



Bringing the glass cockpit to the palm of your hand

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1. Introduction	1
2. Product Overview.....	3
3. <i>PalmEFIS</i> Product and Feature Summary	6
<i>PalmEFIS</i> Attitude Indicator	6
<i>PalmEFIS</i> Moving Map.....	6
<i>PalmEFIS</i> Windometer	6
<i>PalmEFIS</i> Flight Director	6
<i>PalmEFIS</i> Flight Planning	7
<i>PalmEFIS</i> Datasets	7
4. Requirements.....	8
Hardware and Operating System	8
<i>PalmEFIS</i> Suite Add-on Matrix	8
Registration Id.....	9
5. <i>PalmEFIS</i> Products Getting Started	10
<i>PalmEFIS</i> Installation.....	10
Starting <i>PalmEFIS</i>	11
Setting the Registration Id	11
Configuring the GPS Connection	12
Setting <i>PalmEFIS</i> Preferences.....	13
Disable Palm Auto-Off	14
Setting the Aircraft Information.....	15
Setting the Aircraft Airspeed Specifications.....	16
Setting the Aircraft Cruise Performance.....	17
6. <i>PalmEFIS</i> Attitude Indicator	19
Features	19
Attitude Indicator	19

Aircraft Speed	19
Compass	19
Altimeter	19
Wind Direction and Speed Detection	20
Head Wind and Cross Wind Components	20
Speed, Heading and Altitude Bugs	20
Setting Options	20
Set Bugs	20
Select True or Density Altitude	21
Select Indicated or True Airspeed or Ground Speed	21
Select Magnetic Heading, True Course or Track.....	22
Setting the Current Temperature and Altimeter.....	23
Set Wind Speed and Direction.....	24
Operations	24
Sequence Through <i>PalmEFIS</i> Views.....	26
7. <i>PalmEFIS</i> Moving Map and Terrain Clearance	27
Features	27
Visual Terrain Clearance (<i>PalmEFIS</i> Terrain Clearance only)	27
Uses the <i>PalmEFIS</i> Datasets.....	28
North-up Map	28
Zoomable	28
Eight direction scrolling.....	28
Airport Symbols and Runway Layouts.....	28
Airport Information.....	28
Flight Planning.....	28
Rubberbanding Flight Plan Legs	28
Distance, Heading and ETE to Flight Plan Fixes	29

Nearest Airport.....	29
Setup Options.....	29
Map Options and Legend.....	29
Operations.....	30
Sequence Through <i>PalmEFIS</i> Views.....	31
Zooming and Scrolling	31
Activate a Flight Plan	33
Toggling Fix To/From Details and GPS Enable.....	34
Airport Information.....	34
Nearest Airport.....	35
8. <i>PalmEFIS</i> Windometer	37
Features	37
Aircraft Speed	37
Compass.....	37
Altimeter	37
Wind Direction and Speed Detection	38
Head Wind and Cross Wind Components	38
Speed, Heading and Altitude Bugs	38
Setup Options.....	38
Set Bugs	38
Select True or Density Altitude	39
Select Indicated or True Airspeed or Ground Speed	39
Select Magnetic Heading, True Course or Track.....	40
Setting the Current Temperature and Altimeter.....	41
Set Wind Speed and Direction.....	42
Operations.....	42
Sequence Through <i>PalmEFIS</i> Views.....	43

9. PalmEFIS Flight Director	45
Features	45
Automatic Flight Plan Leg Selection.....	45
Intelligent To/From Fix Selection.....	46
Direct To	46
Fly the Arrow	46
Rubberbanding Legs	46
Identifier, Heading, Distance and ETE	46
Airport Information.....	46
Nearest Airport.....	46
Glide Distance.....	47
Operations	47
Sequence Through PalmEFIS Views.....	48
Activate a Flight Plan	48
Nearest Airport.....	49
Airport Information.....	50
PalmEFIS Flight Planning	53
Features	53
Full Featured Flight Plan Editor	53
Finding Fixes	53
Airport and Navaid Database.....	53
Heading, Distance, ETE and Fuel Usage.....	54
Wind Effects	54
What-if Analysis	54
Operations	54
Accessing the Flight Plan Editor	55
Creating Flight Plans	56

Editing Flight Plans	57
Deleting Flight Plans	58
11. PalmEFIS Datasets.....	61
<i>PalmEFIS</i> Dataset Installation.....	62
Removing <i>PalmEFIS</i> Datasets.....	62
12. Legal	65

1. Introduction

The *PalmEFIS* product suite is a set of sophisticated tools that takes the technologies of glass cockpits and makes it available to all pilots on a business tool that they may already own, the PDA running the PalmOS. A PDA makes an excellent platform because of its good screen size, easy to use user interface and low cost as compared to many GPS platforms. The PDA touch screen and graffiti user interactions are faster and easier than the twist knobs and buttons of the average GPS unit. Added to that the PDA is a powerful computer capable of driving artificial horizons, moving maps, flight planning, and many more flight assisting capabilities.



