at a 45° angle. Once the radial is intercepted, Autopilot then tracks the radial. It is on when the NAV light is displayed.

**APR Button.** This allows Autopilot to track an ILS approach. Enter the ILS frequency on the NAV 1 radio, press the Autopilot button (AP), and then press this button. The Autopilot will turn the airplane to intercept the localizer. Approach is on when the APR light is displayed. Once the Autopilot has intercepted the localizer, glide slope seek is active. Then, when the glide slope is intercepted, the Autopilot will "capture" it and follow it for the approach.

**BC Button.** This allows the Autopilot to track an ILS back course approach. The back course is the 180-degree opposite of the ILS approach. The glide slope cannot be tracked on a back course approach. Enter the ILS frequency on the NAV 1 radio, press the Autopilot button (AP), then press this button. The Autopilot will turn the airplane to intercept the localizer on the back course. Back course is on when the BC light is displayed.

*Note: To see the engine gauges on the Baron that are listed below, press the Tab key. This toggles the radio stack and the engine gauges.*

### **Fuel Gauges**

These gauges show the amount of fuel remaining in the left and right tanks.

### **Exhaust Gas Temperature (EGT) Gauge**

The EGT measures the temperature of the exhaust gas exiting the engine through the exhaust manifold. It is used to indirectly determine the proper fuel mixture at higher altitudes.

### **Battery Amperage Level Gauge**

This shows whether electricity is flowing into or out of the battery. A reading toward "C" indicates that the battery is being charged. A reading toward "D" indicates that the battery is being discharged.

### **Oil Temperature Gauges**

These gauges show the engine oil temperature in the left and right engines.

### **Oil Pressure Gauge**

Probably the most important engine instrument on board; registers the oil pressure in pounds per square inch; should reach normal operating value within 30 seconds of engine start.

## Beechcraft Super King Air B200

### Airspeed Indicator

*Note: Refer to the Aircraft Specifications in the Pro Pilot 99 Flight Companion for specific information about the King Air's airspeed indicator.*



The airspeed indicator uses the ram air from the pitot tube, compares it with the static air pressure and converts it to Indicated Airspeed which is displayed on your airspeed indicator. Modern airspeed indicators show knots on the outer scale and mph on the inner scale. There are three definitions of airspeed:

**Indicated Airspeed.** This is what the needle points to on the instrument and is the dynamic pressure sensed by the pitot system.

**Calibrated Airspeed.** The pitot tube may receive dynamic pressure differently at different angles of attack. Calibrated airspeed is indicated airspeed corrected for instrument error. A table in the airplane's operating manual shows the actual error at different airspeeds. Calibrated and indicated airspeeds can be used interchangeably for instrument flight.

**True Airspeed.** This is the indicated airspeed corrected for density altitude. The airspeed indicator is calibrated for standard conditions at sea level. As altitude and temperature increase, air pressure is reduced. Because this instrument measures dynamic pressure, true airspeed drops as temperature and altitude increases. This means that the indicated airspeed drops in relation to true airspeed as altitude and temperature increase.

Generally, true airspeed is 2% higher than indicated for each 1,000 ft of altitude. True airspeed is entered on the flight plan and if it varies by more than 5% or 10 knots (whichever is greater), you should report to ATC.

### Electronic Attitude Direction Indicator (EADI)



The electronic attitude indicator on the Super King Air serves four functions: artificial horizon; angle of attack (AOA) indicator; Course Deviation Indicator (CDI) during VOR tracking and ILS approaches; and glide slope indicator during ILS approaches.

### Artificial Horizon

The artificial horizon shows the relationship of the nose and wings to the horizontal plane. All movements of the flight controls, such as changing pitch or bank, are done by direct reference to this instrument.

The first 30° of bank are shown on the bank index in 10° increments. Then there is a tick mark for 60° and 90° banks. Pitch attitude is named by reference to the center dot in the airplane symbol, as one dot above the horizon, two dots below the horizon, etc...

Note that a bank indicated on this instrument doesn't necessarily translate as a turn. A plane in a forward slip with one wing low, for instance, will appear as a bank on the attitude indicator even though it is not turning. Likewise, a plane in slow flight with a nose-up attitude will appear nose high on the indicator, although this does not translate to a climb. In fact, a plane in descent can appear nose-high on the attitude indicator, so be careful about how you interpret this instrument.

### Angle of Attack Indicator

The AOA Indicator is the scale along the left side of the artificial horizon. Angle of attack is the angle between the relative wind and the chord line of the airfoil. This is not to be confused with the angle of incidence, which is the *fixed* angle between the wing chord line and the reference line of the fuselage.

Angle of attack is controlled by the elevators. By easing back on the yoke, the elevators are raised. The force of the relative wind pushes the tail down (and the nose up), so the wings are rotated to a new angle of attack. At this new angle, the apparent curvature of the airfoil is greater, and for a short period, lift is increased. However, a higher angle of attack also produces greater drag so the plane slows and equilibrium is once again attained (even though the plane could continue to climb).

### Course Deviation Indicator

The CDI is the scale that appears below the artificial horizon. The CDI is used in VOR and localizer tracking and it shows the relative position of the aircraft to the VOR radial or localizer that is being referenced. This indicator duplicates the CDI on the [Electronic Horizontal Situation Indicator](#) (EHSI).

### Glide Slope Indicator

The Glide Slope Indicator appears to the right of the artificial horizon. It shows the position of the aircraft relative to the glide slope on an ILS approach. This indicator duplicates the Glide Slope Indicator on the [Electronic Horizontal Situation Indicator](#) (EHSI).



## Altimeter



The Kollsman window within the instrument face shows the pressure plane setting which is adjusted with the knob at the lower left of the instrument. The altimeter setting at an airport is the local barometric pressure adjusted to sea level, not the actual atmospheric pressure at the station. Therefore, if the Kollsman setting is the current sea level pressure, then the altimeter reads your altitude above sea level.

Standard sea level pressure is 29.92 inches of mercury. At higher altitudes, there is less air above you, so the pressure is less. Atmospheric pressure decreases by one inch of mercury with every 1,000 feet of altitude. At Denver on a standard day, where the altitude is 5,000 feet, the barometer reads 24.92", or five inches below standard sea level pressure. Adjusted to the standard sea level pressure however, the correct altimeter (Kollsman) setting is 29.92, just as it is anywhere else.

Controllers are required to give the local altimeter setting at least once while you are in their sectors. Prior to IFR flight, however, it is important to input the correct altimeter setting and compare the altimeter reading to the local field elevation. The difference should be no more than 75 feet, although there are exceptions to this.

If pressure drops during flight, the altimeter will read higher without an appropriate adjustment to the altimeter setting. This means you would descend to maintain a certain indicated altitude. Pressure can change by several inches over a long flight, and without the appropriate adjustment to the altimeter setting, you could find yourself at a dangerously low altitude. There is a saying about pressure drops that goes: "From high to low, look out below."

Likewise, an increase in pressure will result in a lower indicated altitude and would cause you to climb to maintain an indicated altitude. *Enter the new altimeter setting each time a controller provides it.*

There are five definitions of altitude that pilots need to understand:

**Indicated Altitude** – the number read off the altimeter. This should agree with true altitude if the altimeter setting is accurate and there is no instrument error.

**True Altitude** – actual height above mean sea level (MSL). This is used by all aircraft below 18,000 ft and is the basis for IFR separation.

**Absolute Altitude** – the height above the terrain. The aneroid altimeter cannot measure this. Only a radar altimeter can, as well as your own direct observation.

**Pressure Altitude** – the height above the pressure plane, which is where the pressure is 29.92". The pressure plane is also called the standard datum plane and is equal to true altitude on a standard day. To determine the pressure altitude, enter 29.92 as the altimeter setting and read the indicated altitude.

**Density Altitude** – this is pressure altitude corrected for non-standard temperature. It is a computed value that accounts for temperature and pressure variations. At the 29.92" pressure plane, 15° C is the standard temperature. On a standard day, this temperature decreases predictably with increases in altitude (it's usually colder in the mountains, right). When the temperature varies from this standard, aircraft performance is affected.

Higher temperatures and altitudes reduce air density and decrease aircraft performance. Lift

decreases so airplanes need a longer takeoff roll, have a slower rate of climb, and have slower indicated airspeeds on hot days and at higher elevations.

Density altitude is found by using a computer or a density altitude chart as shown below. It is the basis for calculating true airspeed, which you show on IFR flight plans.

## Inclinometer



In a coordinated turn, the airplane's weight (earthward force) and centrifugal force (the force exerted toward the outside of the turn) are balanced so that the resultant force is directed straight through the floor of the cockpit. A centered ball on the slip-skid indicator confirms a coordinated turn. A ball on the inside of a turn (plane banked right, ball to the right of center) means the turn is slipping. This means the plane isn't turning fast enough for the degree of bank. Apply rudder pressure to increase the turn rate.

A ball on the outside of a turn (plane banked right, ball to the left of center) means the turn is skidding. This means the plane is turning too fast for the degree of bank. Relieve rudder pressure to decrease the turn rate.

## Electronic Horizontal Situation Indicator (EHSI)



The Electronic Horizontal Situation Indicator (EHSI) is a combined heading indicator and VOR display. It comprises a course index (orange arrow), a heading bug (blue pointer), a Course Deviation Indicator (orange bar sometimes aligned with course index), a glide slope deviation indicator (scale to the right of compass rose), and a TO-FROM indicator (small white triangle near center of compass rose).



Two knobs appear on the EHSI Controls panel: the knob with the orange arrow is the Omni-Bearing Selector (OBS). It is used to adjust the course index. The knob to the right with the blue pointer is the heading selector knob. It is used to adjust the heading bug. Click (and hold) to the left or right of either knob to rotate the course index or heading bug clockwise and counterclockwise. To make adjustments in smaller increments, click only once.

The VOR display tells you where the airplane is in relation to the VOR. Use the OBS to dial in the radial being referenced on the VOR. To use the VOR display, first tune the [NAV 1 radio](#) to the correct frequency of the VOR.

The Course Deviation Indicator (CDI), also known as the "needle," shows where the airplane is in

relation to the selected radial. Note: it is not visible if aligned with the course index.

The TO/FROM indicator shows the relationship of the airplane to the selected radial and the VOR.

The glide slope deviation indicator shows whether you are above or below the glide slope on an ILS approach.

Consult the heading indicator as you approach a runway to confirm its heading. This is especially useful in circling approaches.

The heading bug can also be set to a desired heading for the Autopilot to hold. It can also be used as a reminder to stop turning when flying manually. When tracking a VOR or localizer, and the course is set on the OBS, the heading bug can be adjusted to reflect the wind correction required to stay on course.

For more information on VOR navigation, please reference the chapter on navigation in the *Pro Pilot 99 Flight Companion*.

### Vertical Speed Indicator (VSI)



The Vertical Speed Indicator (VSI) is a pressure instrument that measures the rate of climb or descent via a combination of static and ambient pressure. In level flight, the instrument reads zero. The needle will indicate immediately any change in vertical speed (the trend), but the rate displayed tends to lag behind what is actually happening except in sustained climbs, descents, and level flight. Don't rely on the VSI for pitch information especially when the pitch is constantly changing, such as in turbulent weather.

### Radio Magnetic Indicator (RMI)



This instrument is a combined Radio Magnetic Indicator and Automatic Direction Finder. The RMI is used to track VORs. The ADF is used to track NDBs.

The RMI is used in VOR navigation primarily as an indicator of the airplane's position relative to a referenced radial on a VOR. The VOR receiver equipment inside of an airplane consists of an audio panel, [a NAV radio](#), and the RMI.

To use the RMI, first tune the [NAV 2 radio](#) to the correct frequency of the VOR.

The Non-Directional Beacon is a form of navigation that allows you to fly between two locations using ground-based transmitters and aircraft receivers.

The NDB itself is a ground-based radio transmitter, which the aircraft uses as a navaid, and which instrument-rated pilots use to locate airports during instrument approaches. Sometimes even AM radio stations are used as NDB transmitters.

An NDB emits a continuous radio signal that the ADF picks up, assuming it is within range of the signal. Like the VOR, every NDB, assuming it is in working order, is identified by an audible Morse code signal that is broadcast continuously over the NDB's frequency. NDB frequencies lie between 190 kHz and 535 kHz. The Morse code ID and the frequency of every NDB is displayed on aeronautical charts.

To use the ADF, first tune the NDB's frequency on the [ADF radio](#). The needle should point to the NDB.

Either the green or the orange needle can be toggled to track VORs or NDBs. Use the toggle switches to make these determinations. An appropriately colored pointer will indicate if the NAV (RMI) or ADF is active. The needle points to the VOR radial if the NAV is active, or it points to the NDB if the ADF is active.

For more information on VOR and NDB navigation, please reference the chapter on navigation in the *Pro Pilot 99 Flight Companion*.

## Clock



A standard digital clock that measures hours, minutes and seconds, and displays time in a 24-hour format. Time is a critical factor in IFR planning and flying. Altitude, heading changes and distance covered are all affected by time, so the clock and the corresponding instruments become integral.

Simulation time can be adjusted in the [Date & Time](#) dialog under the Options menu.

## Magnetic Compass



This is a magnet with an attached face that allows you to read from 0 to 360 degrees. The magnet aligns itself with the Magnetic North Pole and the plane turns around it. Every 30 degrees the face shows the number of the heading minus the zero (i.e., 60 degrees appears as 6). The number aligned with the lubber line, the vertical white line on the face of the compass, indicates the reading.

