Contents

ALL INFORMATION IN THIS MANUAL IS FOR USE WITH THE VIRTUAL WINGS PRO SIMULATOR ONLY AND IS NOT BY ANY MEANS INTENDED FOR REAL FLIGHT OR FOR REAL OPERATION OF ANY AIRCRAFT!

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Introduction

Welcome to Virtual Wings Pro, a professional simulator for exhilarating instrument flying using precise nav-aid and airport facilities data to model actual general aviation enroute and terminal procedures in a realistic aircraft cockpit with a fully loaded interactive panel.
The Virtual Wings Pro world comes to life with hardware accelerated 3D texture mapped graphics which, with the proper 3D acceleration hardware/software installed, renders enhanced visual atmospheric effects and terrain detail in thousands of colors for added enroute spatial reality and dimensionality.
This manual delineates the instrumentation, avionics and flight controls of the Virtual Wings Aerospatiale TB20, a single-engine, constant speed prop, retractable aircraft and the almost intuitive computer interface for setting up situation flight plans and managing navigation and cockpit functions.
Virtual Wings Pro is beyond a crash course in becoming a private pilot. It is an all-encompassing simulation tool that parallels and enlightens the training experience and goes on to offer the advanced pilot a wide range of real-world challenges.

Quick Start

If you want to fly right away without reading this manual, just follow these five steps and you will be on your way:

Step 1

In the aircraft setup dialog, choose "open" from the file menu. Select the situation file "Ready in Oakland" in the setups folder.

Step 2

Click on the cockpit panel . You will then be placed on a specific runway with the engine running and everything turned on.

Step 3

Take a look at the bottom right of the screen. You can see two levers there, which are black and red. The black lever on the left is the throttle. Grab this lever with the mouse, hold the mouse button down and pull the throttle all the way up. This gives you full power for takeoff.

Step 4

When the airplane starts to roll, keep it on the centerline with the joystick. (If you have pedals connected, use those.) When the airspeed indicator at the top left of the instrument panel shows 65 knots, you can pull the joystick back smoothly to lift off. If you don't have a joystick available, you can use the cursor up and down keys for controlling the elevator, and the cursor left and right keys for controlling the ailerons.

Step 5

When the airplane climbs to 400 feet above the ground, retract the flaps by pressing "Shift F". Do not pitch the nose up more than 10 degrees above the horizon on the attitude indicator (just right of the airspeed indicator), otherwise you will stall the airplane, which shortens your flight significantly.

Navigating The Virtual Wings Pro Screens

Virtual Wings has four situation setup screens plus the cockpit screen. You can navigate these screens by simply clicking on the tabs. Exit the cockpit by pressing the Escape key.

Aircraft Setup Screen

This screen lets you set the conditions for the aircraft. The various parameters are explained below.

Aircraft setup
Enter the initial heading in magnetic degrees, the altitude in feet above mean sea level and the indicated airspeed here. Due to the limitations of the simulated airplanes, you cannot enter an altitude higher than 15000 feet, or an airspeed greater than 200 knots.

Instrument failure probability

Choose between five possibilities for each type of failure from the popup menus.

Vacuum pump failure
All instruments driven by the vacuum pump will fail. This is the artificial horizon and the directional gyro or the HSI.

Electricity
All electric driven systems will fail. This inlcudes radios, navigation instruments, turn coordinator, flaps, landing gear and annuciator lights.

Engine
This lets your engine fail. Use your emergency checklist at the end of this manual.

Instruments

Double attitude indicator scale
Check this box if you want to double the distance of the pitch lines on the artificial horizon. This expands the attitude pitch scale for easier reading.

ADF Compass Card
You can choose between a fixed compass card in your ADF indicator or a rotating compass card. The rotating card is slaved to the heading indicator and is known as radio magnetic indicator (RMI).

Weight and Balance
Choose the weight for the front and the back seats. The chosen weight will influence the performance of the airplane. Also plan your trip fuel and keep both tanks equally filled, plus or minus 20 gallons, at all times. Otherwise, when flying the TB20 the airplane will bank continuously to the side of the fuller tank.

V-Speeds

The right part of the setup dialog card lists some data of the simulated aircraft. This data is for information purposes only and not for use with a real aircraft. V-Speeds are important speeds that are specific for each aircraft. Here is a list of what all these speeds mean:

Vr	Rotation speed. The speed at which the yoke is pulled back to lift the nose wheel off the ground.
Vx	Best angle of climb speed.
Vy	Best rate of climb speed.
Va	Design maneuvering speed. Don't make abrupt control movements above this speed.
Vfe	Flaps extension speed. Don't use full flaps above this speed.
Vref	Speed for the short final of a landing.
Vlo	Landing gear operating speed. Don't operate the gear above this speed.
Vle	Landing gear extended speed. Don't fly above this speed with the landing gear extended.
Vne	Never exceed speed. This is the red line on the airspeed indicator.
Vno	Maximum structural cruising speed. The speed is denoted by the beginning of the yellow arc on the airspeed indicator. Fly above this speed only in smooth air.
Vs0	Stalling speed in landing configuration.
Vs1	Stalling speed at maximum takeoff weight in clean configuration.

Weather Screen

Temperature
The temperature entered here will effect engine performance and icing. Hotter air has smaller air density which will decrease engine power as well as lift and drag of the wings. Also, if you fly in temperatures below zero in visible moisture and you activate the icing feature, your airframe will build up ice.

Visibility
Lower the visibility for IFR training, increase it for VFR flight.
Performance hint: If you are using a slower computer, you can speed up the 3D graphics by reducing the visibility in the setup dialog.

Icing
Icing affects the lift, drag and weight characteristics of your airplane. Airframe icing only occurs between 0 and -15 degrees Celsius in visible moisture. If you set up -10 degrees at an altitude and climb to a higher level, you may have a temperature below -15 degrees, and therefore no airframe icing. See the manual "Introduction to Flying" for more information on icing.

Altimeter Setting
Enter the barometric pressure in inches of mercury or hectopascal here. Set your two cockpit altimeters (left screen and right screen) to the number you entered.

Time

Select "Use System Time" for situation time to be the local time on your computer. Select "Use Situation Time" to enter a time other than local time. Day is from 8:00 to 19:00 hours local time and night is from 19:30 to 7:30 hours.

Cloud Cover and Wind
Virtual Wings Pro lets you set two different types of cloud covers. Choose the cloud coverage from the two popup menus. You can then either hand type in the ceiling and tops of the clouds or move and resize the displayed layer with the mouse. Enter a number in the +/- field if you want the ceiling to randomly vary. This option makes instrument approaches more thrilling because you don't know if you are going to see the runway at the end of the approach.
Note: Ceiling and tops are heights above mean sea level in Virtual Wings Pro.
Virtual Wings Pro features three different wind levels. You can for example set two wind levels for flight level flying and one for low level wind shear. Set the wind directions and velocities by either typing it in or drag one of the wind controllers with the mouse. During flight at that altitude, the wind will change according to the values provided, giving the pilot a realistic wind shear experience. Try this on an ILS approach! Choose random winds if you want to figure out for yourself where the wind comes from.

Preferences Screen

Units

Choose the unit you are using in your country. Once you have configured a set of units, they will be used in all dialogs and also in some cockpit elements (e.g. altimeter).

Graphics

To use 3D acceleration hardware present in your computer, choose Direct3D HAL on Windows computers or the appropriate 3D driver name on the Macintosh. The 3D hardware renderer can display high-end graphics with texture mapping and haze effects in thousands of colors.
The option "RGB Emulation" on Windows computers or "Apple Software" on the Macintosh try to render full textured graphics without using hardware acceleration. Using this option will result in very poor frame rates even on high-end computers.
Check "Built In Software" if you do not have 3D acceleration present in your computer. Virtual Wings Pro will then use an internal renderer, which produces animation in thousands of colors without texture mapping.

Sound

Choose a sound option here.

Input

Pedals

Choose this option if you have pedals installed. The flight dynamics will then model torque effect that gives your airplane a roll and yaw tendency to the left. Also, the steering on the ground is done by pedals.

Joystick Throttle Device

Check this box if you want to use an input device like CH Products Pro® Throttle, ThrustMaster® WCS or an integrated device for the throttle. If you check this box, you cannot control the throttle with the mouse anymore.