An important factor that is often overlooked when considering new aircraft instrumentation is its reliance on existing aircraft systems. One of the greatest features of *PalmEFIS* is that it is totally independent of all the aircraft's systems. So as the aircraft systems fail, *PalmEFIS* is there as a reliable backup.

2. Product Overview

The *PalmEFIS* Product set is a collection of products that uses a pluggable architecture to seamlessly integrate an ever-expanding functionality while protecting your initial investment. The seamless integration is more than skin-deep, behind the scenes there is information sharing between the products to make them all the more intelligent as products of the suite are added. *PalmEFIS* suite of products consists of the following products and add-ons:

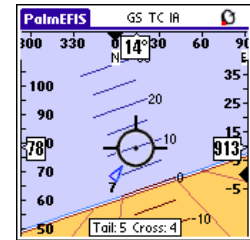
- *PalmEFIS* Attitude Indicator
- *PalmEFIS* Moving Map
- *PalmEFIS* Windometer
- *PalmEFIS* Flight Director (Add-on)
- *PalmEFIS* Flight Planning (Add-on)

The *PalmEFIS* Add-ons are matched with a *PalmEFIS* product to provide expanded its functionality. For example matching *PalmEFIS* with the *PalmEFIS* Flight Director provides *PalmEFIS* with navigational capabilities.

PalmEFIS Attitude Indicator

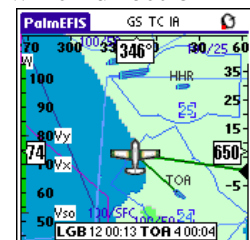
PalmEFIS Attitude Indicator adds the redundancy to your cockpit that you have always wanted. Sure the backup attitude indicator is nice, but when they no longer match which one is failing? With the *PalmEFIS* Attitude Indicator a quick glance gives you the two-out-of-three vote to identify the failing instrument with confidence. In the unlikely event that the complete panel fails *PalmEFIS* Attitude Indicator is there to give you one more chance. With its isolated systems it will be the last instrument standing. *PalmEFIS* uses a heads-up styled display where the Attitude Indicator as its primary view.

Surrounding the Attitude Indicator is the airspeed indicator compass and altimeter. Overlaid onto the Attitude Indicator view is an arrow showing the wind direction and speed, and the resulting head and cross wind components. The wind is detected by monitoring the effects it has on the aircraft's flight profile. The *PalmEFIS* Attitude Indicator view is configurable to match your aircraft specifications.



PalmEFIS Moving Map

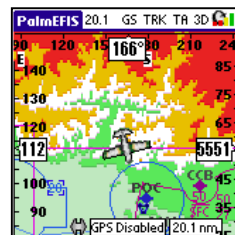
PalmEFIS Moving Map uses a map view within the heads-up styled display. Where the airspeed indicator, compass, and altimeter tell you how fast you are going, which direction and how high, the map tells you where you are located. The map contains airports, nav aids and airspace layered on top of geographical elevation contours. Overlaid on top of the map is the flight plan information that shows you where you are in relation to where you want to go. All the airports and nav aids that you fly over have popup airport information that gives you their communications frequencies, runway layout diagrams, supported services and various remarks. To build flight plans *PalmEFIS* Moving Map includes a full featured flight plan editor. When you need to get to an airport fast pressing the *PalmEFIS* Moving Map Nearest Airport button directs you to the nearest



airport, tells you how far away it is and how long it will take you to get there. The *PalmEFIS* Moving Map is configurable to match your aircraft specifications or pilot preferences.

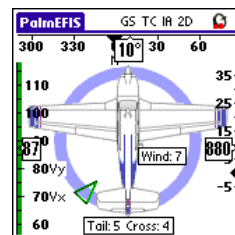
PalmEFIS Terrain Clearance

PalmEFIS Terrain Clearance shows the pilot the perspective of the surrounding terrain with respect to their altitude. With this view the terrain that would conflict with their aircraft is painted red and the terrain one thousand feet below their altitude as a cautionary yellow. As the aircraft raises above the cautionary ground clearances the terrain's surface contours are revealed. Continuously displayed on the Terrain Clearance view are the airports and airspaces for the region. Flight plans that are built with the *PalmEFIS* Flight Plan editor can be activated and navigated with respect to the surrounding terrain elevations.



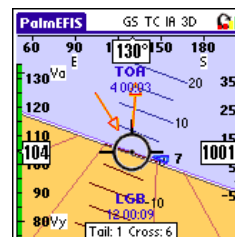
PalmEFIS Windometer

PalmEFIS Windometer focuses on a wind relationship view within the heads-up styled display. Here an image of an aircraft has the wind detection and speed overlaid on top of it in the relationship of how the wind is effecting it. The wind speed and direction is automatically determined by monitoring the effect that the wind is having on the aircraft's flight profile. The *PalmEFIS* Windometer view is configurable to match your aircraft specifications.