## Fuel Tank/Crossfeed Switch

Set the switch to On or cross-feed (X) if required. When the switch is down, fuel is off. Click either

above or below the switch to flip it.

### **Engine Start Switches**

These switches start your engines by allowing electricity to flow from the battery to the starter(s). Click above or below the switches to flip them on or off.

### **Battery/Alternator Switch**

Provides power to the electrical instruments, electrical environmental systems and the lights. Click above and below this switch to turn it on and off.

### **Avionics Power Switch**

Provides electricity to the avionics radios. This should always be off when powering up. Click above and below this switch to flip it on and off.

### **Pitot Heat Switch**

The pitot tube is part of the pitot-static system that drives the [airspeed indicator](#), [altimeter](#), and [vertical speed indicator](#). It is located outside the airplane and is therefore subject to moisture, namely snow and ice. Pitot heat should be used anytime you expect to encounter outside moisture and the outside air temperature is 0 C or colder. Click above and below this switch to flip it on and off.

### **Strobe Lights Switch**

These are two, high-intensity, flashing white lights located on the wingtips. They should only be turned on just prior to takeoff roll and turned off shortly after landing. Click above and below this switch to flip it on and off.

### **Beacon Light Switch**

This is the single flashing red light on top of the vertical stabilizer above the rudder. Click above and below this switch to flip it on and off.

### **Navigation Lights Switch**

The navigation lights are located in the wing tips and in the vertical stabilizer fairing. Click above and below this switch to flip it on and off.

### **Taxi/Landing Light Switches**

The taxi light is located on the nose gear. The landing lights are located on the leading edge of each wing, just inboard of the engine nacelles. Click above and below these switches to turn them on and off.

### **Propeller Synchronization Switch**

This synchronizes the rpm of both propellers on this dual-engine aircraft for smoother, quieter flight. When the [synchroscope](#) is stationary, the propellers are synchronized. Click above or below this switch to flip it on and off.

### **Standby Pump Switches**

These switches operate the standby fuel boost pumps. The standby pumps are for use in the event of a primary fuel boost pump failure, with hot aviation fuel above 20,000 feet, and during crossfeed

operations. Click above or below these switches to flip them on and off.

### **Power Lever**

Click and hold above this lever to open throttle (increase power). Click and hold below it to close throttle (decrease power). The left lever controls the left engine; the right lever controls the right engine.

### **Propeller Lever**

This adjusts the propeller blade pitch. The higher the pitch, the greater the “bite” on the propeller which translates to greater thrust. Click and hold above these levers to increase pitch. Click and hold below them to decrease pitch.

### **Condition Lever**

This lever actuates a valve in the fuel control unit, which controls the flow of fuel at the fuel control outlet and regulates the idle range from Low to High Idle.

### **Elevator Trim Wheel**

Adjusts the elevator trim tabs to relieve you from having to maintain a continuous pressure on the control yoke in order to keep the elevator in its proper position. These trim tabs are mounted on the elevator and can be adjusted to counteract the aerodynamic forces that apply pressure to the elevator when the aircraft is flown in an unbalanced flight condition. Click (and hold) at the top of this trim wheel to pitch the nose down. Click at the bottom of it to pitch the nose up.

### **Rudder Trim Wheel**

Adjusts the rudder trim tabs to relieve you from having to maintain a continuous pressure on the rudder pedals in order to keep the plane on a desired heading. These trim tabs are mounted on the rudder and can be adjusted to counteract the aerodynamic forces that apply pressure to the rudder when the aircraft is flown in an unbalanced flight condition. Click (and hold) to the left of this trim wheel to yaw the plane left. Click to the right of it to yaw the plane right.

### **Aileron Trim Wheel**

Adjusts the aileron trim tabs to relieve you from having to maintain a continuous pressure on the control yoke in order to keep the plane on a desired heading. These trim tabs are mounted on the ailerons. Click (and hold) to the left of this trim wheel to bank the plane left. Click to the right of it to bank the plane right.

### **Landing Gear Lever**

This raises and lowers the landing gear. The green lights indicate that the gear is down. The red light indicates that the landing gear is in transition. Click above this lever to raise the gear. Click below it to lower the gear.

### **Flaps Lever**

Wing flaps are hinged, movable panels installed on the inboard trailing edges of the wings. They may be extended downward into the airflow beneath the wings to provide greater lift and more drag, so that the aircraft can descend or climb at a steeper angle or at a slower airspeed. Flaps permit a slower landing speed, thereby decreasing the required landing distance. They may also be used to shorten takeoff distance and provide a steeper climb path.

The Super King has three flaps settings: up, approach, and down. Click at the bottom of the flaps

control to lower flaps; click above it to raise flaps.

### Torque Indicators



These gauges indicate the engine shaft output torque in foot-pounds.

### Internal Turbine Temperature (ITT)/Fuel Flow Gauge



The left side of this gauge indicates the interstage turbine temperature: the temperature between the compressor and power turbines. The right side indicates the fuel flow in pounds per hour.

### Tachometer and Propeller Tachometer



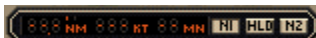
This is a dual gauge. The left side of the instrument shows the speed of the engine in revolutions per minute (rpm). The right side of the instrument shows the propeller speed in revolutions per minute.

### Synchroscope



This indicates whether the propellers are synchronized. If it is rotating, the propellers are not synchronized. Use the [Prop Sync Switch](#) to turn on synchronization.

### Distance Measuring Equipment (DME)



The DME tells a pilot how far the airplane is from a VOR at ground level. In other words, if you're flying at an altitude of 6,000 ft directly over the VOR, the distance indicator will never show less than one mile. The DME radio is tuned to the desired VOR in the same manner as the NAV radio. The DME radio then emits the Morse code for the tuned VOR. The panel shows the distance in nautical miles (NM) to the VOR; the ground speed of the airplane in knots (KT); and the number of minutes to the station (MN).

There are buttons for three settings: the N1 button sets the DME to the NAV 1 radio; N2 is the NAV 2 radio; and Hold keeps the DME on the last selected frequency even if the NAV frequency selectors are subsequently changed. Click on any button with your mouse to depress it.

## Audio Panel



The audio panel allows the pilot to aurally identify the radio signals received by the navigation equipment. It also allows the pilot to listen to the broadcasts received by the communications radios.

**Blue “O” Light.** When the plane passes through the outer marker signal, the blue outer marker light flashes and the audio panel emits a steady, low-tone series of beeps at the rate of two per second. The tones are audible only if the Marker button is depressed.

**Amber “M” Light.** When the plane passes through the middle marker signal, the amber middle marker light flashes and the audio panel emits an alternating long and short, high-pitch series of beeps at the rate of 95 pairs per minute. The tones are audible only if the Marker button is depressed.

**White “I” Light.** This is reserved for inner, back course, and fan markers. The tones are audible only if the Marker button is depressed.

**COM 1 & 2 Buttons.** These activate the COM 1 and COM 2 audio panels. Either COM radio is used to tune in automatic terminal information service (ATIS), and to communicate with various control centers, flight service stations or other facilities during flight.

**NAV 1 & 2 Buttons.** These activate the NAV 1 and NAV 2 audio panels. Once you have the proper frequencies tuned into the NAV radios, you can identify the signal by listening for the Morse code identifier through this portion of the audio panel. The Morse code ID is transmitted once every 15 seconds.

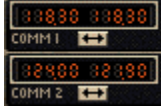
**DME Button.** This allows the pilot to identify the DME signal he/she is receiving with the DME radio. Morse code IDs are broadcast once per minute. The tones are higher pitched than that of the VORs for easier identification of like identifiers.

**Marker Button.** This enables the pilot to hear audio signals from the outer, middle, and inner marker beacons.

**ADF Button.** This enables the pilot to hear the signals, and IDs, from tuned NDBs.

## COM 1 & 2 Radios





The COM 1 & 2 radios are 360-channel transceivers that receive and transmit at frequencies between 118.00 and 135.96 megahertz (MHz) with 50 kilohertz (kHz) separation. They are used to tune in automatic terminal information service (ATIS), and to communicate with various control centers during instrument flight.

The Standby Frequency button (double-headed arrow) toggles the frequency displayed on the right with the frequency displayed on the left.

To set a frequency on standby (the one displayed on the right), click and hold to the left of the decimal point to adjust megahertz. Click and hold to the right of the decimal point to adjust kilohertz (in 50 kHz increments). Note: you cannot adjust the active frequency (the one displayed on the left).

### NAV 1 & 2 Radios



The NAV 1 and 2 radios are 200-channel radios that receive frequencies between 108.00 and 117.95 megahertz (MHz) with 50 kilohertz (kHz) separation. These radios are used to tune in and identify VOR or ILS frequencies. They also control the navigation functions of the [EHSI instrument](#).

The Standby Frequency button (double-headed arrow) toggles the frequency displayed on the right with the frequency displayed on the left.

To set a frequency on standby (the one displayed on the right), click and hold to the left of the decimal point to adjust megahertz. Click and hold to the right of the decimal point to adjust kilohertz (in 50 kHz increments). Note: you cannot adjust the active frequency (the one displayed on the left).

The IDT button identifies the Morse code signal of the selected VOR. The BRG button identifies the bearing that has been selected on the VOR.

### ADF Radio



The ADF radio works in conjunction with the ADF instrument to track NDBs. Once you've tuned an NDB's frequency on the radio, the needle on the ADF instrument should point to the NDB station.

The Standby Frequency button (double-headed arrow) toggles the frequency displayed on the right with the frequency displayed on the left.

To set a frequency on standby (the one displayed on the right), click and hold on the frequency display to adjust kilohertz. Note: you cannot adjust the active frequency (the one displayed on the

left).

The IDT button identifies the Morse code signal of the selected NDB.

## Transponder



The transponder is an electronic piece of equipment used to identify your aircraft, flight number, altitude, and your unique, four-digit transponder squawk code on the air traffic control radar screen. When requested by ATC to “Squawk xxxx...”, make sure the requested squawk code is displayed, then press the IDT (identify) button.

To set a squawk code, click and hold on the code display. The two left digits and the two right digits can be adjusted separately. To squawk VFR, simply press the VFR button and the 1200 code will appear.

FLxxx is the flight level at which you are flying.

## Autopilot



**AP Button.** When the Autopilot button is pressed, Autopilot is engaged. It is on when the AP light is displayed.

**D/U Button.** This rocker switch electrically trims the pitch up (U) or down (D).

**ALT Button.** This allows the Autopilot to hold the current altitude. It is on when the ALT light is displayed.

**HDG Button.** This allows the Autopilot to follow a selected heading. First, set a heading on either the EHSI. Press the Autopilot button (AP), then press this button and the Autopilot will turn the airplane to the selected heading. It is on when the HDG light is displayed.

**NAV Button.** This allows the Autopilot to track a VOR. First, set the frequency of the VOR and the radial bearing to be tracked on the NAV 1 radio. Press the Autopilot button (AP), then press this button. The Autopilot will turn the airplane to intercept the radial at a 45° angle. Once the radial is intercepted, Autopilot then tracks the radial. It is on when the NAV light is displayed.

**APR Button.** This allows Autopilot to track an ILS approach. Enter the ILS frequency on the NAV 1 radio, press the Autopilot button (AP), and then press this button. The Autopilot will turn the airplane to intercept the localizer. Approach is on when the APR light is displayed. Once the Autopilot has intercepted the localizer, glide slope seek is active. Then, when the glide slope is intercepted, the Autopilot will "capture" it and follow it for the approach.

**BC Button.** This allows the Autopilot to track an ILS back course approach. The back course is the 180-degree opposite of the ILS approach. The glide slope cannot be tracked on a back course approach. Enter the ILS frequency on the NAV 1 radio, press the Autopilot button (AP), and then press this button. The Autopilot will turn the airplane to intercept the localizer on the back course. Back course is on when the BC light is displayed.

### **Fuel Gauges**

These gauges show the amount of fuel remaining in the left and right tanks.

### **Exhaust Gas Temperature (EGT) Gauge**

The turbine utilizes the flow of exhaust gases to drive the compressor. The compressor, in turn, supplies pressurized air to the engines for high altitude operation. This gauge shows the temperature of the exhaust gas.

### **Battery Amperage Level Gauge**

This shows whether electricity is flowing into or out of the battery. A reading toward “C” indicates that the battery is being charged. A reading toward “D” indicates that the battery is being discharged.

### **Oil Temperature/Pressure Gauge**



This is a dual gauge that shows both engine oil temperature and pressure. The left side of the gauge shows the engine oil temperature. The right side of the gauge shows the engine oil pressure.

## Cessna CitationJet Model 525

### Airspeed Indicator

*Note: Refer to the Aircraft Specifications in the Pro Pilot 99 Flight Companion for specific information about the CitationJet's airspeed indicator.*



The airspeed indicator uses the ram air from the pitot tube, compares it with the static air pressure and converts it to Indicated Airspeed which is displayed on your airspeed indicator. Modern airspeed indicators show knots on the outer scale and mph on the inner scale. There are three definitions of airspeed:

**Indicated Airspeed.** This is what the needle points to on the instrument and is the dynamic pressure sensed by the pitot system.

**Calibrated Airspeed.** The pitot tube may receive dynamic pressure differently at different angles of attack. Calibrated airspeed is indicated airspeed corrected for instrument error. A table in the airplane's operating manual shows the actual error at different airspeeds. Calibrated and indicated airspeeds can be used interchangeably for instrument flight.