PFC hardware

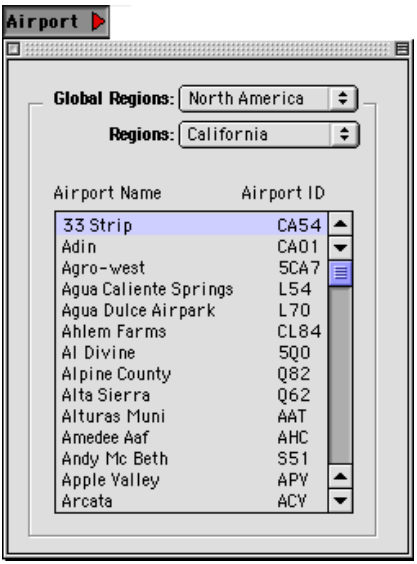
Check this box if you use external hardware controls from Precision Flight Controls. You can get more information about these controls at http://www.flypfc.com.
Click the Calibration button to calibrate the external PFC hardware. The devices must be properly connected to the COM2 port on PCs or to the modem port on Macintosh for calibration.

Map Screen

The map screen displays all navaids and waypoints of the active scenery as well as the position of the airplane, indicated by a red plane symbol. The previous flight path is shown as a red and black curve.
The extent of a scenery is indicated by a red frame on the map. If you place the plane outside this frame, the appropriate scenery will be loaded automatically.

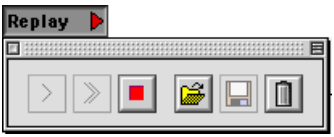
The Airport Palette

Choose a global region and a country, state or local region you want to fly in. The palette will show you all available airports in the chosen area. To get positioned on an airport, simply double click on its name or select its name and hit the enter key. Almost every public airport in northern America and Europe is included in Virtual Wings Pro.



The Replay Palette

Up to 60 minutes of your flight can be replayed at two different speeds, indicated by ">" for slow, and ">>" for fast. If the profile view is activated (see "The Display Palette" to the right), the altitude profile view will plot the vertical flight path. This is useful for practicing approaches.



Virtual Wings Pro can save and open replay files. Simply save a replay file by clicking on the folder icon and reload it by clicking the disk icon. Replay files are saved in a cross platform format for exchange between Macintosh and Windows systems.

The Tools Palette

The drag tool

To reposition the airplane, just drag the plane with the mouse to the desired position. If you drop the plane symbol close to a runway end, the plane will "snap" to that runway. The altitude will be automatically adjusted for the airport. You can also reposition the airplane by holding down the shift key (option key on the Macintosh) and clicking anywhere in the map. This is easier if you scrolled the airplane out of view. Hold down the control key and click on the airplane symbol to adjust the magnetic heading of the airplane.

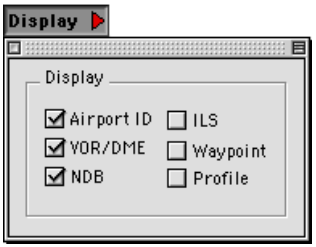
The plotter tool

If you want to measure the distance and heading from one point to another, just click on the first point on the map, keep the mouse button pressed and drag the mouse on the map. You will see a line from the starting point to the present mouse position with heading and distance.

The zoom tools

Click these tools if you want to zoom into or out of the map. The map will be centered at the position where you click with the tool. You can use the Control key (Option key on Macintosh systems) to toggle between zooming in and out. You can also zoom in and out centered on the airplane symbol by pressing + and - on the keyboard or keypad.

The Display Palette



The six checkboxes below the tools let you display or hide certain information on the map at all different zoom levels.

Airport ID

Displays all airport four letter codes on the map. This makes finding of a specific airport easier.

VOR/DME

Displays all VORs and DMEs as blue triangles in circles. Note that some symbols represent a DME station coupled with an ILS frequency or DME coupled with military TACANs.

NDB

Displays all non-directional beacons.

ILS
Displays all instrument landing systems with or without glideslope.

Waypoint
Displays all terminal and en route waypoints.

Profile
Check this box to see the vertical profile of your flight combined with the glideslope.

The Coordinates Palette

This palette displays the geographic coordinates corresponding to the mouse position on the map.

Cockpit Screen

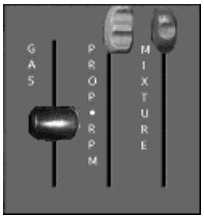
The simulation starts when you enter the cockpit screen. All cockpit elements can be set with the mouse. The mouse cursor changes from the pointer to another symbol when above an adjustable item. Some cockpit items can also be controlled by keystrokes. See the keystroke section at the end of the manual for all available keystrokes.

You can switch between the left and the right cockpit screen with the "S" key. If you have two monitors attached, the cockpit will be displayed on both monitors with the basic flight instruments on the left and radios and engine gauges on the right monitor.

NOTE: You can drag the cockpit with the mouse to any position you like.
Windows: Drag the cockpit using the right mouse button.
Macintosh: Hold the option key while dragging the cockpit.

The following description of the cockpit screen is based on the cockpit layout of the TB20 Trinidad since it is more complex than the C172. The avionics package is almost equal in both airplanes. The differences in using the autopilot will be pointed out. If you want to know more about the basic systems of the Cessna 172, please read the manual "Introduction to Flying".

The levers
Like many other complex single or multi-engine aircraft, the TB20 is equipped with a constant speed propeller, which is much more efficient compared to a fixed-pitch propeller. A constant speed propeller converts a high percentage of the engine power into thrust over a wide range of rpm and airspeed combinations.
An airplane with a constant speed propeller has two power controls and a mixture control, which are explained below.



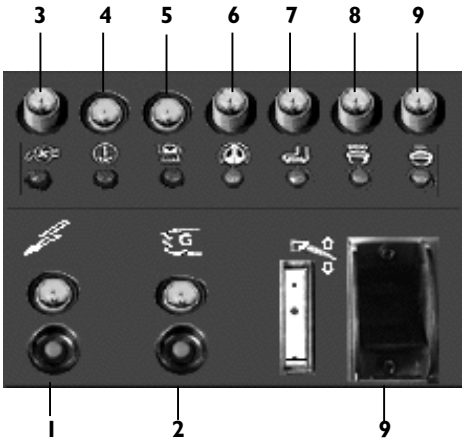
The left, black lever is the throttle. It adjusts the power output of the engine, which is indicated on the manifold pressure gauge. Push the throttle all the way up for full power. Note: Due to the constant speed propeller, moving the throttle does not necessarily cause a change of rpm of the engine as it does in a Cessna 172.

The blue lever in the middle is the propeller control. It changes the pitch of the propeller blades and sets the rpm of the engine and the propeller, which is indicated on the rpm gauge. For takeoff and landing, this lever should be all the way up, giving a low blade angle and high rpm for maximum thrust. In cruise flight you can use a higher pitch and a lower rpm setting to maintain adequate thrust for the desired airspeed. A typical cruise power setting is 2400 rpm by a manifold pressure of 23". See the checklist Power Settings Chart for other typical settings.

The right, red lever enriches or leans the mixture. For takeoff and landing, this lever should be all the way up. For climb, 18 gallons per hour is a typical fuel flow setting as the richer mixture will have a cooling effect on the engine. Cruise fuel flow will be adjusted in the range of 14 to 16 gallons per hour, depending on altitude and throttle setting.. Leaning the mixture in cruise flight will increase the performance of the engine. The engine will run rough or even quit if you lean the mixture too much.

The button panel

These electrical button switches are activated by clicking on the yellow button and released by clicking on the corresponding red release button.



These are the functions:

1. Master switch
Supplies all systems with electric power from the battery.

2. Generator
Charges the battery when the engine is running above 1000 rpm.

3. Fuel pump
Activates the electric backup fuel pump. Only necessary for takeoff and landing.

4. Turn coordinator power supply
Needs to be activated to use the turn coordinator.

5. Beacon
Activate the rotating beacon before starting the engine as a precautionary measure to warn others in the vicinity that you are about to start up.

6. Nav lights
This button activates the green and red navigation lights at the right and left wing tips. Use during night flight.

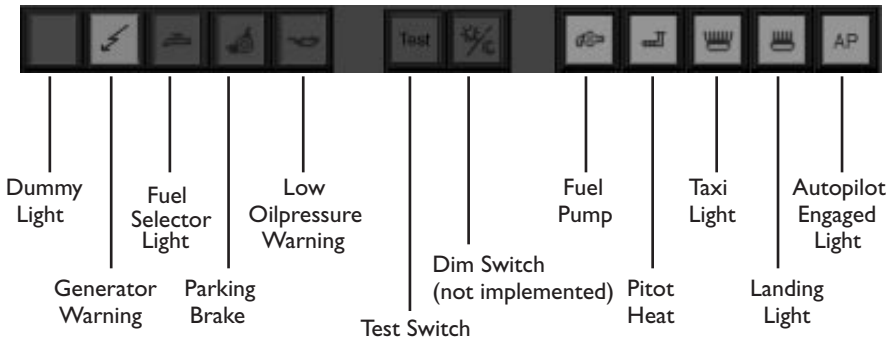
7. Pitot heat
Activates the heater in the pitot tube. Use in visible moisture to avoid icing of the pitot tube, resulting in a failure of the airspeed indicator.