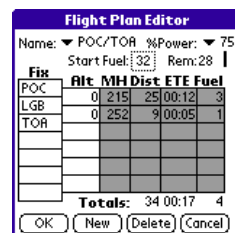
PalmEFIS Flight Director (Add-on)

The Flight Director overlays flight plan information on top of *PalmEFIS*, *PalmEFIS* Moving Map, and *PalmEFIS* Windometer. The Flight Director supports automatic flight plan leg selection and automatic To/From fix determination within a flight plan leg. This allows the Flight Director to intelligently sequence you through a flight plan in a forward or reverse direction without pilot intervention. Along the way the Flight Director displays the To/From fix identifiers, and the distance and ETE to the fixes. Popup airport information is available on the To/From fixes giving you instant access to communications frequencies, runway layout diagrams, services and airport remarks. In case of an emergency the nearest airport is a button push away.



PalmEFIS Flight Planning (Add-on)

PalmEFIS Flight Planning is a full featured flight plan editor. It builds flight plans from an airport and navaid database so that the minimum amount of information needs to be entered. If necessary custom waypoints are definable for the flight plan. Distance, time and fuel usage is calculated for each leg and is summed. The total fuel usage is compared against available fuel. Since the Flight Plan Editor knows your aircraft performance specifications “What-if” analysis is available by adjusting the flight plan leg altitudes and percent power to see the changes in ETE and fuel usage. This helps insure that there will be



enough fuel onboard for the trip.

PalmEFIS Datasets

The *PalmEFIS* Datasets provide the information that is used by the *PalmEFIS* Moving Map, Flight Director and Flight Planning. Contained within the datasets are the airport and navaid information, airspace information and the mapping topographical data. This means that you are not required to build your own maps or to pay the expenses of joining another online service to get your mapping and flight planning data chunks. Up to date information and high quality/high resolution maps are available for immediate use. Because the dataset are prebuilt for the *PalmEFIS* Suite to provide information on very large geographical areas. This means that you are not required to download new datasets for new flight plans, all that you need will need is most likely be already on your Palm.

***3.PalmEFIS* Product and Feature Summary**

***PalmEFIS* Attitude Indicator**

- Attitude Indicator
- Aircraft Speed (ground speed, true air speed, indicated air speed)
- Compass (true course or track, magnetic heading)
- Altimeter (true altitude, density altitude)
- Wind Direction and Speed Detection
- Head Wind and Cross Wind Components
- Speed, Heading and Altitude Bugs

***PalmEFIS* Moving Map**

- North-up Map
- Zoomable (120 miles to less than a mile)
- Eight direction scrolling
- Airport Symbols and Runway Layouts
- Airport Information
- Flight Planning
- Rubberbanding Flight Plan Legs
- Distance, Heading and ETE to Flight Plan Fixes
- Nearest Airport
- Includes *PalmEFIS* Flight Director
- Includes *PalmEFIS* Flight Planning

***PalmEFIS* Windometer**

- Aircraft Speed (ground speed, true air speed, indicated air speed)
- Compass (true course or track, magnetic heading)
- Altimeter (true altitude, density altitude)
- Wind Direction detection
- Head Wind and Cross Wind Components
- Speed, Heading and Altitude Bugs.

***PalmEFIS* Flight Director**

- Airport Information
- Flying the Arrow to Fixes (*PalmEFIS* Attitude Indicator and Windometer)
- Rubberbanding Flight Plan Legs (Moving Map)
- Automatic Flight Plan traversal
- Intelligent To/From Flight Plan Fix Selection
- Distance, Heading and ETE to Flight Plan Fixes
- Direct To Flight Plan Fixes

- Nearest Airport
- Safe Gliding Determination to Nearest Airport

PalmEFIS Flight Planning

- Full Flight Plan Editing
- Airport and Navaid database
- Heading, Distance, ETE, and Fuel Usage Calculations
- Distance, Time, and Fuel Usage Totals
- Remaining Fuel
- Taxi Fuel Burns
- Fix Identifier and Partial Name Lookups
- Altitude and Percent Power What-If Analysis
- Uses Detected Wind Conditions

PalmEFIS Datasets

- Airport Information
 - Name
 - Identifier
 - Type
 - Altitude
 - Runway layout diagrams
 - Communications Frequencies
 - Services
 - Remarks
- Navaid Information
 - Name
 - Identifier
 - Type
 - Altitude
 - Communications Frequencies
- Airspace Information
 - Controlling authority
 - Type
 - Minimum altitude
 - Maximum altitude
 - Shape
- Topographical data.
 - Location
 - Elevation

4.Requirements

This section describes the hardware, software and interdependencies of the *PalmEFIS* products.