**True Airspeed.** This is the indicated airspeed corrected for density altitude. The airspeed indicator is calibrated for standard conditions at sea level. As altitude and temperature increase, air pressure is reduced. Because this instrument measures dynamic pressure, true airspeed drops as temperature and altitude increases. This means that the indicated airspeed drops in relation to true airspeed as altitude and temperature increase.

Generally, true airspeed is 2% higher than indicated for each 1,000 ft of altitude. True airspeed is entered on the flight plan and if it varies by more than 5% or 10 knots (whichever is greater), you should report to ATC.

### Electronic Attitude Direction Indicator (EADI)



The electronic attitude indicator on the CitationJet serves four functions: artificial horizon; angle of attack (AOA) indicator; Course Deviation Indicator (CDI) during VOR tracking and ILS approaches; and glide slope indicator during ILS approaches.

### Artificial Horizon

The artificial horizon shows the relationship of the nose and wings to the horizontal plane. All movements of the flight controls, such as changing pitch or bank, are done by direct reference to this instrument.

The first 30° of bank are shown on the bank index in 10° increments. Then there is a tick mark for 60° and 90° banks. Pitch attitude is named by reference to the center dot in the airplane symbol, as one dot above the horizon, two dots below the horizon, etc...

Note that a bank indicated on this instrument doesn't necessarily translate as a turn. A plane in a forward slip with one wing low, for instance, will appear as a bank on the attitude indicator even though it is not turning. Likewise, a plane in slow flight with a nose-up attitude will appear nose high on the indicator, although this does not translate to a climb. In fact, a plane in descent can appear nose-high on the attitude indicator, so be careful about how you interpret this instrument.

### Angle of Attack Indicator

The AOA Indicator is the scale along the left side of the artificial horizon. Angle of attack is the angle between the relative wind and the chord line of the airfoil. This is not to be confused with the angle of incidence, which is the *fixed* angle between the wing chord line and the reference line of the fuselage.

Angle of attack is controlled by the elevators. By easing back on the yoke, the elevators are raised. The force of the relative wind pushes the tail down (and the nose up), so the wings are rotated to a new angle of attack. At this new angle, the apparent curvature of the airfoil is greater, and for a short period, lift is increased. However, a higher angle of attack also produces greater drag so the plane slows and equilibrium is once again attained (even though the plane could continue to climb).

### Course Deviation Indicator

The CDI is the scale that appears below the artificial horizon. The CDI is used in VOR and localizer tracking and it shows the relative position of the aircraft to the VOR radial or localizer that is being referenced. This indicator duplicates the CDI on the [Electronic Horizontal Situation Indicator](#) (EHSI).

### Glide Slope Indicator

The Glide Slope Indicator appears to the right of the artificial horizon. It shows the position of the aircraft relative to the glide slope on an ILS approach. This indicator duplicates the Glide Slope Indicator on the [Electronic Horizontal Situation Indicator](#) (EHSI).

## Altimeter



The Kollsman window within the instrument face shows the pressure plane setting which is adjusted with the knob at the lower left of the instrument. The altimeter setting at an airport is the local barometric pressure adjusted to sea level, not the actual atmospheric pressure at the station. Therefore, if the Kollsman setting is the current sea level pressure, then the altimeter reads your altitude above sea level.

Standard sea level pressure is 29.92 inches of mercury. At higher altitudes, there is less air above you, so the pressure is less. Atmospheric pressure decreases by one inch of mercury with every 1,000 feet of altitude. At Denver on a standard day, where the altitude is 5,000 feet, the barometer reads 24.92", or five inches below standard sea level pressure. Adjusted to the standard sea level pressure however, the correct altimeter (Kollsman) setting is 29.92, just as it is anywhere else.

Controllers are required to give the local altimeter setting at least once while you are in their sectors. Prior to IFR flight, however, it is important to input the correct altimeter setting and compare the altimeter reading to the local field elevation. The difference should be no more than 75 feet, although there are exceptions to this.

If pressure drops during flight, the altimeter will read higher without an appropriate adjustment to the altimeter setting. This means you would descend to maintain a certain indicated altitude. Pressure can change by several inches over a long flight, and without the appropriate adjustment to the altimeter setting, you could find yourself at a dangerously low altitude. There is a saying about pressure drops that goes: "From high to low, look out below."

Likewise, an increase in pressure will result in a lower indicated altitude and would cause you to climb to maintain an indicated altitude. *Enter the new altimeter setting each time a controller provides it.*

There are five definitions of altitude that pilots need to understand:

**Indicated Altitude** – the number read off the altimeter. This should agree with true altitude if the altimeter setting is accurate and there is no instrument error.

**True Altitude** – actual height above mean sea level (MSL). This is used by all aircraft below 18,000 ft and is the basis for IFR separation.

**Absolute Altitude** – the height above the terrain. The aneroid altimeter cannot measure this. Only a radar altimeter can, as well as your own direct observation.

**Pressure Altitude** – the height above the pressure plane, which is where the pressure is 29.92". The pressure plane is also called the standard datum plane and is equal to true altitude on a standard day. To determine the pressure altitude, enter 29.92 as the altimeter setting and read the indicated altitude.

**Density Altitude** – this is pressure altitude corrected for non-standard temperature. It is a computed value that accounts for temperature and pressure variations. At the 29.92" pressure plane, 15° C is the standard temperature. On a standard day, this temperature decreases predictably with increases in altitude (it's usually colder in the mountains, right). When the temperature varies from this standard, aircraft performance is affected.

Higher temperatures and altitudes reduce air density and decrease aircraft performance. Lift

decreases so airplanes need a longer takeoff roll, have a slower rate of climb, and have slower indicated airspeeds on hot days and at higher elevations.

Density altitude is found by using a computer or a density altitude chart as shown below. It is the basis for calculating true airspeed, which you show on IFR flight plans.

## Inclinometer



In a coordinated turn, the airplane's weight (earthward force) and centrifugal force (the force exerted toward the outside of the turn) are balanced so that the resultant force is directed straight through the floor of the cockpit. A centered ball on the slip-skid indicator confirms a coordinated turn. A ball on the inside of a turn (plane banked right, ball to the right of center) means the turn is slipping. This means the plane isn't turning fast enough for the degree of bank. Apply rudder pressure to increase the turn rate.

A ball on the outside of a turn (plane banked right, ball to the left of center) means the turn is skidding. This means the plane is turning too fast for the degree of bank. Relieve rudder pressure to decrease the turn rate.

## Electronic Horizontal Situation Indicator (EHSI)



The Electronic Horizontal Situation Indicator (EHSI) is a combined heading indicator and VOR display. It comprises a course index (orange arrow), a heading bug (blue pointer), a Course Deviation Indicator (orange bar sometimes aligned with course index), a glide slope deviation indicator (scale to the right of compass rose), and a TO-FROM indicator (small white triangle near center of compass rose).



Two knobs appear on the EHSI Controls panel: the knob with the orange arrow is the Omni-Bearing Selector (OBS). It is used to adjust the course index. The knob with the blue pointer is the heading selector knob. It is used to adjust the heading bug. Click (and hold) to the left or right of either knob to rotate the course index or heading bug clockwise and counterclockwise. To make adjustments in smaller increments, click only once.

The VOR display tells you where the airplane is in relation to the VOR. Use the OBS to dial in the radial being referenced on the VOR. To use the VOR display, first tune the [NAV 1 radio](#) to the correct frequency of the VOR.

The Course Deviation Indicator (CDI), also known as the “needle,” shows where the airplane is in relation to the selected radial. Note: it is not visible if aligned with the course index.

The TO/FROM indicator shows the relationship of the airplane to the selected radial and the VOR.

The glide slope deviation indicator shows whether you are above or below the glide slope on an ILS approach.

Consult the heading indicator as you approach a runway to confirm its heading. This is especially useful in circling approaches.

The heading bug can also be set to a desired heading for the Autopilot to hold. It can also be used as a reminder to stop turning when flying manually. When tracking a VOR or localizer, and the course is set on the OBS, the heading bug can be adjusted to reflect the wind correction required to stay on course.

For more information on VOR navigation, please reference the chapter on navigation in the *Pro Pilot 99 Flight Companion*.

### Vertical Speed Indicator (VSI)



The Vertical Speed Indicator (VSI) is a pressure instrument that measures the rate of climb or descent via a combination of static and ambient pressure. In level flight, the instrument reads zero. The needle will indicate immediately any change in vertical speed (the trend), but the rate displayed tends to lag behind what is actually happening except in sustained climbs, descents, and level flight. Don't rely on the VSI for pitch information especially when the pitch is constantly changing, such as in turbulent weather.

### Radio Magnetic Indicator (RMI)



This instrument is a combined Radio Magnetic Indicator and Automatic Direction Finder. The RMI is used to track VORs. The ADF is used to track NDBs.

The RMI is used in VOR navigation primarily as an indicator of the airplane's position relative to a referenced radial on a VOR. The VOR receiver equipment inside of an airplane consists of an



audio panel, [a NAV radio](#), and the RMI.

To use the RMI, first tune the [NAV 2 radio](#) to the correct frequency of the VOR.

The Non-Directional Beacon is a form of navigation that allows you to fly between two locations using ground-based transmitters and aircraft receivers.

The NDB itself is a ground-based radio transmitter, which the aircraft uses as a navaid, and which instrument-rated pilots use to locate airports during instrument approaches. Sometimes even AM radio stations are used as NDB transmitters.

An NDB emits a continuous radio signal that the ADF picks up, assuming it is within range of the signal. Like the VOR, every NDB, assuming it is in working order, is identified by an audible Morse code signal that is broadcast continuously over the NDB's frequency. NDB frequencies lie between 190 kHz and 535 kHz. The Morse code ID and the frequency of every NDB is displayed on aeronautical charts.

To use the ADF, first tune the NDB's frequency on the [ADF radio](#). The needle should point to the NDB.

Either the green or the orange needle can be toggled to track VORs or NDBs. Use the toggle switches to make these determinations. An appropriately colored pointer will indicate if the NAV (RMI) or ADF is active. The needle points to the VOR radial if the NAV is active, or it points to the NDB if the ADF is active.

For more information on VOR and NDB navigation, please reference the chapter on navigation in the *Pro Pilot 99* Flight Companion.

## Clock



A standard digital clock that measures hours, minutes and seconds, and displays time in a 24-hour format. Time is a critical factor in IFR planning and flying. Altitude, heading changes and distance covered are all affected by time, so the clock and the corresponding instruments become integral.

Simulation time can be adjusted in the [Date & Time](#) dialog under the Options menu.

## Magnetic Compass



This is a magnet with an attached face that allows you to read from 0 to 360 degrees. The magnet aligns itself with the Magnetic North Pole and the plane turns around it. Every 30 degrees the face shows the number of the heading minus the zero (i.e., 60 degrees appears as 6). The number aligned with the lubber line, the vertical white line on the face of the compass, indicates the reading.

**Fuel/Crossfeed Switch**

Set the switch to On or cross-feed (X) if required. When the switch is down, fuel is off. Click either above or below the switch to flip it.

**Engine Start Switches**

These switches start your engines by allowing electricity to flow from the battery to the starter(s). Click on the switches to press them in (on) or out (off).

**Battery/Alternator Switch**

Provides power to the electrical instruments, electrical environmental systems and the lights. Click above and below this switch to turn it on and off.

**Avionics Power Switch**

Provides electricity to the avionics radios. This should always be off when powering up. Click above and below this switch to flip it on and off.

**Pitot Heat Switch**

The pitot tube is part of the pitot-static system that drives the [airspeed indicator](#), [altimeter](#), and [vertical speed indicator](#). It is located outside the airplane and is therefore subject to moisture, namely snow and ice. Pitot heat should be used anytime you expect to encounter outside moisture and the outside air temperature is 0° C or colder. Click above and below this switch to flip it on and off.

**Strobe Lights Switch**

These are two, high-intensity, flashing white lights located on the wingtips. They should only be turned on just prior to takeoff roll and turned off shortly after landing. Click above and below this switch to flip it on and off.

**Beacon Light Switch**

This is the single flashing red light on top of the vertical stabilizer above the rudder. Click above and below this switch to flip it on and off.

**Navigation Lights Switch**

The navigation lights are located in the wing tips and in the vertical stabilizer fairing. Click above and below this switch to flip it on and off.

**Taxi/Landing Light Switches**

The taxi and landing lights are both located on the underside of the fuselage. Click above and below these switches to turn them on and off.

**Thrust Lever**

Click and hold above this lever to open throttle (increase power). Click and hold below it to close throttle (decrease power). The left lever controls the left engine; the right lever controls the right engine.

**Speedbrake Switch**

Speedbrakes are installed on the upper and lower surfaces of each wing to permit rapid rates of

descent, rapid deceleration, and to spoil lift during landing roll. Click above and below this switch to flip speedbrake on and off.

### **Fuel Boost Switch**

These switches operate the fuel boost pumps. The electric boost pump provides fuel pressure for engine starting, crossfeeding, and acts as a backup for the primary ejector pump. Click above or below these switches to flip them on and off.

### **Marker Lights**

**Blue “O” Light.** When the plane passes through the outer marker signal, the blue outer marker light flashes and the audio panel emits a steady, low-tone series of beeps at the rate of two per second. The tones are audible only if the Marker button is depressed.