8. Taxi light
Use when taxiing at night.

9. Landing light
Use for takeoff and landing.

Flaps
The flaps are located on the same panel as the button switches. The TB20 has only three flap settings: 0, 10 and 40 degrees. Be aware of a high increase of lift and drag when switching from the 10 to the 40 degrees position during an approach. The first notch of flaps can be set below 128 knots, the second below 103 knots. The gear up warning horn will sound off when setting 40 degrees of flaps with the gear in the up position.

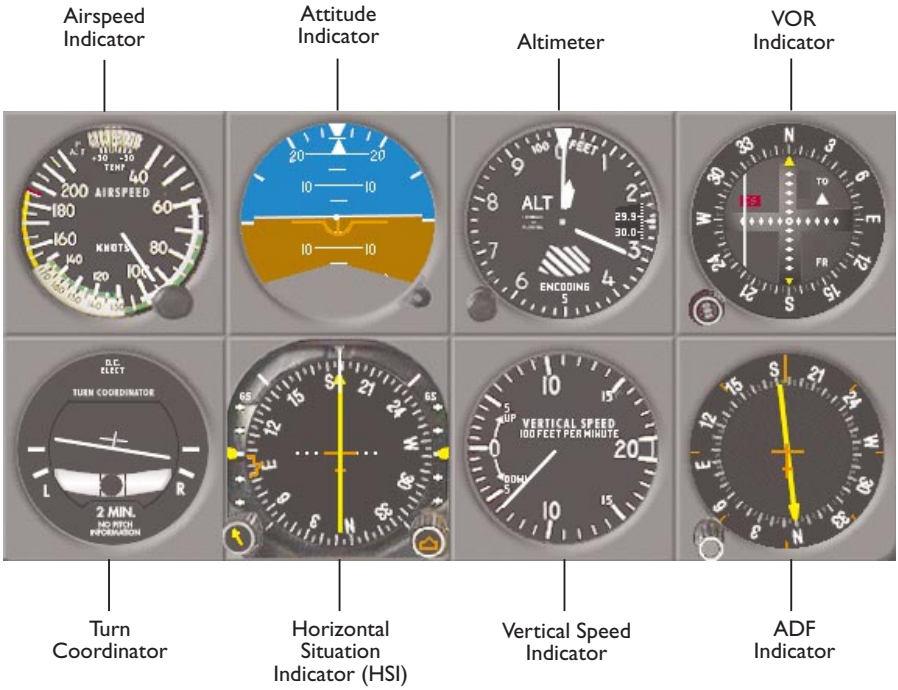
The announciator lights



Dummy light: Not used.
Generator warning light: Illuminates when the voltage is low or the engine is operated below 1000 rpm.
Fuel selector light: Illuminates when the fuel tank selector is in the “off” position.
Parking brake: Illuminates when the parking brake is set.
Low oil pressure warning: Illuminates when oil pressure is low or the engine is not running.
Test switch: Click on this switch to test all annunciator lights.
Dim Switch: This switch dims all lights for use at night (not implemented).
Fuel pump: Illuminates when the electric fuel pump is activated.
Pitot heat: Illuminates when the pitot heat is activated.
Taxi/landing light: Illuminates when Taxi/landing light is activated
Autopilot engaged light: Illuminates when the autopilot is engaged.

Flight instruments

Below you see the flight instruments. The instruments can be controlled with the mouse.



Starter

The starter works a lot like in a car except that it has five positions: off, left, right, both magnetos, and start. On engine start click the starter to the right side four times until you hear the starter cranking. Keep the mouse button pressed until the engine runs. The switch will automatically return two the “both” position, which always should be used. Operation on one magneto is done just for the “run up”, which is a checklist item to test the ignition mechanism of the engine

Suction gauge

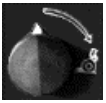
This gauge should be in the green when the vacuum pump that drives the HSI and attitude indicator is working properly. It shows low when the throttle is closed or the vacuum pump failed.

Digital engine gauge

The digital engine gauge displays the manifold pressure, rpm and the fuel flow digitally.

Parking brake

The parking brake is useful for the runup. Turn the knob to the three o'clock position to set the brake, turn it to the twelve o'clock position to release it. The brakes can also be actuated by pushing the stick forward when on the ground, or by pushing the top of the pedals (only if pedals with brake feature are installed). The zero key on the keyboard also activates braking.

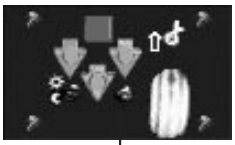


Radio/autopilot master

The radio master is the left switch. Turn it on to use the radios. The autopilot Master to the right supplies power to the electric trim and the autopilot.

Landing Gear

To lower or raise the landing gear, drag the gear handle with the mouse to the desired position. You can also use the "G" key to toggle the gear handle position. The small knob below the right green light is a test knob. When clicked, all lights will illuminate.
Note: If the gear is up and you close the throttle or set the flaps to 40-degrees, a warning horn will sound off. This helps to prevent a gear up landing.


Test knob

Trim indicator

The trim indicator shows the movement of the elevator trim tab. The trim can be actuated by pressing 8 for down and 2 for up. Keep the key pressed and you will see the indicator move until you release the key.
Hint: The best way to use the trim is to assign these two keys to a rocker switch on a joystick.
Note: You cannot use the trim without turning on the Autopilot Master switch. Activating the trim will automatically disengage the autopilot.

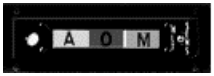
Fuel tank selector

The TB20 has two tanks, one in each wing. The fuel tank selector determines from which tank the engine gets the fuel. The switch has three positions: right, left or off. The off position is not used in normal operation. Do not forget to switch tanks every 30 minutes. Otherwise, the airplane will continuously bank to the side with more fuel and you might even run one tank dry.

Distance measuring equipment (DME)

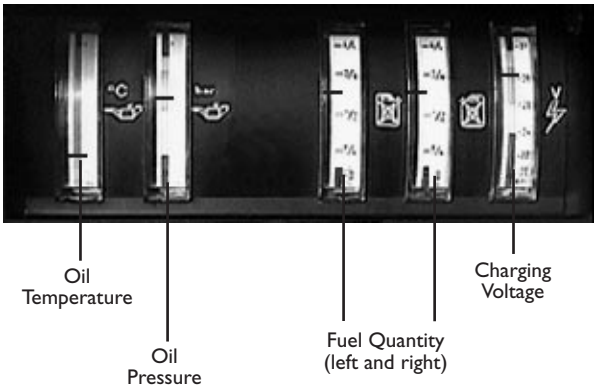
The DME shows distance, ground speed and time to a selected station. Use the rotary switch below the DME indicator to select DME information from Nav 1 or Nav 2. If required, the HLD setting holds (freezes) the last selected DME readings when changing frequencies in nav receivers.

Marker beacon lights

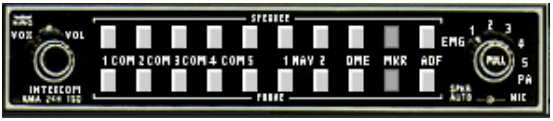


One of the three marker beacon lights will illuminate when an inner, outer or middle marker is passed. Clicking on the test button tests the lights.

Engine gauges



Audio control console



Push either the speaker or phone button corresponding to the navaid for which you wish to verify station identification audibly. The morse code identification of navaids is shown on navigation charts and approach plates.
Note: In the real airplane, the upper buttons are for listening on the speaker, the lower ones for headphones. In the Virtual Wings simulator, you can push either one to hear the morse code. The COM buttons do not have any function in this version of Virtual Wings.

NAV/COMM receivers 1 and 2

The right part is the NAV part. The COMM part on the left side has no function in this version of Virtual Wings. Select a frequency in the right (STBY) section, using the mouse to turn the inner and outer knobs. Then use the flip-flop button to switch the selected frequency to the left (USE) section. NAV 1 is linked to the HSI and NAV 2 is linked to the VOR indicator in the cockpit panel.

ADF receiver

Tune this receiver to NDB navigation aids. They are shown as green symbols in the map when the NDB display option is on. Select a frequency as described above for the NAV/COMM receivers.