Hardware and Operating System

The *PalmEFIS* products run on a wide range of PalmOS PDA devices and virtually all GPS receivers that are capable of providing a data feed. *PalmEFIS* provides a demonstration mode that allows you to try it on your PDA before a purchase. If you do not own a PDA or GPS, or are looking to upgrade here is a set of guidelines for your purchase.

The Minimum *PalmEFIS* Requirements:

- *PalmEFIS* runs on any PalmOS compatible PDA with the PalmOS version of 3.5 or greater.
- CPU speed of at least 33 mhz.
- At least 8 megs of memory on the PDA.
- A Color PDA is optional but highly recommended.
- Any GPS that supports NMEA 0183 v2.0 RMC, GGA, and GSA sentences.

PalmEFIS Suite Add-on Matrix

The *PalmEFIS* product suite can be mixed and matched to provide the functionality that you need. The *PalmEFIS* Suite Matrix shows the possible combinations and dataset requirements.

	<i>PalmEFIS</i>	<i>PalmEFIS</i> Moving Map	<i>PalmEFIS</i> Windometer	<i>PalmEFIS</i> Flight Director (add-on)	<i>PalmEFIS</i> Flight Planning (add-on) * ₃
<i>PalmEFIS</i>		✓	✓	✓	✓
<i>PalmEFIS</i> Moving Map	✓		✓	Included	Included
<i>PalmEFIS</i> Terrain Clearance	✓		✓	Included	Included
<i>PalmEFIS</i> Windometer	✓	✓		✓	✓
<i>PalmEFIS</i> Flight Director (add-on)	✓	* ₁ Included	✓		Required
<i>PalmEFIS</i> Flight Planning (add-on) * ₃	✓	* ₁ Included	✓	* ₂ Required	
<i>PalmEFIS</i> Datasets		Required		Required	Required

*₁ Included in *PalmEFIS* Moving Map and Terrain Clearance.

- *₂ The *PalmEFIS* Flight Director requires the Flight Planning add-on.
- *₃ The *PalmEFIS* Flight Planning is a free add-on.

All of the products of the *PalmEFIS* products are purchased separately unless otherwise noted. When purchased each product adds additional functionality while seamlessly integrating with prior *PalmEFIS* Suite purchases. Products within the *PalmEFIS* Suite do not require the other products of the suite to function, with the exception of the add-ons. The *PalmEFIS* Suite add-ons require at least one of the *PalmEFIS* Suite products to be fully functional.

Registration Id

The *PalmEFIS* Suite runs in a demonstration mode until they are purchased. This allows you to experience the full functionality with the exception of connecting it to a GPS to receive its data feed. Once a *PalmEFIS* product is purchased you will be supplied with a Registration Id. Entering the Registration Id into *PalmEFIS* turns on the GPS data feed.

5. *PalmEFIS* Products Getting Started

The *PalmEFIS* Suite is pretty much ready to go as soon as it is installed on your PDA. When *PalmEFIS* is first installed it runs in a demo mode. In the demo mode *PalmEFIS* simulates a GPS data feed. In order for *PalmEFIS* to use the realtime GPS data the Registration Id must be set. The Registration Id is issued when the *PalmEFIS* products are purchased. The other things that you may want to do before using *PalmEFIS* is to set the display units and to configure *PalmEFIS* for your GPS and aircraft.

To help you get all products in the *PalmEFIS* Suite up and going quickly we'll walk you through the steps necessary to get started. These include:

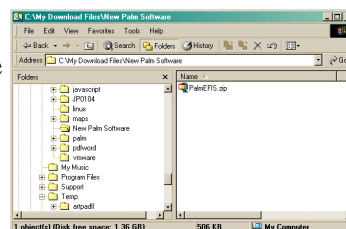
- *PalmEFIS* Installation
- Starting *PalmEFIS*
- Setting the Registration Id
- Configuring the GPS Connection
- Setting *PalmEFIS* Preferences
- Disable Palm Auto-Off
- Setting the Aircraft Information
- Setting the Aircraft Airspeed Specifications
- Setting the Aircraft Cruise Performance

PalmEFIS Installation

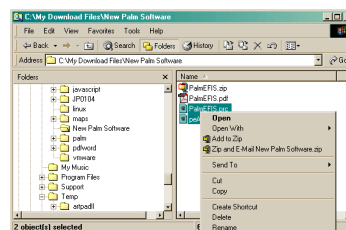
The primary use of HotSync operation is to synchronize your PDA with the information that is on your desktop. But the HotSync operation is also used to install new software onto your PDA. This is how *PalmEFIS* is installed on your PDA.

To install *PalmEFIS* first go to the www.HangarB17.com site and download the program(s).

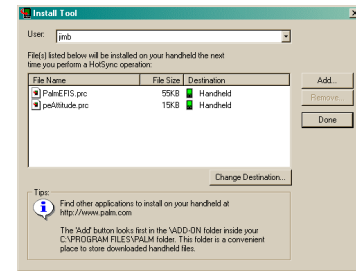
Locate the downloaded program(s), The Windows Explorer is very useful for this. They will be in a zip file. Expand the zip file into the directory that they were downloaded.