**Amber “M” Light.** When the plane passes through the middle marker signal, the amber middle marker light flashes and the audio panel emits an alternating long and short, high-pitch series of beeps at the rate of 95 pairs per minute. The tones are audible only if the Marker button is depressed.

**White “I” Light.** This is reserved for inner, back course, and fan markers. The tones are audible only if the Marker button is depressed.

### **Elevator Trim Wheel**

Adjusts the elevator trim tabs to relieve you from having to maintain a continuous pressure on the control yoke in order to keep the elevator in its proper position. These trim tabs are mounted on the elevator and can be adjusted to counteract the aerodynamic forces that apply pressure to the elevator when the aircraft is flown in an unbalanced flight condition. Click (and hold) at the top of this trim wheel to pitch the nose down. Click at the bottom of it to pitch the nose up.

### **Rudder Trim Wheel**

Adjusts the rudder trim tabs to relieve you from having to maintain a continuous pressure on the rudder pedals in order to keep the plane on a desired heading. These trim tabs are mounted on the rudder and can be adjusted to counteract the aerodynamic forces that apply pressure to the rudder when the aircraft is flown in an unbalanced flight condition. Click (and hold) to the left of this trim wheel to yaw the plane left. Click to the right of it to yaw the plane right.

### **Aileron Trim Wheel**

Adjusts the aileron trim tabs to relieve you from having to maintain a continuous pressure on the control yoke in order to keep the plane on a desired heading. These trim tabs are mounted on the ailerons. Click (and hold) to the left of this trim wheel to bank the plane left. Click to the right of it to bank the plane right.

### **Landing Gear Lever**

This raises and lowers the landing gear. The green lights indicate that the gear is down. The red light indicates that the landing gear is in transition. Click above this lever to raise the gear. Click below it to lower the gear.

### **Flaps Lever**

Wing flaps are hinged, movable panels installed on the inboard trailing edges of the wings. They may be extended downward into the airflow beneath the wings to provide greater lift and more drag, so that the aircraft can descend or climb at a steeper angle or at a slower airspeed. Flaps

permit a slower landing speed, thereby decreasing the required landing distance. They may also be used to shorten takeoff distance and provide a steeper climb path.

The CitationJet has four flaps settings: up, takeoff/approach, down, and ground. The ground position provides additional drag during the landing roll. Click at the bottom of the flaps control to lower flaps; click above it to raise flaps.

### Battery Amperage Level Gauge

This shows whether electricity is flowing into or out of the battery. A reading toward “C” indicates that the battery is being charged. A reading toward “D” indicates that the battery is being discharged.

### Angle of Attack Indicator



Angle of attack is the angle between the relative wind and the chord line of the airfoil. This is not to be confused with the angle of incidence, which is the *fixed* angle between the wing chord line and the reference line of the fuselage.

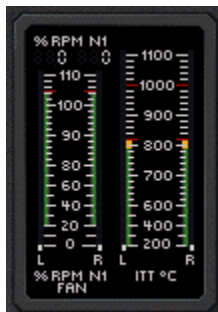
Angle of attack is controlled by the elevators. By easing back on the yoke, the elevators are raised. The force of the relative wind pushes the tail down (and the nose up), so the wings are rotated to a new angle of attack. At this new angle, the apparent curvature of the airfoil is greater, and for a short period, lift is increased. However, a higher angle of attack also produces greater drag so the plane slows and equilibrium is once again attained (even though the plane could continue to climb).

### Air Temperature



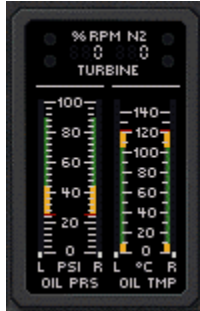
This is a digital display of the Outside Air Temperature (OAT). It can be toggled to display either degrees Celsius or degrees Fahrenheit.

### Fan Tachometer (RPM N1) / Internal Turbine Temperature (ITT)



This is a dual meter. The left side shows the low-pressure turbine speed in revolutions per minute. A digital readout of the same information is displayed above the meter. The fan is attached to the low-pressure turbine. The right side indicates the interstage turbine temperature: the engine operating temperature between the high and low-pressure turbine sections.

### Turbine Tachometer (RPM N2) / Oil Pressure / Oil Temperature Indicator



This is a combination meter. The top shows the high-pressure turbine speed in revolutions per minute. The bottom left displays Oil pressure in psi for both the left and right engines. The bottom right displays Oil temperature in degrees Celsius for both the left and right engines.

### Fuel Flow Indicator



This digital display shows the fuel flow in pounds per hour for both the left and right engines.

### Fuel Level Indicator

This meter shows the fuel quantity in pounds for both the left and right tanks.

### Distance Measuring Equipment (DME)



The DME tells a pilot how far the airplane is from a VOR at ground level. In other words, if you're flying at an altitude of 6,000 ft directly over the VOR, the distance indicator will never show less than one mile. The DME radio is tuned to the desired VOR in the same manner as the NAV radio. The DME radio then emits the Morse code for the tuned VOR. The panel shows the distance in nautical miles (NM) to the VOR; the ground speed of the airplane in knots (KT); and the number of minutes to the station (MN).

There are buttons for three settings: the N1 button sets the DME to the NAV 1 radio; N2 is the NAV 2 radio; and Hold keeps the DME on the last selected frequency even if the NAV frequency selectors are subsequently changed. Click on any button with your mouse to depress it.

## Audio Panel

**COM 1 & 2 Switches** These activate the COM 1 and COM 2 audio panels. Either COM radio is used to tune in automatic terminal information service (ATIS), and to communicate with various control centers, flight service stations or other facilities during flight.

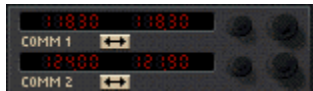
**NAV 1 & 2 Switches** These activate the NAV 1 and NAV 2 audio panels. Once you have the proper frequencies tuned into the NAV radios, you can identify the signal by listening for the Morse code identifier through this portion of the audio panel. The Morse code ID is transmitted once every 15 seconds.

**DME Switch** This allows the pilot to identify the DME signal he/she is receiving with the DME radio. Morse code IDs are broadcast once per minute. The tones are higher pitched than that of the VORs for easier identification of like identifiers.

**Marker Switch** This enables the pilot to hear audio signals from the outer, middle, and inner marker beacons.

**ADF Switch** This enables the pilot to hear the signals, and IDs, from tuned NDBs.

## COM 1 & 2 Radios



The COM 1 & 2 radios are 360-channel transceivers that receive and transmit at frequencies between 118.00 and 135.96 megahertz (MHz) with 50 kilohertz (kHz) separation. They are used to tune in automatic terminal information service (ATIS), and to communicate with various control centers during instrument flight.

The Standby Frequency button (double-headed arrow) toggles the frequency displayed on the right with the frequency displayed on the left.

To set a frequency on standby (the one displayed on the right), click and hold to the left of the decimal point to adjust megahertz. Click and hold to the right of the decimal point to adjust kilohertz (in 50 kHz increments). Note: you cannot adjust the active frequency (the one displayed on the left).

## NAV 1 & 2 Radios



The NAV 1 and 2 radios are 200-channel radios that receive frequencies between 108.00 and 117.95 megahertz (MHz) with 50 kilohertz (kHz) separation. These radios are used to tune in and

identify VOR or ILS frequencies. They also control the navigation functions of the [EHSI instrument](#).

The Standby Frequency button (double-headed arrow) toggles the frequency displayed on the right with the frequency displayed on the left.

To set a frequency on standby (the one displayed on the right), click and hold to the left of the decimal point to adjust megahertz. Click and hold to the right of the decimal point to adjust kilohertz (in 50 kHz increments). Note: you cannot adjust the active frequency (the one displayed on the left).

The ID button identifies the Morse code signal of the selected VOR. The BRG button identifies the bearing that has been selected on the VOR.

## ADF Radio



The ADF radio works in conjunction with the ADF instrument to track NDBs. Once you've tuned an NDB's frequency on the radio, the needle on the ADF instrument should point to the NDB station.

The Standby Frequency button (double-headed arrow) toggles the frequency displayed on the right with the frequency displayed on the left.

To set a frequency on standby (the one displayed on the right), click and hold on the frequency display to adjust kilohertz. Note: you cannot adjust the active frequency (the one displayed on the left).

The ID button identifies the Morse code signal of the selected NDB.

## Transponder



The transponder is an electronic piece of equipment used to identify your aircraft, flight number, altitude, and your unique, four-digit transponder squawk code on the air traffic control radar screen. When requested by ATC to "Squawk xxxx...", make sure the requested squawk code is displayed, then press the IDT (identify) button.

To set a squawk code, click and hold on the code display. The two left digits and the two right digits can be adjusted separately. To squawk VFR, simply press the VFR button and the 1200 code will appear.

FLxxx is the flight level at which you are flying.

## Autopilot Panel



**AP Button.** When the Autopilot button is pressed, Autopilot is engaged. It is on when the AP light is displayed.

**D/U Button.** This rocker switch electrically trims the pitch up (U) or down (D).

**ALT Button.** This allows the Autopilot to hold the current altitude. It is on when the ALT light is displayed.

**HDG Button.** This allows the Autopilot to follow a selected heading. First, set a heading on either the EHSI. Press the Autopilot button (AP), then press this button and the Autopilot will turn the airplane to the selected heading. It is on when the HDG light is displayed.

**NAV Button.** This allows the Autopilot to track a VOR. First, set the frequency of the VOR and the radial bearing to be tracked on the NAV 1 radio. Press the Autopilot button (AP), then press this button. The Autopilot will turn the airplane to intercept the radial at a 45° angle. Once the radial is intercepted, Autopilot then tracks the radial. It is on when the NAV light is displayed.

**APR Button.** This allows Autopilot to track an ILS approach. Enter the ILS frequency on the NAV 1 radio, press the Autopilot button (AP), and then press this button. The Autopilot will turn the airplane to intercept the localizer. Approach is on when the APR light is displayed. Once the Autopilot has intercepted the localizer, glide slope seek is active. Then, when the glide slope is intercepted, the Autopilot will "capture" it and follow it for the approach.

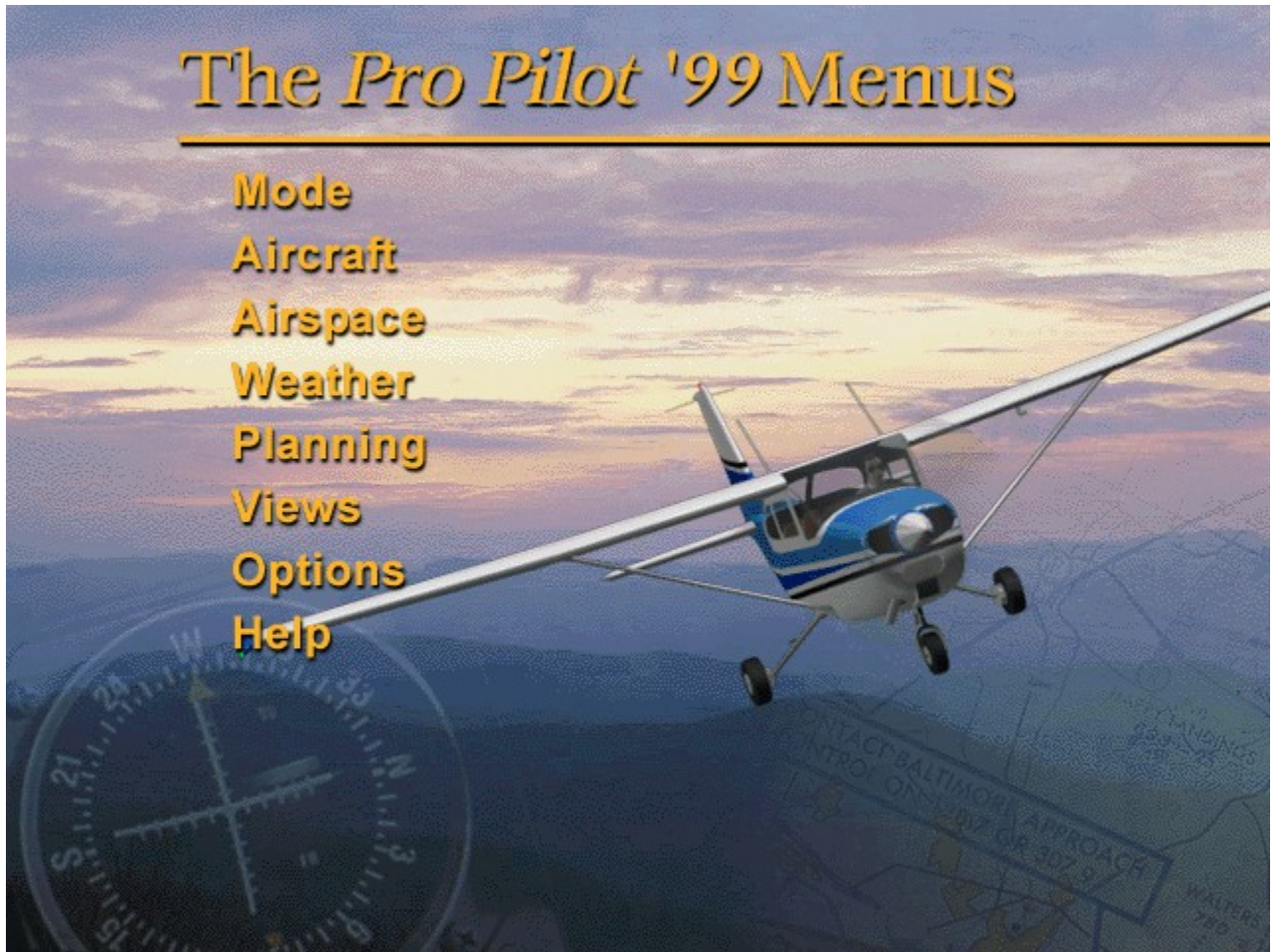
**BC Button.** This allows the Autopilot to track an ILS back course approach. The back course is the 180-degree opposite of the ILS approach. The glide slope cannot be tracked on a back course approach. Enter the ILS frequency on the NAV 1 radio, press the Autopilot button (AP), and then press this button. The Autopilot will turn the airplane to intercept the localizer on the back course. Back course is on when the BC light is displayed.