Autopilot

The TB20 in Virtual Wings Pro is equipped with the two-axis King KAP150 autopilot. The autopilot master switch must be on to use the autopilot. The Nav and Approach modes only work in conjunction with the NAV 1 receiver. The use of this system is described below. (See Keyboard Layout for Autopilot key commands).

System self-test
A test of all the internal systems must be performed before the autopilot can be engaged. Click the TEST button to perform the test. All annunciator lights will be illuminated, the autopilot will beep six times, and all lights will go off. If the autopilot is not tested after turning on the AP master switch, the red "TRIM" light above the test switch will glow.

Autopilot (AP) mode
On initial engagement, if no other autopilot modes are selected, the autopilot will maintain the existing aircraft pitch attitude and keep the wings level. To change the existing pitch attitude, click the UP or DOWN buttons on the left side of the autopilot and keep the button pressed for a moment. The aircraft will change pitch attitude slowly and will start to climb or descend. The longer you keep the button pressed, the greater the pitch change.
The autopilot is engaged by clicking on the AP ENG button on the autopilot or by pressing the E key on the keyboard.
When the autopilot is disengaged, it will beep six times to inform the pilot. The autopilot is disengaged by pressing the AP ENG button again or by pressing the E key.

Altitude hold (ALT) mode
In the altitude hold mode, the autopilot maintains the altitude at which the mode was engaged. The altitude mode is activated by clicking on the ALT button on the autopilot or by pressing the A key.

Heading select (HDG) mode
In the heading mode, the autopilot will intercept and fly the heading selected by the heading bug on the directional gyro or the HSI. The heading mode is activated by clicking on the HDG button of the autopilot or by pressing the H key.

Navigation (NAV) Mode in the Cessna 172
In the navigation mode, the autopilot intercepts and tracks VOR courses.
To operate in the NAV mode in the C172:
- Select a frequency for the desired VOR station on NAV 1 (the upper radio on the right screen).
- Set the OBS of VOR 1 to the desired course.
- Click the NAV button on the autopilot or press the N key. If the NAV mode is selected within 4 degrees of course deviation, the NAV mode will engage directly. Otherwise the NAV light will flash to signify that the NAV mode is armed, but the autopilot is still operating in HDG mode.
- Within five seconds, move the heading bug on the directional gyro to the same magnetic heading as the selected course on the OBS.
- The autopilot will fly a 45 degree intercept heading until entering the capture zone, then turn to intercept the selected course. The heading light will go off and the NAV light will glow steadily as the NAV mode goes from armed to engaged.
- The autopilot will maintain the radial to or from the VOR by banking as necessary.

Navigation (NAV) Mode in the TB20
In the navigation mode, the autopilot intercepts and tracks VOR courses.
To operate in the NAV mode in the TB20:
- Select a frequency for the desired VOR station on NAV 1 (the upper radio on the right screen).
- Set the desired course with the yellow needle on the HSI.
- Establish the desired intercept angle by setting the orange heading bug on the intercept heading and activate HDG mode. The HDG light will illuminate.
- Click the NAV button on the autopilot or press the N key. If the NAV mode is selected within 4 degrees of course deviation, the NAV mode will engage directly. Otherwise the NAV light will flash to signify that the NAV mode is armed, but the autopilot is still operating in HDG mode.
- The autopilot will fly the selected heading until entering the capture zone, then turn to intercept the selected course. The heading light will go off and the NAV light will glow steadily as the NAV mode goes from armed to engaged.
- The autopilot will maintain the radial to or from the VOR by banking as necessary.

Approach (APR) mode in the Cessna 172
The approach mode allows the autopilot to intercept and track ILS (both localizer and glideslope) and VOR courses. To operate in the APR mode:
- Select a frequency for the desired ILS or VOR station.

- Set the OBS of VOR 1 to the final approach course.
- Check the heading displayed on the directional gyro against the magnetic compass and reset if necessary.
- Click the APR button on the autopilot or press the R key. If the APR mode is selected within 4 degrees of course deviation, the APR mode will engage directly. Otherwise the APR light will flash to signify that the APR mode is armed, but the autopilot is still operating in HDG mode.
- Within five seconds, move the heading bug on the directional gyro to the same magnetic heading as the selected course on the OBS.
- The autopilot will fly a 45-degree intercept heading until entering the capture zone, then turn to intercept the selected course. The heading light will go off and the APR light will glow steadily as the APR mode goes from arm to engage.
- The autopilot will maintain the selected course by banking as necessary.
- Once localizer course capture has occurred on an ILS approach, the glideslope mode is armed. Automatic capture occurs as the aircraft approaches the glideslope from below. When the glideslope is intercepted, the GS light glows steadily. The autopilot will maintain the glideslope with pitch corrections. If altitude hold (ALT) mode had been engaged prior to GS capture, it will disengage at capture and the ALT light will go off. The yellow tabs in the HSI show the glideslope location relative to the aircraft.

Approach (APR) mode in the TB20

- The approach mode allows the autopilot to intercept and track ILS (both localizer and glideslope) and VOR courses. To operate in the APR mode:
- Select a frequency for the desired ILS or VOR station.
- Set the final approach course with the yellow needle on the HSI.
- Establish the desired intercept angle by setting the orange heading bug on the intercept heading and activate HDG mode. The HDG light will illuminate.
- Click the APR button on the autopilot or press the R key. If the APR mode is selected within 4 degrees of course deviation, the APR mode will engage directly. Otherwise the APR light will flash to signify that the APR mode is armed, but the autopilot is still operating in HDG mode.
- The autopilot will fly the selected heading until entering the capture zone, then turn to intercept the selected course. The heading light will go off and the APR light will glow steadily as the APR mode goes from arm to engage.
- The autopilot will maintain the selected course by banking as necessary.
- Once localizer course capture has occurred on an ILS approach, the glideslope mode is armed. Automatic capture occurs as the aircraft approaches the glideslope from below. When the glideslope is intercepted, the GS light glows steadily. The autopilot will maintain the glideslope with pitch corrections. If altitude hold (ALT) mode had been engaged prior to GS capture, it will disengage at capture and the ALT light will go off. The yellow tabs in the HSI show the glideslope location relative to the aircraft.

Back course (BC) mode in the C172

In the back course mode, the autopilot intercepts and tracks a reverse course localizer. Clicking on the BC button on the autopilot activates the back course mode.

- Select a frequency for the desired ILS back course on NAV 1 (the upper radio on the right screen).
- Click the BC button on the autopilot. If the BC mode is selected within 4 degrees of course deviation, the BC mode will engage directly. Otherwise the BC light will flash to signify that the BC mode is armed, but the autopilot is still operating in HDG mode.
- Within five seconds, move the heading bug on the directional gyro to the same magnetic heading as the selected front course on the OBS.
- The autopilot will fly a 45 degree intercept heading until entering the capture zone, then turn to intercept the desired course, which will be a reciprocal of the front course. The HDG light will go off and the APR light will glow steadily as the BC mode goes from arm to engage.
- The autopilot will maintain the selected course by banking as necessary. Glideslope will be locked out.

Back course (BC) mode in the TB20

In the back course mode, the autopilot intercepts and tracks a reverse course localizer. Clicking on the BC button on the autopilot activates the back course mode.

- Select a frequency for the desired ILS back course on NAV 1 (the upper radio on the right screen).
- Set the front — not the back! — course of the ILS with the yellow needle on the HSI.
- Establish the desired intercept angle by setting the orange heading bug on the intercept heading and activate HDG mode. The HDG light will illuminate.
- Click the BC button on the autopilot. If the BC mode is selected within 4 degrees of course deviation, the BC mode will engage directly. Otherwise the BC light will flash to signify that the BC mode is armed, but the autopilot is still operating in HDG mode.
- The autopilot will fly the selected heading until entering the capture zone, then turn to intercept the selected course. The HDG light will go off and the APR light will glow steadily as the BC mode goes from arm to engage.
- The autopilot will maintain the selected course by banking as necessary. Glideslope will be locked out.

Note: Like a real autopilot of this class, the autopilot of Virtual Wings Pro has its limitations. For example, do not try to fly an approach by autopilot with full throttle or throttle back. Also engaging altitude mode with a VSI reading of more than 1000 ft/min will cause the autopilot to overshoot.