Select all the files that end with a ".prc" or ".pdb" extension. Using the mouse right-click on the selected files. A popup menu will be displayed with "Open" as the first menu item. Select the "Open" menu item.



The selected “.prc” or “.pdb” files are then opened into the Palm Install Tool. They are now ready to be installed on your PDA with a HotSync operation.



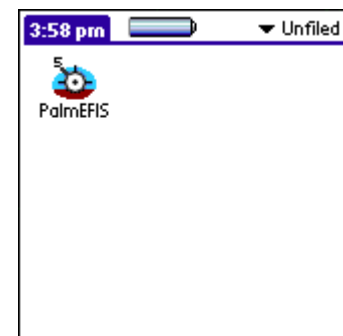
Pressing the HotSync button on the Palm cradle starts the HotSync operation that will install the *PalmEFIS* software.



Starting *PalmEFIS*

PalmEFIS must first be installed on the Palm Handheld through a HotSync operation. By default *PalmEFIS* will be put into the Palm **Unfiled** category.

To start or launch *PalmEFIS* go to the Unfiled category on your Palm Handheld and tap on the *PalmEFIS* icon.



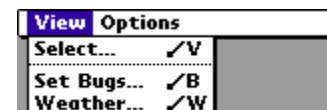
Setting the Registration Id

When *PalmEFIS* is downloaded it runs in a demonstration mode, which ignores GPS input until the Registration Id is entered. After the Registration Id is entered *PalmEFIS* auto detects the attached GPS unit and starts using its input to update the display. With each *PalmEFIS* product purchase the Registration Id is augmented to reflect each product. Therefore only enter the last Registration Id issued.

To set the Registration Id tap on the Palm dropdown menu button in the Palm graffiti area after launching *PalmEFIS*.



The menu bar is displayed at the top of the Palm display area. Select the **Options** menu.



The Options menu drop down will be displayed. Select the **About** menu item.



The **About** dialog is displayed with the **Reg Id** entry field just above the OK push button. In this field enter the *PalmEFIS* registration id that you received with your purchase.

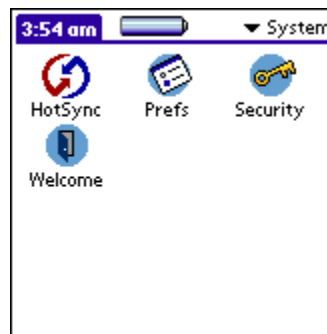


Configuring the GPS Connection

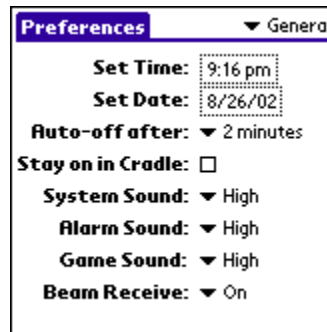
PalmEFIS will automatically connect to most GPS receivers and does not need configuring. If your GPS receiver uses a serial port other than the Cradle/Cable port and its baud rate is other than 4800 bps you will need the following setup.

The *PalmEFIS* Garmin and Bluetooth GPS drivers do not need to be configured. These GPS drivers are self-configuring. Removing the prior PalmEFIS driver (peGpsDriverStd) and HotSyncing the Garmin or Bluetooth GPS driver onto the PDA is all that is necessary.

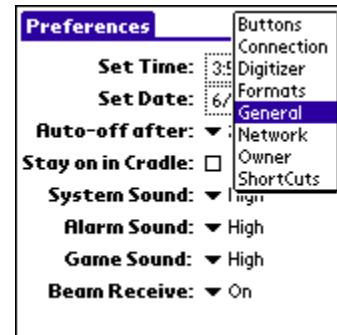
To configure *PalmEFIS* to connect to a GPS receiver go to the Palm **System** category. Launch the **Prefs** application by tapping on its icon.



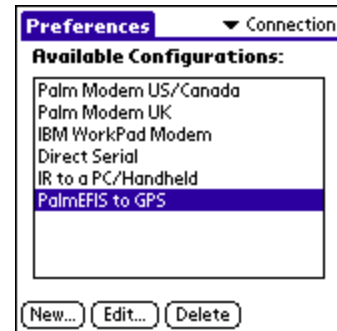
In the upper right corner of the Preferences dialog is a popup list that is most likely displaying **General**. Tapping on the popup list displays the available preference sections.



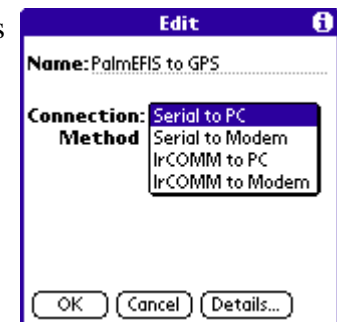
Selecting the **Connection** popup list item from the popup list accesses the Preference's connections.