# The *Pro Pilot '99* Menu

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**Mode**  
**Aircraft**  
**Airspace**  
**Weather**  
**Planning**  
**Views**  
**Options**  
**Help**



# The Mode Menu

## Pilot-in-command

Pilot-in-Command means that you have control over all of the radios, and you are responsible for maintaining the proper altitudes and headings assigned to you by air traffic control. You can select Pilot-in-Command from the Mode menu to cancel Dual Flight mode, or you can press **F2**.

## Dual Flight

This dialog box allows you to place a copilot in the plane and set options for the copilot.

### Copilot Onboard

Check this to receive copilot assistance in the categories that you select below.

### Calls off Airspeed on Takeoff

The copilot will announce airspeed in 10 knot increments as you roll down the runway.

### Handles Radio Communication

The copilot handles all calls to ATC.

### Handles NAV Radios

The copilot sets the NAV radios to the appropriate frequencies.

### Gives Flight Advice

The copilot suggests what control adjustments to make during flight.

### Monitors Altitude

The copilot calls out the altitude you are approaching.

### Monitors Heading

The copilot calls out the heading required to reach a navigation fix.

## Ground Lesson

When you select this option, you will be prompted to insert CD #2. This is the disc that contains all of the AVIs (movies) for the *Pro Pilot 99* Ground School. Insert the disc and click **OK**. Select the desired lesson from the list that appears and click **PLAY** to view it. Click **STOP** to end the lesson early.

To return to Pilot-in-command mode, click **Done**. You will be prompted to insert CD #1 again. Insert the disc and click **OK**.

## Restart

Selecting this option reloads your last loaded flight. If you are currently following a flight plan, you will be prompted to save it. You can also press **ALT-F2**.

## Exit

Selecting this option exits *Pro Pilot 99*. You can also press **ALT-F4**.

# The Aircraft Menu

## Select Aircraft

Choose one of six different aircraft by clicking on the picture of it. A brief history of the aircraft appears in the textbox. Click **OK** to return to the cockpit of the selected airplane.

## Show Operating Handbook

Choosing this menu option (or pressing **F3**) will display the Pilot's Operating Handbook for the particular aircraft you are flying. The Pilot's Operating Handbook can offer a step-by-step explanation of flight procedures, or provide details about a specific flight. You can customize the Pilot's Operating Handbook to display any information you wish. Click [here](#) for details.

## Fuel & Cabin Loading

This dialog shows cabin and fuel loading weights for the selected aircraft. Note the maximum legal takeoff weight allowed. If you need to increase the cabin loading, you must lower your fuel loading to stay within your maximum weight. Click in the textboxes provided to enter the left tank, right tank, and cabin loading amounts. The current total or gross weight automatically adjusts to reflect your input.

### Top Tanks

Click **Top Tanks** to maximize your fuel loading. The cabin loading will automatically adjust downward, if necessary, to allow for the additional fuel weight.

## Crash Detection

Toggles crash detection on and off. If this is toggled off, the airplane cannot crash, allowing the inexperienced pilot to continue flying without going through all of the startup procedures.

## Auto Coordination

Normally, an aircraft's rudders move independently of the ailerons. To perform a coordinated turn, you must move the rudders in coordination with the yoke. When Auto Coordination is checked, *Pro Pilot 99* will automatically coordinate the rudders with the yoke. Note that for certain procedures, such as landing in a crosswind, you may want to turn auto coordination off. Press **I** to toggle this option on and off.

## Synch Multiengine Controls

This option essentially makes dual controls (throttle, prop pitch, starters, etc...) act as one control. Press **ALT-L** to toggle this option on and off.

## System Reliability

Set the percentage reliability of the Vacuum, Pitot-Static, and Electrical System instruments, as well as the Power Plant. The percentage settings will only affect the instruments/engines checked (otherwise, they remain at 100%). Instruments will freeze at their current state upon failure.

## Show Magnetic Compass

When this menu option is checked, a magnetic compass will appear at the top of your instrument panel. Press **ALT-M** to toggle this option on and off.

## Digital Instrument Readout

When you have change the view to exclude the instrument panel (Cowl View or Scenery View), selecting this option places a digital readout of your heading, altitude, indicated airspeed (IAS), and rate of climb (in feet per minute) at the top of the screen. Press **ALT-R** to toggle this option on and

off.

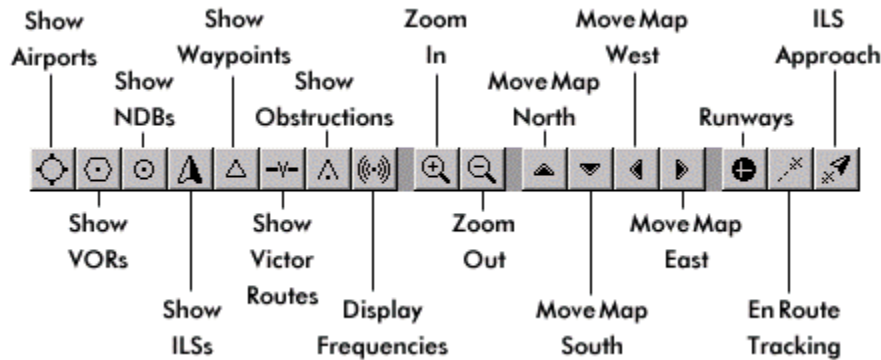
**Partial Panel**

From this dialog box, you can cover any of the six primary flight instruments: the attitude indicator, heading indicator, airspeed indicator, altimeter, vertical speed indicator, or turn coordinator. This is most useful as a training tool, and is only available on the Cessna Skyhawk 172P and 172R.

# The Airspace Menu

## Position Aircraft

The Position Aircraft dialog box allows you to place your aircraft anywhere within the *Pro Pilot 99* airspace. When you select this option from the Airspace menu, you will see a map representing your current position. The buttons at the bottom of the map control which map features are visible, and you can move your aircraft within the map view by clicking and dragging the icon with the mouse. You can also access this option by pressing **F4**.



To position the aircraft on another runway, make sure the Show Airports button is toggled on and that you have zoomed in far enough for the airport abbreviations to appear. Then click the Runways button and click on an airport to display its runways. A list of available runways will appear. Click on the specific runway you want, then click **Go To** and the scenery for that runway will load.

### Show Buttons

These buttons display the locations of specific navigational aids.

### Display Frequencies

This button shows the frequencies of the navigational aids and airports that are displayed.

### Zoom In/Out

Click on either of these, then click on the area of the map that you want to enlarge or reduce.

### Move Buttons

The move buttons shift the map by increments of roughly 15' (latitude or longitude) per click.

### Runways

Click this button, then click on an airport (you must be zoomed in far enough) to go to a specific runway. A list of available runways will appear. Click on the specific runway you want, then click **Go To** and the scenery for that runway will load.

### En Route Tracking

Click this button, then click on a VOR symbol (you must be zoomed in far enough) to track around that specific VOR. A dialog box appears that allows you to set different parameters.

The parameters are:

#### Track VOR: Outbound Course/ Inbound Course

Track away from or toward the selected VOR using any radial. Click the radio button next to the course direction, then position the cursor inside the "Using Radial" textbox and type the magnetic heading of the desired radial.

#### Tune NAV 1/NAV 2 to Station

Tune either NAV 1 or NAV 2 to the VOR frequency by checking the appropriate box.

### **Adjust OBS of Selected NAV**

This adjusts the Omni-Bearing Selector knob to dial in the selected radial on the NAV instrument.

### **Distance To/From VOR, Altitude, Heading**

You can position the aircraft any distance to or from the VOR, at any altitude, on any heading. Once all of these are selected, click **Go To** and the aircraft will be positioned accordingly.

### **ILS Approach**

To use this button, the Show ILSs button must first be pressed. Then click this button and click on the ILS approach symbol on the map (you must be zoomed in far enough to see these).

#### **Inbound Course**

This heading is preset to align your aircraft with the runway heading. You can change it by clicking inside the textbox and entering a new heading.

#### **Distance From Touchdown Point/From Outer Marker**

Enter the distance in nautical miles, from the touchdown point or outer marker where you want to begin the approach.

#### **Altitude, Heading**

Enter the altitude and heading from where you want to begin the approach. The heading is preset to align with the runway heading.

Once all of these are selected, click **Go To** and the aircraft will be positioned accordingly.

The coordinates of your cursor location on the map are displayed in the upper right corner. The Range indicates the map's scale depending on the magnification selected.

### **Airports**

The Airports dialog box allows you to select an airport and runway placement, and place your aircraft on the runway or on a landing approach. In order to select an airport, click and drag across all of the text in the box to select it. Next, choose an airport from the list below by typing in the airport's name or three-letter identification code. The Information section will list important details about the airport such as its field elevation and any relevant radio frequencies, such as ATIS.

#### **Runways**

Click on the desired runway from the list that appears.

#### **Aircraft Placement**

Position the aircraft on the runway, or in the air on the final leg, base leg, downwind leg, or 20 miles inbound. Click **Finish** when ready and the scenery for the selected runway/placement will load.

#### **Enable ATC Radar Vectoring**

ATC radar vectoring will allow you to hear spoken commands from ATC directing you to various approach and departure points. If this box is not checked, you will not receive these instructions from ATC. Note that this option is only available at airports that have an air traffic control tower.

To search for an airport, first highlight all existing text in the upper textbox of the Airports window, then type in the first few letters of the airport you are seeking. The list of airports in the lower window scrolls alphabetically as you type. Click on the airport you want (it should appear in the upper textbox), then click **Next**.

### **ATC Communication**

These options allow you to send commands or requests to ATC as you approach. Even if you haven't filed a flight plan, you can initiate a dialog with ATC at any airport that has a tower by listening to the ATIS broadcast on the appropriate frequency. You can access this option by pressing **Shift-F4**.

### **Landing Preference**

You have two options for landing: Touch-and-Go, which clears you for takeoff again right after

touching down, and Full Stop, which assumes you will be turning on any taxiway directly after landing.

#### **Traffic Pattern**

At most airports, you would follow a left-hand traffic pattern, but if you would like to change the direction, you can check right-hand in the Traffic Pattern field.

#### **Auto-Tune Com 1 Radio**

Check this box to enable the COM 1 radio swap button to automatically tune in the next ATC frequency in the takeoff or landing sequence.

#### **Auto Taxi to Runway**

With this option enabled, you will be put at the end of the runway automatically (after receiving clearance from ATC), without having to taxi. This option will only work when a flight plan is active.

#### **Request**

This box provides you with a way to communicate with ATC. You can hit **Shift-F4** to bring the box up, then click on the button to send the request. You can also use a keyboard shortcut for most of these commands.

#### **Say Again**

Click this button to repeat the last ATC transmission.

You can also access this option by pressing **Ctrl-R**.

#### **Cancel ATC**

Click this to terminate ATC communications for a takeoff or landing sequence.

You can also access this option by pressing **Ctrl-Q**.

#### **New Altitude**

Click this button to request a new altitude from ATC.

You can also access this option by pressing **Ctrl-A**.

#### **Different Runway**

Click this button to request a different landing runway from ATC.

You can also access this option by pressing **Ctrl-J**.

#### **Go-Around**

Click this button to report a go-around or missed approach.

You can also access this option by pressing **Ctrl-G**.

#### **Listen to Pilot's Readback**

Pilots are required to read instructions back to ATC to acknowledge them. If you check this box, you will hear the co-pilot (or your own voice, if you have installed it) read back each instruction to ATC.

#### **Closed Traffic**

When this option is checked, you will not be given vectors out of the traffic pattern after takeoff. This is most useful when practicing touch-and-go landings.

### **Air Traffic**

#### **Listen to Other Pilots**

Check this box to listen to other pilots in the surrounding airspace.

#### **See Other Aircraft**

Check this box to see other aircraft in the surrounding airspace.

### **Navigational Aids**

The selection of all navigational aids — VORs, NDBs, ILSs, and Waypoints — requires a similar process. First, you must highlight *all* of the text in the textbox labeled “Enter the first few letters of the VOR you are looking for.” Then type in the first few letters of the navaid’s abbreviation or full name. Click on the navaid name after it appears in the list.

#### **VORs**

Select a VOR by scrolling to it in the list and clicking once on it. You can also highlight all of the text in the upper text box, and when you type the first few letters of the VOR name that

you are seeking, the list will automatically scroll alphabetically.

#### **Setup VOR Tracking**

This allows you to track a VOR and position the aircraft relative to the selected VOR.