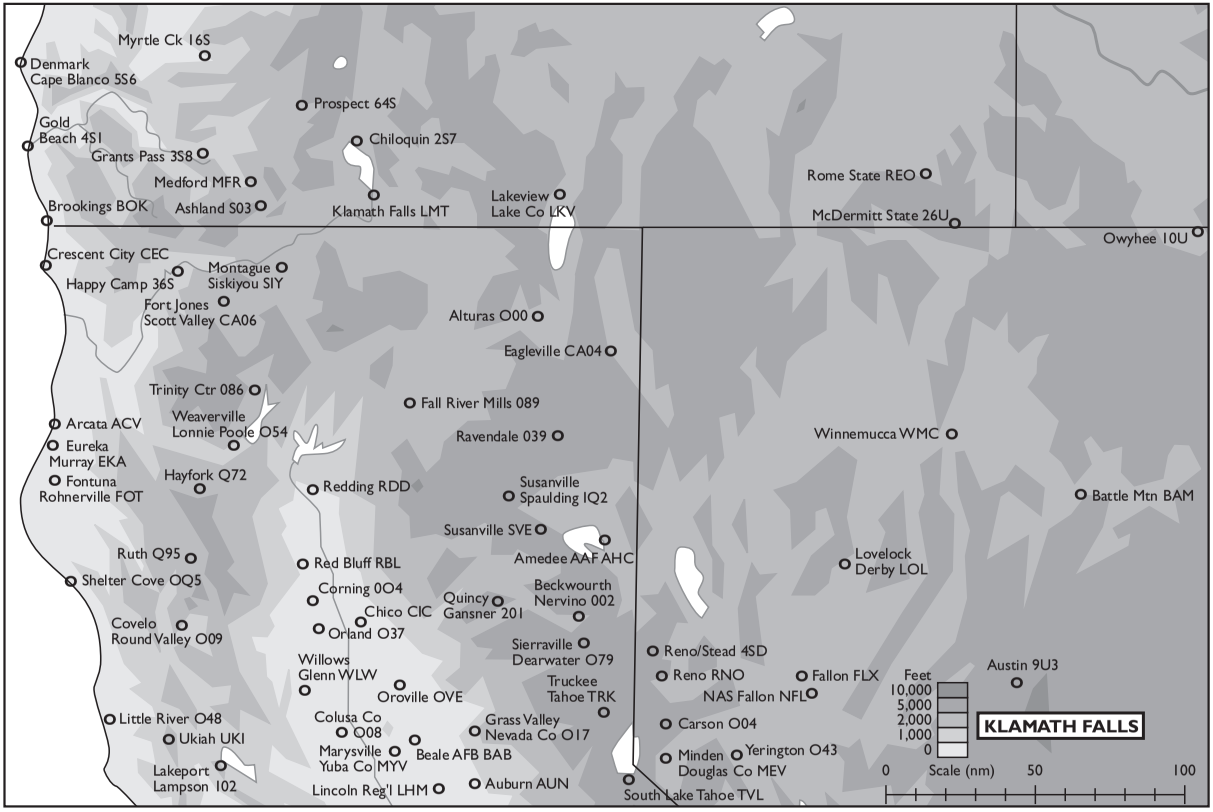
Engine gauges

The two right gauges display the effects of the control lever settings.
The manifold pressure gauge at the bottom left displays the power output of the engine, set by the throttle. When the engine is not running, it registers the atmospheric pressure. When the engine is running, it senses the reduced pressure in the manifold and indicates less than atmospheric pressure. During a climb with a constant power setting, the manifold pressure will decrease by one inch for each 1000 feet due to the decrease of atmospheric pressure.
The tachometer at the top shows rpm of the engine and the propeller, set by the propeller control.
The fuel flow gauge at the bottom right displays the rate of fuel consumption in gallons per hour. Monitor this gauge when leaning the mixture with the mixture control.
The top left gauges display the cylinder temperature (CHT, left) and the exhaust gas temperature (EGT, right).
The exhaust gas temperature gauge (EGT) is a visual indication of fuel/air ratio of the combustion mixture entering the cylinders. Exhaust gas temperature is measured by a thermocouple in the engine exhaust pipe. Exhaust gas is hottest when the fuel/air mixture injected into the cylinders is optimally balanced for best combustion. Two situations in the combustion mixture will decrease the exhaust temperature. Too much air for the amount of fuel (too lean) or too much fuel for the amount of air (too rich). The mixture control adjusts the amount of fuel entering the engine cylinders to match the amount of oxygen present in the ambient air.
At cruise altitude, to achieve the best combustion ratio, pull down (decrease fuel in the combustion ratio) on the mixture control handle until the EGT needle tops out and starts back down "on the lean side" of its max reading. Then increase the mixture until the EGT needle tops out again and starts back down "on the rich side" of its max reading by about two ticks on the gauge for proper fuel/air mixture at cruise altitude. This procedure must be done fairly slowly because there is some lag in the thermocouple response to temperature change. The engine will eventually start to choke-up on the lean side of max exhaust temperature and the cylinder head temperature will start to rise towards the red line. Therefore, it is desirable to have the mixture a tad rich, since the engine is cooled by the atomized fuel in the combustion mixture. Remember to adjust the combustion mixture whenever power (throttle/prop) or altitude changes are made. For takeoffs, approaches and traffic pattern work, the mixture is normally left full rich.

The cylinder head temperature gauge (CHT) is also a thermocouple that measures temperature of the hottest running cylinder on the engine. It's the only indication of engine temperature in the cockpit other than oil temperature. CHT is effected by the amount of forced air flowing around the engine, oil pressure, and the fuel/air ratio (a richer mixture cools the engine better).