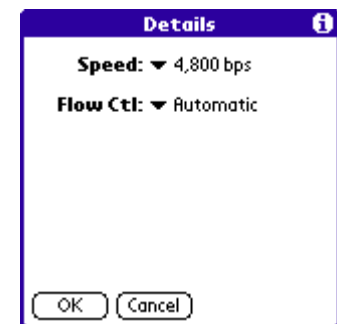
From the Preference's **Available Configurations** list, select the **PalmEFIS to GPS** configuration and press the Edit push button.



The connection **Edit** dialog is used to select a serial port which is called a **Connection Method**. Using the Connection Method's popup list select another serial port, other than the default Cradle/Cable port. This could be a port such as the CD port.



To change the port's **baud rate** tap on the Details push button. This displays the connection Details dialog.



The baud rate or connection **Speed** is changed by tapping on the Speed popup list and selecting the baud rate that the GPS receiver supports. Consult the GPS documentation to determine the appropriate speed. The default speed is 4,800 bps.

Setting *PalmEFIS* Preferences

PalmEFIS supports customization of units and display settings.

Units can be changed for:

- distance
- altitude

- speed

The different units are typically selected based on aircraft instrumentation or pilot preferences.

Display preferences exposes flight calculator styled functionality for:

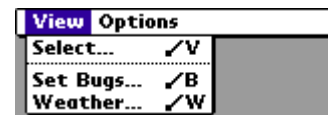
- speed
- heading
- altitude with their specific variations

For example speed could be displayed as indicated airspeed, true airspeed, or ground speed.

To change the *PalmEFIS* preferences tap on the Palm dropdown menu button in the Palm graffiti area after starting *PalmEFIS*.



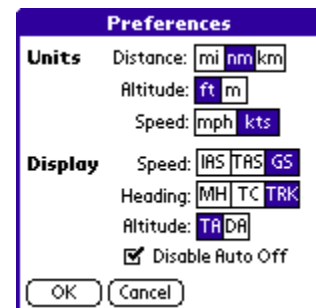
The menu bar is displayed at the top of the Palm display area. Select the **Options** menu.



The Options menu will drop down. Select the **Preferences** menu item.



The **Preferences** dialog will display once the Preferences menu item is tapped. At the top of the dialog is the **Units** section. Here **Distance** could be set to miles (**mi**), nautical miles (**nm**), or kilometers (**km**) by tapping on the corresponding box. **Altitude** has the option of displaying in feet (**ft**) or meters (**m**). **Speed** can display in miles per hour (**mph**) or knots (**kts**). As in the distance field, tapping on the corresponding button box sets the altitude and speed units.



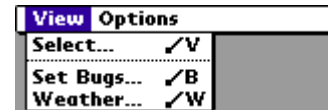
Disable Palm Auto-Off

Disabling the Palm auto-off feature allows *PalmEFIS* to continuously display results during a flight. Otherwise the Palm will automatically shutoff after a period of inactivity. Yet before the flight when preferences are being set or weather parameters are being entered it is advantageous to have the Palm auto shutoff to conserve power.

To disable the Palm auto-off capability, tap on the Palm dropdown menu button in the Palm graffiti area after *PalmEFIS* is launched.



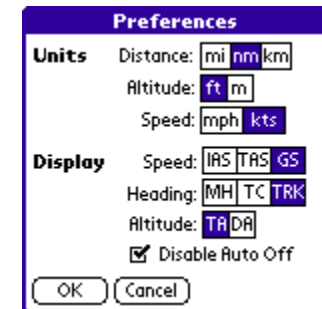
The menu bar is displayed at the top of the Palm display area. Select the **Options** menu.



The Options menu will drop down. Select the **Preferences** menu item.



The **Preferences** dialog will display once the Preferences menu item is tapped. At the bottom of the Preferences dialog is the **Disable Auto Off** check box. Check the check box to keep your Palm from turning off. Uncheck the check box to allow the Palm to turn off after a period of inactivity.



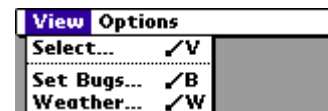
Setting the Aircraft Information

PalmEFIS records various aircraft specifications to assist in customizing the display to match your aircraft and as support for *PalmEFIS* add-on functionality such as *PalmEFIS* Flight Planning and the Flight Director.

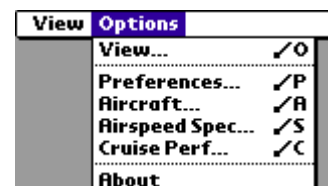
To change the *PalmEFIS* aircraft information tap on the Palm dropdown menu button in the Palm graffiti area after launching *PalmEFIS*.



The menu bar is displayed at the top of the Palm display area. Select the **Options** menu.



The Options menu will drop down. Select the **Aircraft** menu item.