##### **Track VOR: Outbound Course/ Inbound Course**

Track away from or toward the selected VOR using any radial. Click the radio button next to the course direction, then position the cursor inside the “Using Radial” textbox and type the magnetic heading of the desired radial.

##### **Adjust OBS of Selected NAV**

This adjusts the Omni-Bearing Selector knob to dial in the selected radial on the NAV instrument. You can also use the keyboard to adjust the OBS by pressing **Shift-1** to select VOR/LOC 1 or **Shift-2** to select VOR/LOC 2. Then, press **Shift-0** and **Shift-9** to rotate the dial.

##### **Distance To/From VOR, Altitude, Heading**

You can position the aircraft any distance to or from the VOR, at any altitude, on any heading. Once all of these are selected, click **Go To** and the aircraft will be positioned accordingly.

### **NDBs**

Select an NDB by scrolling to it in the list and clicking once on it. You can also highlight all of the text in the upper text box, and when you type the first few letters of the NDB name that you are seeking, the list will automatically scroll alphabetically.

#### **Setup NDB Tracking**

This allows you to track an NDB and position the aircraft relative to the selected NDB.

##### **Track Bearing: To the NDB/ From the NDB**

Track away from or toward the selected NDB using any bearing. Click the radio button next to the course direction, then position the cursor inside the “Using Course” textbox and type the course of the desired bearing.

##### **Auto-Align Compass Card of ADF**

This adjusts the ADF compass card so the selected bearing is straight up.

##### **Distance to/from NDB, Altitude, Heading**

You can position the aircraft any distance to or from the NDB, at any altitude, on any heading. Once all of these are selected, click **Go To** and the aircraft will be positioned accordingly.

### **ILSs**

Select an ILS approach by scrolling to it in the list and clicking once on it. You can also highlight all of the text in the upper text box, and when you type the first few letters of the ILS name that you are seeking, the list will automatically scroll alphabetically. The location coordinates and frequency are displayed for the selected ILS (Instrument Landing System). Tune either NAV 1 or NAV 2 to the ILS frequency by checking the appropriate box.

#### **Setup ILS Approach**

This allows you to position the aircraft relative to the selected ILS.

##### **Inbound Course**

This heading is preset to align your aircraft with the runway heading. You can change it by clicking inside the textbox and entering a new heading.

##### **Distance From Touchdown Point/From Outer Marker**

Enter the distance in nautical miles, from the touchdown point or outer marker where you want to begin the approach.

##### **Altitude, Heading**

Enter the altitude and heading from where you want to begin the approach. The heading is preset to align with the runway heading.

Once all of these are selected, click **Go To** and the aircraft will be positioned accordingly.

### **Waypoints**



Select a Waypoint by scrolling to it in the list and clicking once on it. You can also highlight all of the text in the upper text box, and when you type the first few letters of the Waypoint name that you are seeking, the list will automatically scroll alphabetically. The location coordinates are displayed for the Waypoint.

**Setup Waypoint**

This allows you to position the aircraft relative to the selected Waypoint.

**Distance, Altitude, Heading**

You can position the aircraft any distance to or from the Waypoint, at any altitude, on any heading. Once all of these are selected, click **Go To** and the aircraft will be positioned accordingly.

# The Weather Menu

## Surface Conditions

Wield even more power than the National Weather Service... set the atmosphere and surface wind conditions for any flight! This dialog allows you to enter the atmospheric pressure and temperature, wind speed, wind direction, and wind character. Check the “Calibrate Altimeter” box to automatically adjust the pressure setting in the Kollsman window of your altimeter.

## Winds Aloft

You can set several wind characteristics for up to nine different altitude layers in this dialog. The default settings — direction, speed, character, turbulence, and turbulence duration — are displayed in the upper window. As you enter new information, these settings will change.

To make changes to a layer, highlight the layer in the main window first. Then click in the appropriate text box or on the appropriate “radio button” and enter the new information. Click the **Set Layer** button near the bottom of the screen and the new characteristics will replace the default settings in the upper window.

## Clouds

In the Clouds dialog box, you can set a range of conditions for VFR flight, or you can select IMC and set the overall visibility.

### VFR

#### High-Level, Mid-Level, Low-Level

You can set the cloud coverage for three different levels, each starting at an altitude you specify and rising to an altitude you specify.

#### Base

The level begins at this altitude.

#### Height

The level rises to this altitude.

#### Coverage

This is the amount of cloud coverage divided into eighths.

### IMC

If you click on IMC, you can create a uniform bank of fog that limits visibility to the range specified on the slider.

## Weather Briefing

Select this option to see the Departure, En Route, and Destination weather conditions for your planned flight. Click **Continue** to return to the cockpit. You can also press **F5** to access the Weather Briefing.

# The Planning Menu

## Create Flight Plan

This is a wizard which will allow you to create a flight plan with a defined route, weather, and en route fixes. At the end of the wizard, you will see a flight log that displays all of the flight plan parameters.

### Route Selection

After you select this preliminary information, click **Next** to proceed to the next step in the wizard. Click **Back** at any time to return to the previous step in the wizard.

#### VFR

Visual Flight Rules

#### IFR

Instrument Flight Rules

### Cruise Settings

Set the en route cruising speed and power.

## Departure Point

Select your departure airport. If you know where the airport is located in the list, scroll to it, click once on it, then click **Next**.

To search for an airport, first highlight *all* existing text in the upper textbox of the Airports window, then type in the first few letters of the airport you are seeking. The list of airports in the lower window scrolls alphabetically as you type. Click on the airport you want (it should appear in the upper textbox), then click

**Next**.

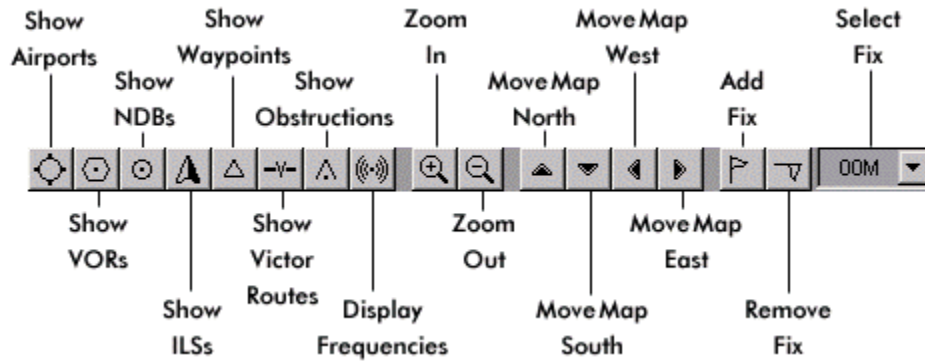
## Destination Point

Select your Destination airport. If you know where the airport is located in the list, scroll to it, click once on it, then click **Next**.

To search for an airport, first highlight *all* existing text in the upper textbox of the Airports window, then type in the first few letters of the airport you are seeking. The list of airports in the lower window scrolls alphabetically as you type. Click on the airport you want (it should appear in the upper textbox), then click **Next**.

## Flight Plan Map

This map is similar to the map that is displayed from the Position Aircraft option under the Airspace menu. It shows the flight path as a yellow line. Airports, ILSs, VORs, NDBs, Waypoints, Victor Routes, and frequencies can all be displayed on the map by clicking the appropriate button.



**Show Buttons**

These buttons display the locations of specific navigational aids.

**Display Frequencies**

This button shows the frequencies of the navigational aids and airports that are displayed.

**Zoom In/Out**

Click on either of these, then click on the area of the map that you want to enlarge or reduce.

**Move Buttons**

The move buttons shift the map by increments of roughly 15' (latitude or longitude) per click.

**Add/Remove Fix**

Click this button, then click on an airport, VOR, NDB, or waypoint (you must be zoomed in far enough) to add it to or remove it from the flight plan.

**Select Fix**

When adding a new fix, *Pro Pilot 99* will insert the fix into your path **AFTER** the fix selected in this list and modify your route accordingly. Keep this in mind when adding a fix in the middle of a route.

**Weather Briefing**

This displays the departure, en route, and destination weather forecast. You can determine the radius, in nautical miles, for the weather forecast at each location.

**Generate Weather**

Each time you click this button, a random weather forecast is generated for all three areas in the weather briefing.

**Save Plan**

Save a flight plan you have created. You can create your own folder for storing flight plans on your hard drive, or use an existing folder within the *Pro Pilot 99* directory. All flight plans must be created with the filename extension .PLN.

Type the name of the plan as you want it to appear, then click **Save**.

**Load Plan**

Load a saved flight plan.

**Flight Log**

This is a synopsis of all the flight plan information:

**Route**

Departure and destination points.

**Altitude**

Cruising altitude.

**Power**

Cruising power.

**Fuel Loading**

The weight of the fuel loaded on board prior to starting the engine, in pounds.

**Fuel Flow**

The fuel consumption rate in pounds per hour.

**TAS**

True Airspeed

**Departure Point**

The origin of the flight plan.

**Trip Distance**

Total distance of the current leg in the flight plan.

**Trip Time**

The total time estimated for the entire trip.

**Time Off**

Elapsed trip time upon takeoff clearance.

**Trip Fuel**

Total estimated fuel required for the trip.

**Close Flight Plan**

Closes the loaded flight plan.

**Save Flight**

Save the current flight (aircraft state and environment state). You can create your own folder for storing flights on your hard drive, or use an existing folder within the *Pro Pilot 99* directory. All flights must be created with the filename extension .FLT.

Type the name of the flight as you want it to appear, then click **Save**.

**Resume Flight**

Load a saved flight.

**Logbook**

This is how you keep track of your flying time. The logbook allows you to enter and delete flights and tracks your total flight time, as well as your time for day, night, and instrument flights.

**Date**

Enter the starting date of the flight.

**Aircraft**

Select the aircraft flown.

**From**

Enter the departure airport.

**To**

Enter the destination airport.

**Remarks**

Enter any noteworthy information about the flight.

**Category**

Select the aircraft category flown.

**Conditions**

Select the conditions flown under.

**Piloting Time**

If you flew solo, select Pilot-in-command. If you flew with a flight instructor, select Dual. If you are logging hours from a cross-country flight assignment, select Cross-country.

**Duration**

Enter the total flying time in hours (example: 8 hours, 15 minutes is entered as 8.25).

Click **Add Entry** and the information you entered will appear in the logbook entry window. You may click and drag on the border of any column heading in the logbook entry window to adjust the column width. If not all of the columns are visible, use the scroll bar at the bottom of the window to bring them into view.

To delete a logbook entry, click on it in the logbook entry window, then click **Delete Entry**. Click **OK** to accept all changes, or click **Cancel** to return to the cockpit without accepting changes.

# The Views Menu

## Full Screen

*Pro Pilot 99* supports most 3Dfx based accelerator cards, providing smoother, enhanced graphics, and a faster frame rate. In order to take advantage of the accelerator card's capabilities, press **ALT-ENTER** to switch to full screen. If you do not have a 3Dfx based accelerator card, pressing **ALT-ENTER** will switch to full screen Direct Draw mode.

## Cockpit View

Press **F7** to toggle between the various views of the panel, engine cowling, and scenery only.

### Panel View 1

Displays the default forward view from the pilot's seat, which includes the full instrument panel. Moving the mouse to the top of the instrument panel (the cursor will change to a double-headed arrow) will allow you to drag the panel up and down.

### Panel View 2

Displays a forward, partial view of the instrument panel from the pilot's seat. Moving the mouse to the top of the instrument panel (the cursor will change to a double-headed arrow) will allow you to drag the panel up and down.

### Cowl

Displays a forward view over the airplane's cowling. All instruments are hidden from view. **ALT-R** will display the Digital Instrument Readout.

### Scenery Only

Displays a forward view through the windshield. All instruments and the airplane's cowling are hidden from view.

## Switch Panel View

This option will allow you to toggle Panel View 1 and Panel View 2. Pressing **Ctrl-F7** will also toggle between Panel View 1 and Panel View 2.

## Tower Cam

Displays an outside view of the aircraft from the nearest control tower.

## Sky Cam 1 through 4

These are four different views from outside your aircraft. You can cycle through the 4 different views by using the **ALT-F7** keys. You can move the camera around in each outside view by using **Shift** and the arrow keys:

<b>Shift-up arrow</b>	Zoom camera in
<b>Shift-down arrow</b>	Zoom camera out
<b>Shift-left arrow</b>	Pan camera left
<b>Shift-right arrow</b>	Pan camera right
<b>Shift-page up</b>	Increase camera altitude
<b>Shift-page down</b>	Decrease camera altitude

## Panoramic Transitions

When this option is selected, the camera will zoom dramatically to the next viewpoint when you change exterior views. To change immediately to the next view with no transition, deselect this option.

## Show GPS Display

This places a moveable window for a Global Positioning System Receiver within the cockpit. A GPS overview is provided in the *Pro Pilot 99* Flight Companion. The GPS receiver is explained in this online manual or the *Pro Pilot 99* Getting Started Manual. Click [here](#) for details. Pressing **F8** will also toggle the GPS on/off.



# The Options Menu

## Select Pilot

### Pilot's Name

Click on the arrow button to the right of this text box to select your name from the list.

### Delete Pilot

Highlight a name from the Pilot's Name list, then click this button to delete it.