Outside air temperature

This gauge displays the outside air temperature, which is the temperature entered in the setup dialog, corrected for the current altitude.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Brookings BOK
Ashland S03
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Lakeview
Lake Co LKV
McDermitt State 26U
Owyhee 10U
Crescent City CEC
Montague
Siskiyou SIY
Happy Camp 36S
Fort Jones
Scott Valley CA06
Alturas O00
Eagleville CA04
Trinity Ctr 086
Fall River Mills 089
Weaverville
Lonnie Poole O54
Arcata ACV
Ravendale 039
Winnemucca WMC
Eureka
Murray EKA
Hayfork Q72
Fontuna
Rohnerville FOT
Redding RDD
Susanville
Spaulding IQ2
Battle Mtn BAM
Susanville SVE
Amedee AAF AHC
Ruth Q95
Red Bluff RBL
Lovelock
Derby LOL
Shelter Cove OQ5
Corning 0O4
Beckwourth
Nervino 002
Quincy
Gansner 201
Chico CIC
Covelo
Round Valley O09
Orland O37
Sierraville
Dearwater O79
Reno/Stead 4SD
Austin 9U3
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Fallon FLX
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Marysville
Yuba Co MYV
Beale AFB BAB
Minden
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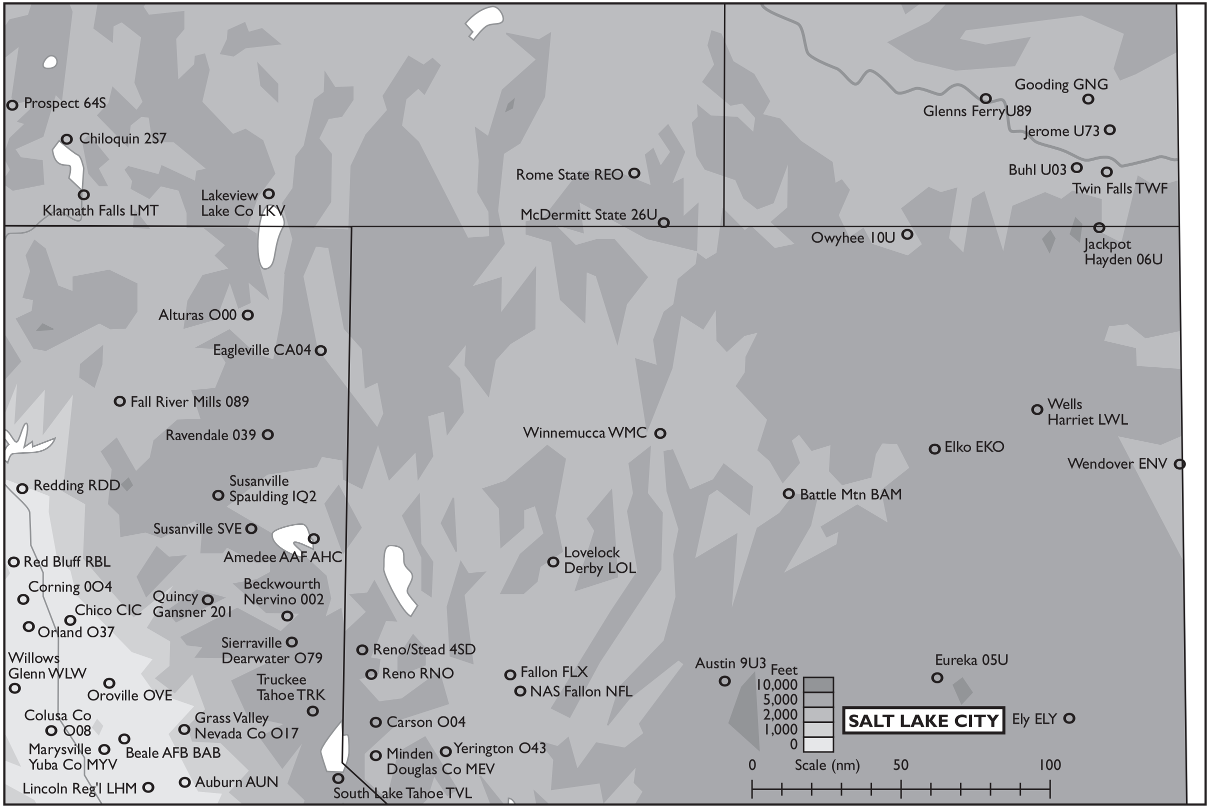
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Eagleville CA04
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Ravendale 039
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Susanville
Spaulding IQ2
Battle Mtn BAM
Susanville SVE
Amedee AAF AHC
Lovelock
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Red Bluff RBL
Corning 0O4
Chico CIC
Orland O37
Quincy
Gansner 201
Beckwourth
Nervino 002
Sierraville
Dearwater O79
Reno/Stead 4SD
Reno RNO
Fallon FLX
NAS Fallon NFL
Austin 9U3
Eureka 05U
Willows
Glenn WLW
Oroville OVE
Truckee
Tahoe TRK
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Grass Valley
Nevada Co O17
Carson O04
Marysville
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Beale AFB BAB
Minden
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Yerington O43
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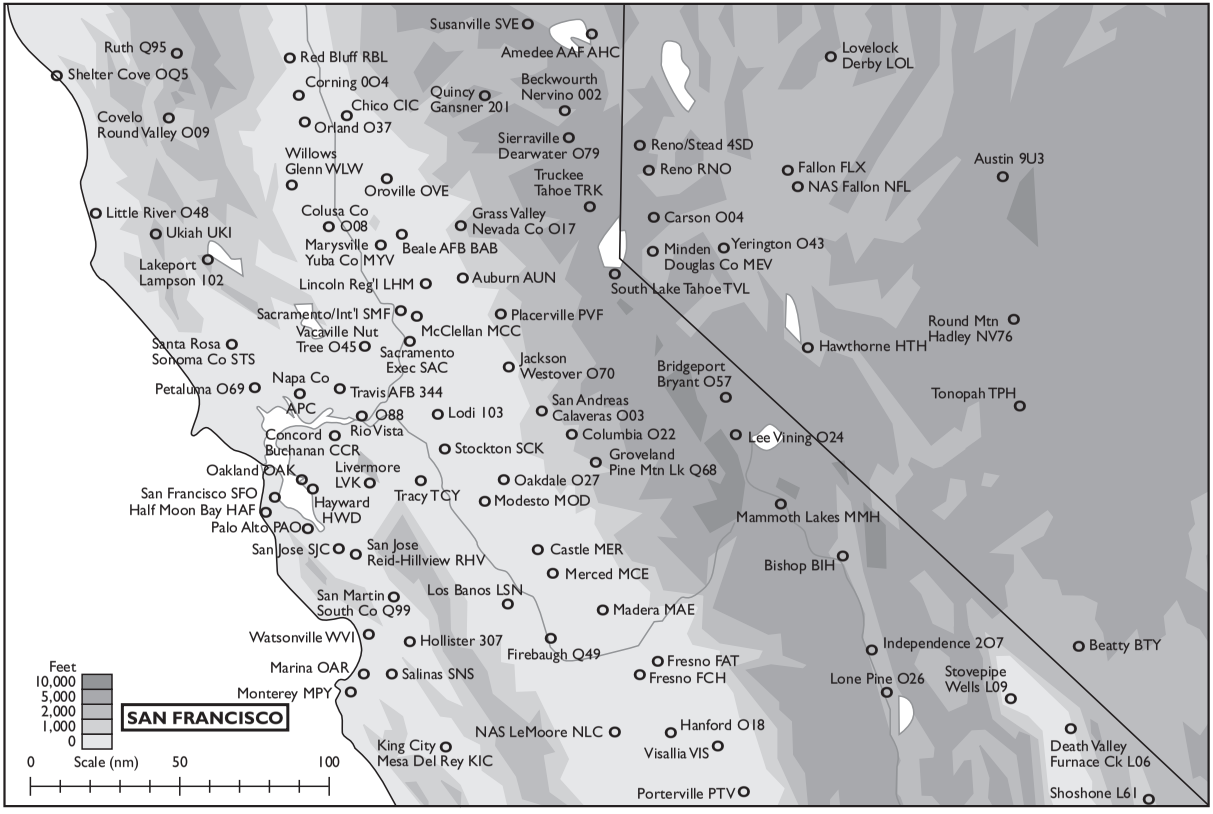
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Minden
Douglas Co MEV
Yerington O43
Lakeport
Lampson 102
Lincoln Reg'l LHM
Auburn AUN
South Lake Tahoe TVL
Sacramento/Int'l SMF
Placerville PVF
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Vacaville Nut
Tree O45
McClellan MCC
Santa Rosa
Sonoma Co STS
Sacramento
Exec SAC
Jackson
Westover O70
Hawthorne HTH
Bridgeport
Bryant O57
Napa Co
Petaluma O69
Travis AFB 344
Tonopah TPH
APC
O88
Lodi 103
San Andreas
Calaveras O03
Rio Vista
Concord
Buchanan CCR
Columbia O22
Lee Vining O24
Stockton SCK
Groveland
Pine Mtn Lk Q68
Oakland OAK
Livermore
LVK
Oakdale O27
San Francisco SFO
Hayward
HWD