The **Aircraft Information** dialog will display once the Aircraft menu item is tapped. In this dialog various aircraft specific detail are entered. Enter the aircraft identification number in the **Call Sign** field. The **Crosswind** (maximum crosswind), **Glide Ratio**, **Climb Rate**, **Ceiling** (service ceiling), **Takeoff** (takeoff distance), **Landing** (landing distance) and **Taxi** fuel consumption fields are entered based on the aircraft specifications listed in the aircraft handbook. The **Usable** (usable fuel) should be entered based on the amount of fuel that is onboard for a given flight.

Aircraft Information	
Call Sign:	N5077R
Performance	
Crosswind:	17
Glide Ratio:	3.1 miles per 1000 ft
Climb Rate:	1200
Ceiling:	16000
Takeoff:	465
Landing:	425
Fuel	
Usable:	42
Taxi:	1.5
<input type="button" value="OK"/> <input type="button" value="Cancel"/>	

Consult your Pilot's Operating Manual to get these numbers. The Glide Ratio may have to be determined experimentally if it is not listed in the manual. If the glide ratio is not listed in the manual climb your aircraft up to a safe altitude and then pull back the power. Trim your aircraft to it best glide speed and record your altitude and initial distance. After descending say 3 thousand feet record the number of miles flown while gliding. Then apply the following formula:

Glide Ratio = miles * 1000 / feet descended

For example:

Glide Ratio = 5 miles * 1000 / 2000 feet = 2.5

Enter 2.5 as the Glide Ratio.

Setting the Aircraft Airspeed Specifications

The *PalmEFIS* **Airspeed Specifications** dialog has the aircraft speeds that are used to customize the *PalmEFIS* speed gage.

To change the *PalmEFIS* aircraft airspeed specifications tap on the Palm dropdown menu button in the Palm graffiti area after starting *PalmEFIS*.



The menu bar is displayed at the top of the Palm display area. Select the **Options** menu.


View	Options
Select...	✓V
Set Bugs...	✓B
Weather...	✓W

The Options menu will drop down. Select the **Airspeed Spec** menu item.

View	Options
View...	✓O
Preferences...	✓P
Aircraft...	✓A
Airspeed Spec...	✓S
Cruise Perf...	✓C
About	

The **Airspeed Specification** dialog will display once the Airspeed Spec menu item is tapped. The information used to enter into this dialog is listed in the aircraft handbook. The airspeed values are cross-checked with each other so it is important to have all the airspeed numbers handy before entering them into the dialog fields. Some aircraft do not have flaps, which means that they will not have a dirty stall speed (V_{S2}). In this case set the **Vs1 Clean** field to 0.

Consult your Pilot's Operating Manual to get these numbers.



Airspeed Specifications

Units: mph

Climb
 Vr Rotation: 56
 Vx Angle: 70 Vy Climb: 80

Structural
 Va Design: 132 Vno Cruise: 160
 Vne: 200

Stall
 Vso: 53 Vs Clean: 53

OK Cancel

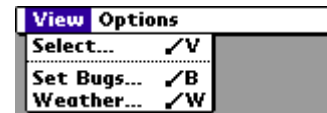
Setting the Aircraft Cruise Performance

The *PalmEFIS* **Cruise Performance** dialog captures the aircraft cruise specifications that are used during flight planning. *PalmEFIS* requires a minimum subset of the cruise information to be entered for it to interpolate the rest of the performance chart.

To change the *PalmEFIS* cruise performance information tap on the Palm dropdown menu button in the Palm graffiti area after starting *PalmEFIS*.



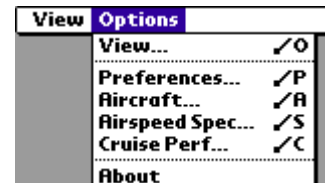
The menu bar is displayed at the top of the Palm display area. Select the **Options** menu.



View Options

Select... /V
 Set Bugs... /B
 Weather... /W

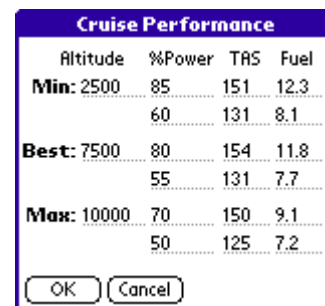
The Options menu will drop down. Select the **Cruise Perf** menu item.



View Options

View... /O
 Preferences... /P
 Aircraft... /A
 Airspeed Spec... /S
 Cruise Perf... /C
 About

The **Cruise Performance** dialog will display once the Cruise Perf menu item is tapped. Before entering values into the cruise performance table notice that the table is broken into three altitude ranges. The three **altitude** ranges that should be entered into the table are the aircraft's minimum altitude performance specifications, the best performance altitude, and maximum altitude performance specifications. For each altitude only enter the highest and lowest **Percent Power** specifications.