## Auto Complexity

If *Pro Pilot 99*'s frame rate seems sluggish, you can select this option to let the computer manage the detail level for you. If you have a slower computer, some of the scenery details will be minimized as you enter busy areas. This will maintain an acceptable frame rate. If you prefer to manage your own settings, you can set the detail options under Scenery Graphics. Note that if you want to adjust Scenery Graphics yourself, Auto Complexity must not be checked.

## Use Alternate Graphics

This allows you to quickly change to pre-selected graphic detail settings with a single click of the mouse (after the initial setup). The initial setup for the alternate graphics is created from the Scenery Graphics dialog (see below).

## Scenery Graphics

All of the options shown here will enhance the graphical experience of *Pro Pilot 99*, but may lead to a slower frame rate on some machines. Experiment with various settings to achieve an acceptable frame rate while maximizing the scenery as you fly. The Alternate tab allows you to create alternate graphic settings, which can be toggled on with the Use Alternate Graphics option (see above). The hot key for this is **F9**.

### Minimum Detail

This turns off all detail options and minimizes the scenery.

### Maximum Detail

This turns on all detail options and maximizes the scenery.

### Alternate

The alternate tab allows you to quickly change to a pre-selected detail set with a single click of the mouse (after the initial setup).

## Brightness

This menu option allows you to change the overall brightness of the display. This works in both 3D- and non-accelerated graphics modes. Note that you must click OK in order to see the results of your changes.

## Sound

Click and drag the slider bar to increase or decrease the sound volume of the engine, voices, or cockpit sound effects. Mute turns off the selected sound.

### Mute all Sounds

Turns off all sounds.

## Flight Controls

### Joystick / Yoke On

Check this box to toggle the joystick/yoke control on. When off, the keyboard becomes the flight controller. **Alt-J** will enable the Joystick. **Alt-K** will enable the keyboard.

### Aileron Sensitivity

Click and drag the slider to adjust how far the ailerons move given a corresponding

movement of the joystick. The lower the setting, the greater the left and right movement of the joystick that is required to affect a turn.

#### **Rudder Sensitivity**

Click and drag the slider to adjust how far the rudder moves given a corresponding movement of the rudder wheel on the joystick. The lower the setting, the greater the left and right movement of the wheel that is required to affect a turn.

#### **Elevator Sensitivity**

Click and drag the slider to adjust how far the elevator moves given a corresponding movement of the joystick. The lower the setting, the greater the up and down movement of the joystick that is required to affect a pitch change.

#### **Dead Space**

Dead space is the amount of movement that has no affect when moving the joystick from a centered position. This slider widens and narrows the dead space.

### **Daylight**

Set the lighting conditions for Dawn, Day, Dusk, or Night. *Pro Pilot 99* flies in real time, so you'll see the dawning sky brighten or the evening sky darken as time elapses.

### **Date and Time**

#### **Time Mode**

UTC Time sets the cockpit clock to Universal Coordinated Time or Greenwich Mean Time.

Manual Local Time allows you to set the cockpit clock to any U.S. time zone. Automatic Local Time automatically sets the cockpit clock to the time zone you're in.

#### **Time Zone**

Select the time zone that you want the cockpit clock to read (you must first select Manual Local Time as the Time Mode).

#### **Reset to System Clock**

This resets the date and time to your computer's internal clock settings.

### **Time Acceleration**

This option is useful for long cross-country flights where the flying becomes routine (i.e., straight and level for three hours). Use time acceleration with caution. If the airplane is climbing or descending when you decide to accelerate time, you could find yourself in the stratosphere or plowing fields in a pretty big hurry.

### **Slew Control**

Slew control is useful for positioning your aircraft while in the air to obtain a desired location for practicing a maneuver. When Slew Control is on, the airplane's location coordinates and altitude (mean sea level) are displayed in the upper left corner of the scenery window. **Alt-X** will also enable slew control.

Use the arrow keys on your numeric keyboard to move the aircraft as follows (when keyboard is enabled):

- 1: Pivot left.
  - 2: Move back.
  - 3: Pivot right.
  - 4: Slide left.
  - 5: Stop movement.
  - 6: Slide right.
  - 7: Bank left.
  - 8: Move forward.
  - 9: Bank right.
- Q: Increase Altitude  
A: Decrease Altitude  
+: Pitch up  
-: Pitch down

Spacebar: reset pitch/bank/heading

**Pause**

Pause the simulation. The shortcut key is **P**.

**Freeze**

Freeze your aircraft position without pausing the simulation. Unlike pause, this allows you to make changes to your flight controls. The shortcut key is **Shift-F**.

# The Help Menu

CONTENTS

## **Contents**

Displays a contents page for this online help file.

## **Search**

Opens a dialog that allows you to search this help file by keyword.

## **Sections**

Jumps to a specific topic or submenu in this help file.

## **How to Use Help**

Jumps to the topic that explains how to get the most out of this help file.

## **About *Pro Pilot 99***

Displays a list of the personnel involved in the development of *Pro Pilot 99*.

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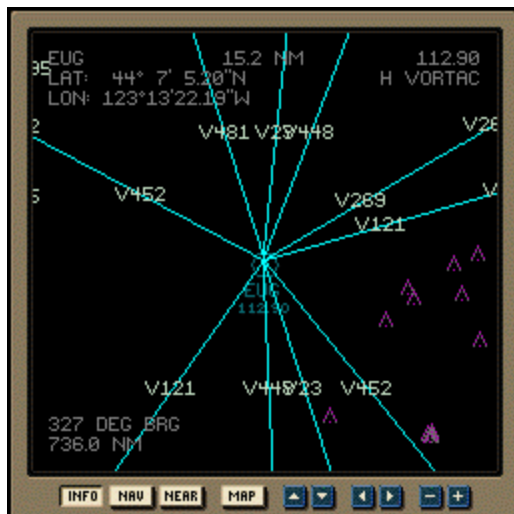
# Using the GPS Simulator

The Global Positioning System puts a broad selection of navaid and flight plan viewing tools at your fingertips. Within a few clicks you can see your proximity to surrounding airports, VORs, Intersections, and NDBs. The GPS shows you the distance and bearing of each of these waypoints, gives you their latitude and longitude, and provides their frequencies, where applicable. You can even see the exact route of a loaded flight plan, including the distance and ETA of each leg on the flight plan.

There are essentially three ways to use the GPS Receiver. INFO provides detailed information about a single, specific waypoint that you select. NAV allows you to display multiple waypoints simultaneously. It also shows you the flight plan details. NEAR displays your airplane's proximity to surrounding waypoints. The MAP button is used to toggle between the map display and the menu display for all three of these modes, and the arrow buttons allow you to move the menu cursor among the menu selections and options.

*Note: click and drag any edge of the GPS Display to resize it.*

## INFO Map



Click the INFO button to see a moving map of your airplane in relation to a single, specific waypoint. (If the menu appears instead of the map, click the MAP button once.) If a waypoint is showing that isn't close enough to your airplane, then the plane icon will not appear. You can use the + and – buttons to zoom the map display in and out. The nautical-mile radius of the visible area is always displayed at the top center of the map. The visible area can be adjusted to between approximately 0.1 and 100 nautical miles.

The waypoint abbreviation is displayed in the upper left corner of the map just above the latitude and longitude of the waypoint. The bearing of and the distance to the waypoint are always displayed in the lower left corner of the map. Otherwise, depending on the type of waypoint, the information changes as follows:

- VOR – the frequency and the type of VOR are displayed in the upper right corner.
- NDB – the frequency of the NDB is displayed in the upper right corner.

INTER – intersections show no additional information.

AIRPORT – the frequency of all ATC agencies are displayed in the upper right corner. If you are zoomed in far enough, the runway headings are displayed along with the localizer frequencies for ILS approaches. The airport's elevation is also displayed just below the latitude and longitude. The ATC agency abbreviations are:

ATIS – Automated Terminal Information System

CLD – Clearance Delivery

GND – Ground Control

TWR – Tower

DEP – Departure Control

APP – Approach Control

## INFO Menu



To toggle between the INFO map and the INFO menu, click the MAP button. On the menu, the selections, as they are referred to here, are listed on the left. The options are listed on the right. To toggle up and down between options, click the up and down arrow buttons on the GPS Receiver. To toggle between options for each selection, click the left and right arrow buttons on the GPS Receiver. The INFO menu has three selections:

WAYPOINT TYPE – this determines what type of waypoint will appear on the map.

With the GPS cursor on this selection, click the left or right arrow button to toggle VOR, NDB, INTER, or AIRPORT.

WAYPOINT ID – this determines the specific waypoint that will appear on the map. When it is first toggled to, the entire ID is highlighted by the cursor. Click the right arrow button once to highlight only the first letter of the ID. Click it again to highlight the second letter, and so on. Once any letter is highlighted, click the up or down arrow button to scroll alphabetically (or numerically) through the letters. Once all the ID letters are selected, click the right or left arrow button until the entire ID is again highlighted with the cursor. Then you can click the up or down arrow button to move to the next selection.

SHOW VICTOR ROUTES – this determines whether or not Victor routes will appear on the map. Click the left or right arrow button to toggle YES or NO.

SHOW OBSTACLES – this determines whether or not (fixed geographic) obstacles of sufficient altitude will appear on the map. Click the left or right arrow button to toggle YES or NO.

Some of the information about each waypoint that appears on the map is also displayed on the INFO menu. Once all menu selections are made, click the MAP button to see the selected waypoint.

## NAV Map – Flight Plan Loaded



The NAV map shows the route of your flight plan as a single white line. Your track appears as a single yellow line. Both lines only extend to the next waypoint on the plan. Once this waypoint is reached, the lines switch to the next waypoint. All of the waypoint types that are selected from the NAV menu appear on the NAV map. You can use the + and – buttons to zoom the map display in and out. The nautical-mile radius of the visible area is always displayed at the top center of the map. The visible area can be adjusted to between approximately 0.1 and 100 nautical miles.

Additionally, the leg departure and destination waypoints appear in the upper left corner above the bearing and distance to the destination waypoint. The destination frequencies, if applicable, appear in the lower left corner. The airplane's track over the ground, speed, and time to arrival appear in the upper right corner.

A Course Deviation Indicator appears at the bottom of the map. Each tick mark on the scale represents two degrees. The white pointer shows your airplane's deviation from the flight plan track.

## NAV Map – No Flight Plan Loaded



When no flight plan is loaded, the NAV map only displays the information that is toggled on in the NAV menu.

## NAV Menu – Flight Plan Loaded



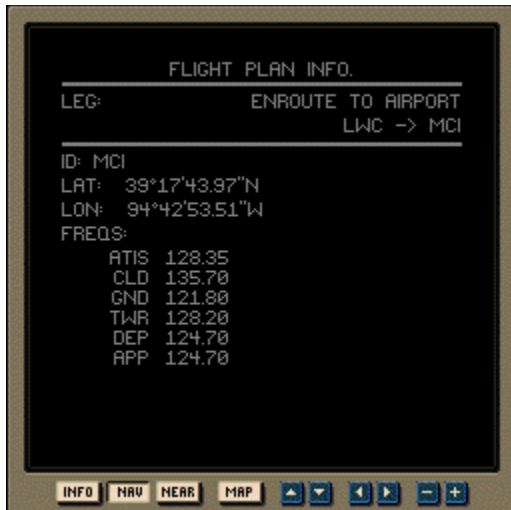
The selections on the NAV menu will display basic information about waypoints on the map. To toggle between the NAV map and the NAV menu, click the MAP button. On the menu, the selections, as they are referred to here, are listed on the left. The options are listed on the right. To toggle up and down between options, click the up and down arrow buttons on the GPS Receiver. To toggle between options for each selection, click the left and right arrow buttons on the GPS Receiver. The NAV menu has six selections:

SHOW VOR  
SHOW NDB  
SHOW INTERSECTIONS  
SHOW AIRPORTS  
SHOW VICTOR ROUTES  
SHOW OBSTACLES

Each one of these selections has two options, YES or NO. Move up and down through the selections by clicking the up and down arrow buttons. Change the options by clicking the left and right arrow buttons.

FLIGHT PLAN ACTIVE is automatically toggled to YES when a flight plan is loaded using the Load Flight Plan option from the [Planning Menu](#). Otherwise, it is toggled to NO.





After your selections are made in the NAV menu, click the MAP button once to see a subsequent menu that contains information about the first leg of the flight plan. When this menu is displayed, click the left or right arrow buttons to scroll through each leg of the flight plan. The departure and destination waypoints of the leg appear in the upper right of the screen.

Click the MAP button again to return to the NAV map.

### NAV Menu – No Flight Plan Loaded



The selections are the same as when a flight plan is loaded, however FLIGHT PLAN ACTIVE will be automatically toggled to NO. Also, you will not see the subsequent menus that show flight plan leg information.

### NEAR Map



The NEAR map shows your airplane's proximity to neighboring waypoints. The type of waypoint can be selected from the NEAR menu. To toggle between the NEAR map and the NEAR menu, click the MAP button. Above each waypoint that appears on the map are two numbers separated by a slash: magnetic bearing and distance (in nautical miles) from the airplane (bearing/distance). The only other information that appears is the airplane's track and speed in the upper right corner.

Additionally, you can use the + and - buttons to zoom the map display in and out. The nautical-mile radius of the visible area is always displayed at the top center of the map. The visible area can be adjusted to between approximately 0.1 and 100 nautical miles.