Tracy TCY
Modesto MOD
Half Moon Bay HAF
Mammoth Lakes MMH
Palo Alto PAO
San Jose SJC
San Jose
Reid-Hillview RHV
Castle MER
Bishop BIH
Merced MCE
San Martin
South Co Q99
Los Banos LSN
Madera MAE
Watsonville WVI
Hollister 307
Firebaugh Q49
Independence 2O7
Beatty BTY
Fresno FAT
Fresno FCH
Marina OAR
Salinas SNS
Lone Pine O26
Stovepipe
Wells L09
Monterey MPY
NAS LeMoore NLC
Hanford O18
King City
Mesa Del Rey KIC
Visallia VIS
Death Valley
Furnace Ck L06
Porterville PTV
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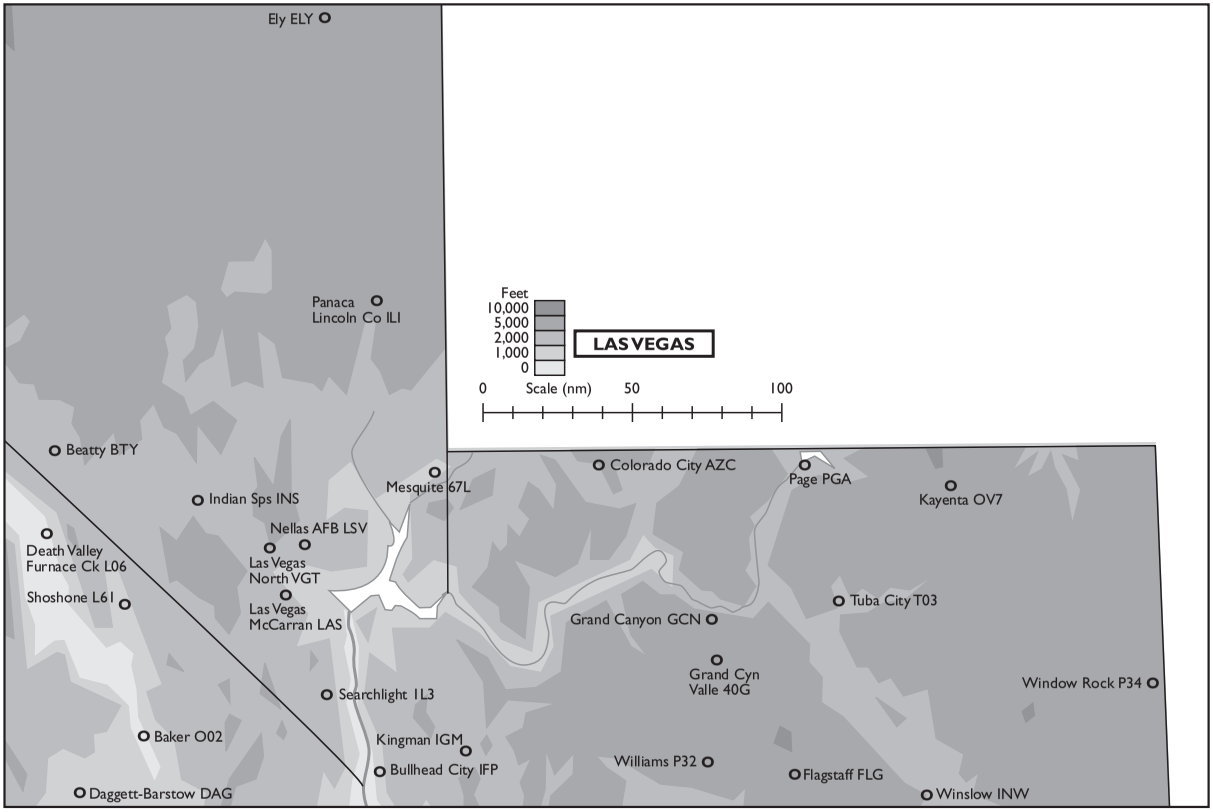
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Tuba City T03
Grand Canyon GCN
Grand Cyn
Valle 40G
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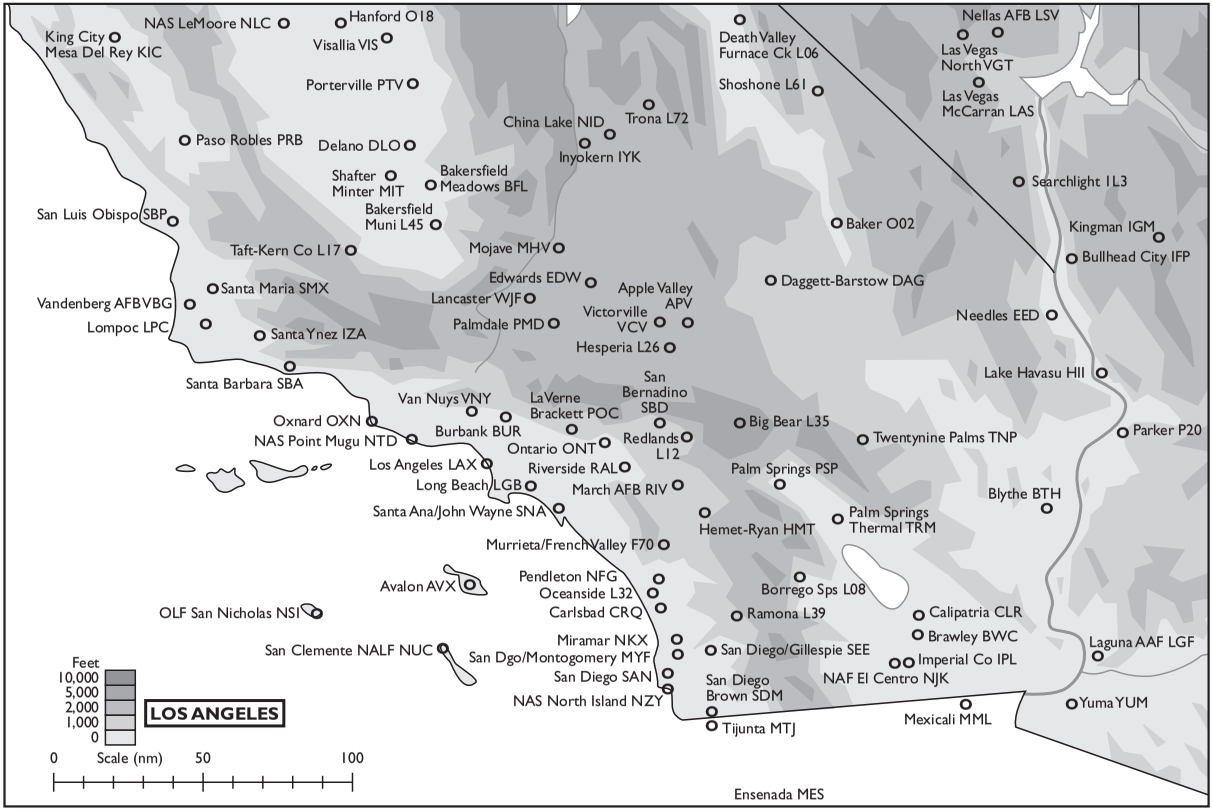
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Bakersfield
Meadows BFL
Bakersfield
Muni L45
San Luis Obispo SBP
Taft-Kern Co L17
Mojave MHV
Santa Maria SMX
Vandenberg AFB VBG
Lompoc LPC
Santa Ynez IZA
Santa Barbara SBA
Edwards EDW
Lancaster WJF
Palmdale PMD
Apple Valley
APV
Victorville
VCV
Hesperia L26
Van Nuys VNY
LaVerne
Brackett POC
San
Bernadino
SBD
Oxnard OXN
NAS Point Mugu NTD
Burbank BUR
Ontario ONT
Redlands
L12
Los Angeles LAX
Riverside RAL
Long Beach LGB
March AFB RIV
Santa Ana/John Wayne SNA
Murrieta/French Valley F70
Avalon AVX
Pendleton NFG
Oceanside L32
Carlsbad CRQ
OLF San Nicholas NSI
San Clemente NALF NUC
Miramar NKX
San Dgo/Montogomery MYF
San Diego SAN
NAS North Island NZY
Tijunta MTJ
Ensenada MES
China Lake NID
Trona L72
Inyokern IYK
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Bullhead City IFP
Daggett-Barstow DAG
Needles EED
Lake Havasu HII
Big Bear L35
Twentynine Palms TNP
Parker P20
Palm Springs PSP
Blythe BTH
Hemet-Ryan HMT
Palm Springs
Thermal TRM
Borrego Sps L08
Ramona L39
Calipatria CLR
Brawley BWC
Laguna AAF LGF
San Diego/Gillespie SEE
Imperial Co IPL
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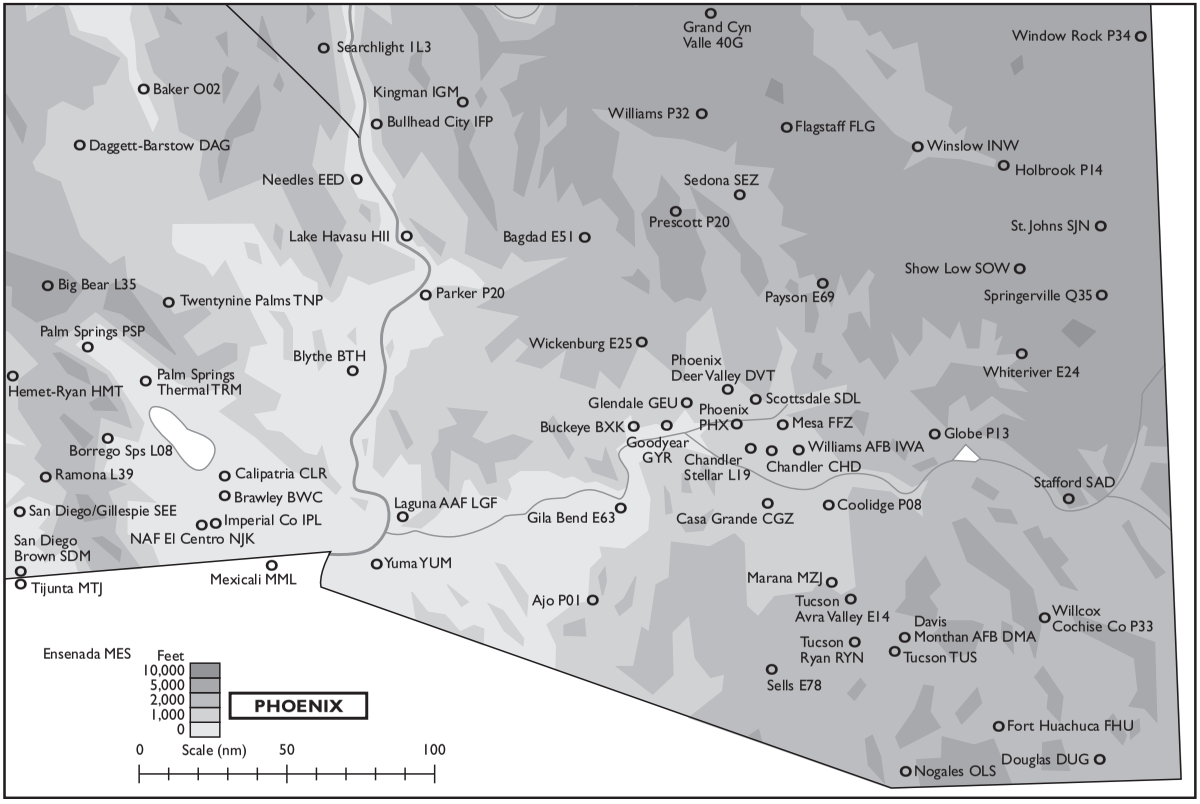
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Holbrook P14
Needles EED
Sedona SEZ
Prescott P20
St. Johns SJN
Lake Havasu HII
Bagdad E51
Show Low SOW
Big Bear L35
Twentynine Palms TNP
Parker P20
Payson E69
Springerville Q35
Palm Springs PSP
Wickenburg E25
Blythe BTH
Phoenix
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Whiteriver E24
Hemet-Ryan HMT
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Mesa FFZ
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Tijunta MTJ
Marana MZJ
Ajo P01
Tucson
Avra Valley E14
Willcox
Cochise Co P33
Davis
Monthan AFB DMA
Tucson
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Scale (nm)
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Fort Huachuca FHU
Douglas DUG
Nogales OLS

Key Strokes & Quick Reference for Windows

aircraft

- [+] increase throttle
- [–] decrease throttle
- [2] trim nose up
- [8] trim nose down
- G gear up/down
- F flaps down 1 notch
- shift + F flaps up 1 notch
- [0] toe brakes (also push stick fwd)
- ↓ climb
- ↑ descend
- → steer right
- ← steer left

autopilot

- J test
- E engage
- A altitude hold
- H heading select
- N navigation mode
- R approach mode
- B back course mode
- W pitch up
- Q pitch down

radios

- T toggle Nav 1 freq's
- Y toggle Nav 2 freq's
- U toggle NDB freq's
- I turn DME switch left
- O turn DME switch right
- Z audio Nav 1
- X audio Nav 2
- C audio DME
- V audio NDB

controls/views

- cmd + F go cockpit
- esc exit cockpit
- P pause simulation
- [5] view forward
- [4] view left @ 45 °
- [6] view right @ 45°
- S toggle L / R panel
- right mouse button drag panel tool
- F1 full panel
- F2 2/3 panel
- F3 1/3 panel

pre-flight
(non-functional from cockpit)

- control + K setup window
- control + H weather window
- control + M map window
- control + O open situation

map

- + zoom in
- – zoom out
- control + 🔍 change magnifiy direction
- shift + ☝ click to position aircraft
- control+click rotate aircraft

[ ] denotes keypad only

Key Strokes & Quick Reference for Macintosh

aircraft

- [+] increase throttle
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- [2] trim nose up
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- [–] zoom out
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- control+click rotate aircraft

[ ] denotes keypad only

TB20 Trinidad Normal Checklist*

COCKPIT CHECK

Preflight Inspection.....COMPL.
Papers.....ABOARD
Seats and Seatbelts.....CKD
Doors.....CLOSED/LATCHED
Parking Brake.....SET
Radio Master.....OFF
Landing Gear Handle.....DOWN
Fuel Selector.....CYCLE
Master Switch.....ON
Fuel Quantity.....CKD

COCKPIT CHECK COMPLETED

ENGINE START

Fuel Pump.....ON
Anticollision Light.....ON
Throttle.....OPEN 1/4"
Prop.....FWD
Mixture.....5 SEC RICH -> CUT OFF
Fuel Pump.....OFF
Prop Area.....CLEAR
Starter.....ENGAGED
Mixture.....FULL RICH
Oil Pressure.....CKD

ENGINE START CHECK COMPL.

AFTER START CHECK

RPM.....1000 -1200
Alternator.....ON
Alternator Light.....CKD OFF
Annunciator Lights.....CKD
Voltmeter.....CKD GREEN
Turn Coordinator.....ON
Nav Lights.....ON
Flaps.....CKD
Radio Master.....ON
AP Master.....ON / TESTED
Landing Gear Lights.....3 GREEN
Trim Tabs.....SET FOR T/O
Transponder.....STBY

AFTER START CHECK COMPLETED

TAXI CHECK

Brakes.....CKD
Flight Instruments.....CKD

TAXI CHECK COMPLETED

RUN UP

Parking Brake.....SET
Flight Controls.....FREE AND CORRECT
Fuel Selector.....FULLEST TANK
Throttle.....2000 RPM
Engine Instruments.....GREEN
Magnetos.....MAX DROP 175, MAX DIFF 150
Prop Check.....1500 RPM
Suction.....CKD
Throttle.....1000-1200 RPM
Flaps.....SET FOR T/O
NAV Setting.....COMPLETED
T/O Briefing.....COMPLETED

RUN UP COMPLETED

BEFORE TAKEOFF

Magnetos.....SET TO BOTH
Fuel Pump.....ON
Pitot Heat.....ON
Landing Light.....ON
Transponder.....ALT
Parking Brake.....RELEASED

BEFORE TAKEOFF CHECK COMPL.

AFTER TAKE OFF

Gear.....UP
Flaps.....UP
Fuel Pump.....OFF
Landing Lights.....OFF
Altimeters.....X-CKD

AFTER TAKE OFF CHECK COMPL.

*This checklist is not for use with a real aircraft.

TB20 Trinidad Normal Checklist*

CRUISE

Cruise Power ..... SET
Engine Instruments ..... GREEN
Fuel Flow ..... CKD
Fuel Selector ..... SET

CRUISE CHECK COMPLETED

APPROACH CHECK

Altimeters ..... SET
Fuel Pump ..... ON
Landing Light ..... ON
NAV Instruments ..... SET
Approach Briefing ..... COMPL
Minimum ..... CKD

APPROACH CHECK COMPLETED

FINAL CHECK

Gear ..... DOWN, 3 GREEN
Tank ..... FULLEST
Prop ..... FWD
Mixture ..... FULL RICH
Flaps ..... SET

FINAL CHECK COMPLETED

CLEAR OF RUNWAY

Fuel Pump ..... OFF
Pitot Heat ..... OFF
Landing Light ..... OFF
Flaps ..... UP
Trim ..... NEUTRAL
Transponder ..... STBY

CLEAR OF RWY CHECK COMPL.

SHUTDOWN / PARKING

Turn Coordinator ..... OFF
Lights ..... OFF
Parking Brake ..... AS REQUIRED
Radio Master ..... OFF
Autopilot Master ..... OFF
Throttle ..... 1200 RPM
Mixture ..... CUT OFF
Anticollision Light ..... OFF
Magnetos ..... OFF
Master Switch ..... OFF
Alternator Switch ..... OFF

SHUTDOWN CHECK COMPLETED

Speeds

Rotate ..... 65 kts
Take Off ..... 70 kts
Initial Climb ..... 75 kts
Best Rate Climb ..... 95 kts
Approach ..... 90 kts
Final ..... 75 kts

Power Settings

Climb ..... 25“ MP, 2500 rpm, 18 gallons
Cruise ..... 23“ MP, 2400 rpm, 16 gallons
Traffic Pattern / Holding ..... 19“ MP, 2200 rpm
Approach / Descent ..... 15“ MP, 2500 rpm

* This checklist is not for use with a real aircraft.

TB20 Trinidad Emergency Checklist*

ENGINE FAILURE DURING TAKEOFF

Speed ..... >70 kts
Landing Gear ..... RETRACTED
Magntos ..... OFF
Fuel Tank Selector ..... OFF
Mixture ..... IDLE CUTOFF

ENGINE FAILURE IN FLIGHT

Fuel Pump ..... ON
Mixture ..... FULL RICH
Fuel Gauges ..... CHECKED
Fuel Tank Selector ..... OTHER TANK
Magnetos ..... SET TO BOTH

EMERGENCY LANDING (ENGINE OUT)

Establish Best Glide Speed ..... 92 kts
Landing Gear ..... RETRACTED
Flaps ..... RETRACTED
Magnetos ..... OFF
Fuel Tank Selector ..... OFF
Seat Belts ..... FASTENED

On Final

Speed ..... 70/76 kts
Flaps ..... FULL
Master Switch ..... OFF

EMERGENCY LANDING (ENGINE RUNNING)

Landing Gear ..... DOWN
Speed ..... 70/76 kts
Flaps ..... FULL
Master Switch ..... OFF
Mixture ..... IDLE CUTOFF

EMERGENCY DESCENT

Speed ..... BELOW 130 kts
Landing Gear ..... DOWN
Speed ..... 140 kts

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