### NEAR Menu



To toggle between the NEAR map and the NEAR menu, click the MAP button. On the menu, the selections, as they are referred to here, are listed on the left. The options are listed on the right. To toggle up and down between options, click the up and down arrow buttons on the GPS Receiver. To toggle between options for each selection, click the left and right arrow buttons on the GPS Receiver. The NEAR menu has three selections:

WAYPOINT TYPE – the options are AIRPORT, NDB, VOR, and INTER (Intersection). Only one option can be displayed on the moving map at a time.

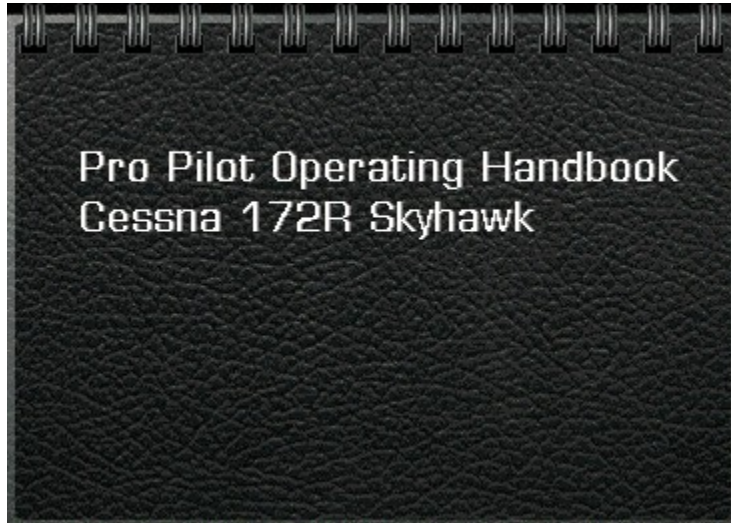
SHOW VICTOR ROUTES – the options are YES and NO. YES shows all of the Victor Routes within the vicinity of the moving map.

SHOW OBSTACLES – the options are YES and NO. YES shows all of the obstacles within the vicinity of the moving map.

Click the up and down arrows to move between selections. Click the left and right buttons to change options.

# Using the Operating Handbook

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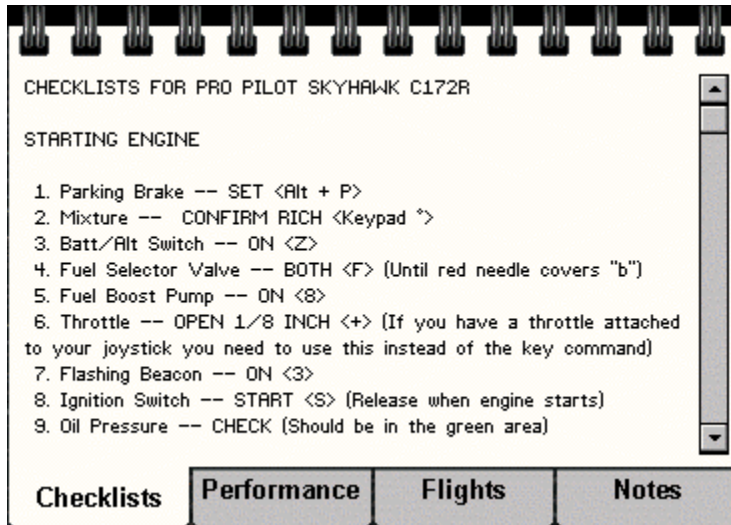
Each of the 6 aircraft in *Pro Pilot 99* comes with its own unique Pilot's Operating Handbook (POH). These handy reference guides are available to you both on the ground and while in the air. Detailed information regarding the use of the POH can be found in **Chapter 2** of the **Getting Started Manual**.

To access a POH, select the **Aircraft/ Show Operator Handbook** option from the on-screen Pull-Down menu. A POH corresponding to the aircraft you are currently flying will instantly appear on screen.

You may also access the POH by pressing the **F3 key**. (Note that the **F3 key** is actually a toggle. The POH is removed from your screen by pressing the **F3 key** a second time.) If the POH is blocking your field of view, use your left mouse button to click & drag it to a more convenient on-screen location.

When the POH first appears, you are shown a view of its outer cover. To open it, click your left mouse button anywhere on the outer cover. You'll notice that the POH is divided into four main sections. Each section can be immediately accessed by clicking your left mouse button on the corresponding Tab. The four Tabs are: **Checklist**, **Performance**, **Flights**, and **Notes**. A vertical slider bar is located along the right side of the page. You may use the slider bar to quickly page through each section as needed.

## Checklist



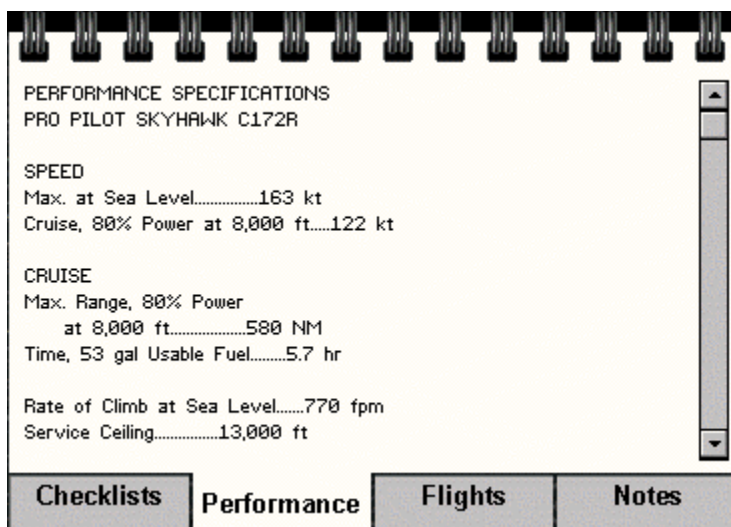
The Checklist tab gives you access to a list of aircraft functions/ operations and their implementation procedures. For example, if you forget the sequence of steps necessary to start your aircraft's engine, you may find this information in the Checklist portion of the POH.

Because the POH is visible on screen while you are in the cockpit, you can view the engine start-up instructions while performing the actual procedures. The Checklist section covers everything you will need to know about the normal operation of your aircraft from start-up to shut down.

The Checklist file for each aircraft may be found in the *ProPilot99/Flight/English* directory. The filename convention is : *aircrafttype\_checklist.txt*

You may modify the text appearing in these Checklists by opening the file, making the desired modification, then saving the file under its current filename. Note that you cannot use the **Tab key** when modifying Checklists. You must also press the **Enter key** after the last sentence in the file.

## Performance



The Performance tab gives you access to your aircraft's performance specifications. This important information is available to you at a glance. For example, if you need to know how far your aircraft must

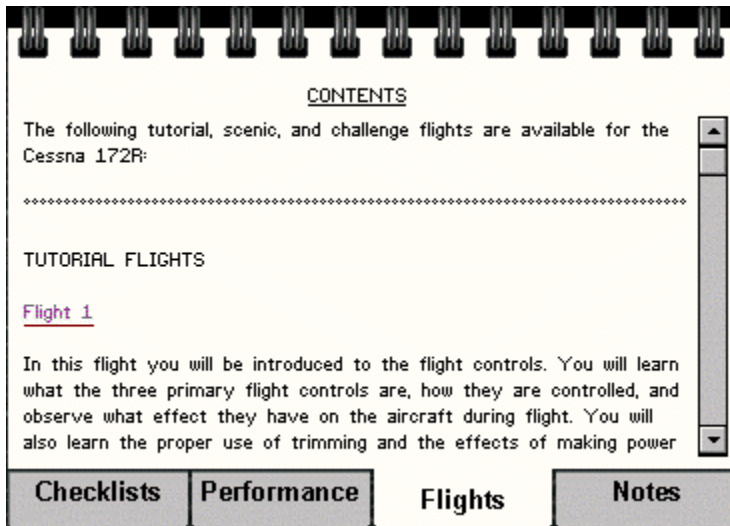
travel in order to clear a 50 ft. obstacle, you can find out by consulting this section of your POH.

The Performance data file for each aircraft may be found in the *ProPilot99/Flight/English* directory. The filename convention is : *aircrafttype\_performance.txt*

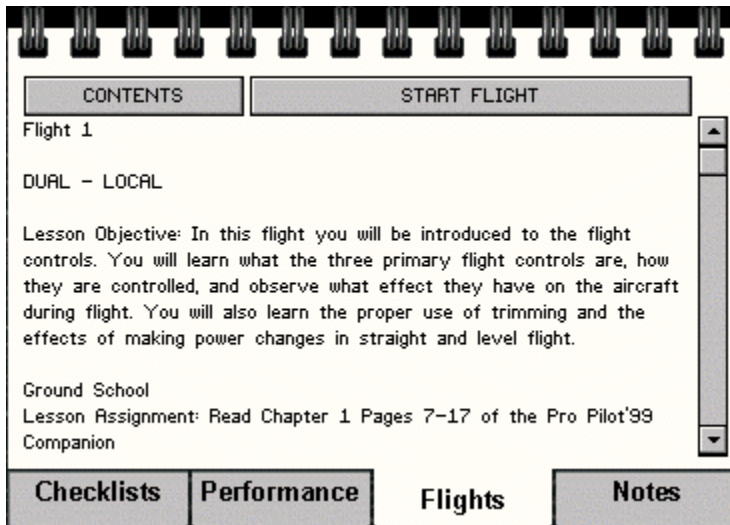
You may modify the text by opening the file, making the desired modification, then saving the file under its current filename. Note that you cannot use the **Tab key** when modifying performance data. You must also press the **Enter key** after the last sentence in the file.

Changes made to the performance data in this manner do not affect the actual performance of the aircraft.

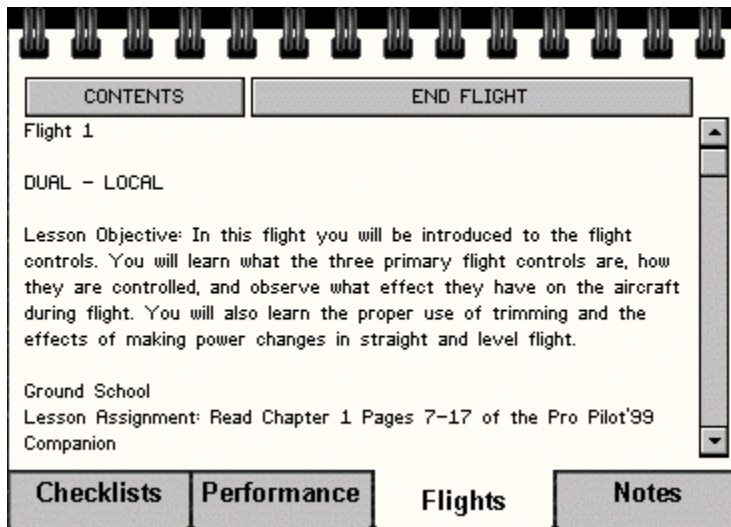
## Flights



The Flights section of the POH is a convenient way to access a variety of pre-configured flights. You can participate in any of the Flights listed here, in any order, simply by left clicking your mouse pointer on the title of the flight. Text associated with the selected Flight appears in the POH.



To start the flight, left click your mouse pointer on the **Start Flight** button above the text.



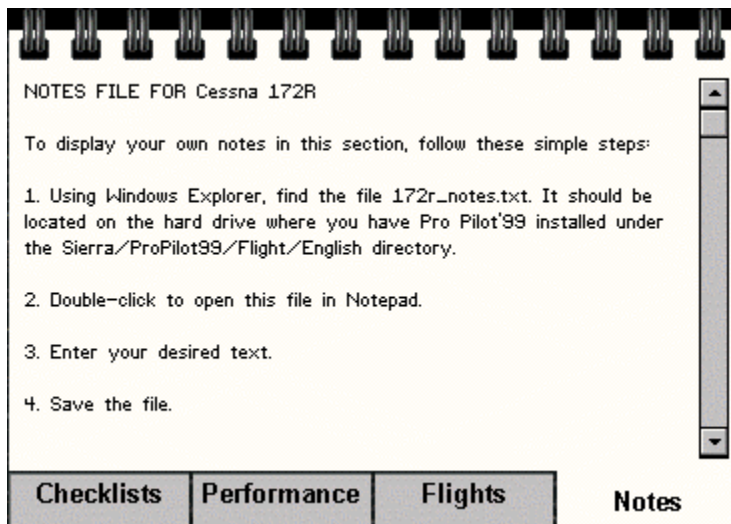
To end a flight, left click your mouse pointer on the **End Flight** button above the text.

To return to the contents page, left click your mouse pointer on the **Contents** button above the text.

There are three different types of flights contained in this section: *Tutorial flights*, *Scenic Flights*, and *Challenge flights*. Tutorial flights are essentially “lessons” that have been specifically designed to teach a particular aspect of flight. Scenic flights take you to some of the more exotic natural and man-made features in *Pro Pilot 99*. Challenge flights are designed to “test” your piloting skills by having you perform a specific task.

It is possible for you to create your own *Tutorial*, *Scenic*, or *Challenge Flights* and add these to the POH. Detailed information regarding the creation of these Flights is found in **Chapter 2** of the **Getting Started** manual.

## Notes



This section of the POH allows you to write down notes or reminders concerning any aspect of your *Pro Pilot 99* experience.

The Notes file for each aircraft may be found in the *ProPilot99/Flight/English* directory. The filename convention is : *aircrafttype\_notes.txt*

You may modify the text appearing in your Notes section by opening the file, making the desired modification, then saving the file under its current filename.