Cruise Performance

Altitude	%Power	TAS	Fuel
Min: 2500	85	151	12.3
	60	131	8.1
Best: 7500	80	154	11.8
	55	131	7.7
Max: 10000	70	150	9.1
	50	125	7.2

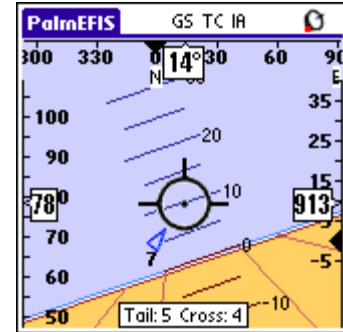
OK Cancel

If your aircraft has a **variable pitch prop**, select the rpm that you typically use during normal cruise, and use the rpm's corresponding cruise performance specifications.

Consult your Pilot's Operating Manual to get these numbers.

6. PalmEFIS Attitude Indicator

The *PalmEFIS* attitude Indicator utilizes the power of the Palm to produce flight and navigation instrumentation in the same manner as a Heads Up Display that is a useful backup, cross check, or convenience to pilots in their flight experience. In some cases *PalmEFIS* gives the pilot an added safety margin. With the cross wind and head wind components pilots are alerted early to dangerous conditions so that they could land to refuel if head winds are too strong or select another airport if the cross winds exceed the aircraft capabilities or the pilot's comfort level. With the *PalmEFIS* density altitude feature pilots can cross check their aircraft's altitude performance margins visually in real-time. But one of the biggest reasons for having *PalmEFIS* in your flight bag is on those dark high overcast nights or flights in the clouds when the instrument panel goes dark. Pointers no longer correspond to each other. Where the next communication would be "I've lost all..." That's when *PalmEFIS* gives you one more chance to return to earth safely.



Features

PalmEFIS has features similar to a Heads Up display with the addition of **wind direction** and speed, and the effect that the wind has on the aircraft. As with most Heads Up displays the **aircraft speed** is on the left edge of the display, the **aircraft direction** is on top, with the **current altitude** displayed on the right edge. In the center is the **aircraft attitude**. The wind effects are a composite on the aircraft attitude display. This will graphically display the wind direction with respect to your aircraft direction along with the current wind speed. *PalmEFIS* has the net effect of a flight computer that constantly updates itself based on the current flight conditions.

Attitude Indicator

The Attitude Indicator is driven from a synthetic gyro. to show rate of climb and turn.

Aircraft Speed

The aircraft speed is configurable to display Ground Speed, True Airspeed, or Indicated Airspeed. The speed could also be set to use knots or mph units.

Compass

The compass is configurable to show either the True Course or Magnetic Heading.

Altimeter

The altimeter displays True Altitude or uses the outside air temperature, atmospheric

pressure and current altitude to determine and display the Density Altitude.

Wind Direction and Speed Detection

PalmEFIS can work with statically entered wind speeds and directions or it can automatically determine the wind conditions from the wind effects on your flight profile.

Head Wind and Cross Wind Components

To assist a pilot with their landing or headwind decisions *PalmEFIS* breaks the wind conditions into their head and crosswind components and displays them as an overlay on the Attitude Indicator view.

Speed, Heading and Altitude Bugs

The aircraft speed indicator, compass and altimeter all support bugs to mark the targeted speed, heading and altitude.

Setting Options

Setting the *PalmEFIS* options allows the pilot to configure it to their preferences or to use it in the same way as a flight calculator. The *PalmEFIS* options are:

- Set Bugs
- Select True or Density Altitude
- Select Indicated or True Airspeed or Ground Speed
- Select Track, True Course or Magnetic Heading
- Setting the Current Temperature and Altimeter
- Set Wind Speed and Direction

Set Bugs

PalmEFIS has Bugs for targeted trip speed, heading and altitude. The bugs are displayed as black triangles on the speed, heading and altitude scales in a position that represents the bug value. The bugs will be displayed on the *PalmEFIS* Speed Indicator, Compass and Altimeter gauges.

To set a speed, heading or altitude bug tap on the Palm dropdown menu button in the Palm graffiti area after starting *PalmEFIS*.



The Palm dropdown menu bar will appear with the **View** menu highlighted. Select the **Set Bugs** menu item.

View	Info	Options
Attitude		✓A
Moving Map		✓M
Flight Plan		✓F
Windometer		✓W
Set Bugs...		✓B
Weather...		✓W

When the Set Bugs menu item is selected, *PalmEFIS* displays the **Bugs** dialog. Here the current heading, altitude and speed bugs are displayed. To change a bug setting drag Palm stylist over the value to change and then enter a new value in the Palm graffiti area.



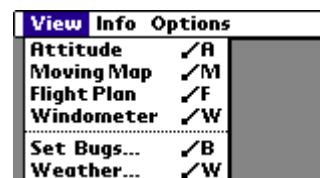
Select True or Density Altitude

PalmEFIS can display the altitude as true altitude or density altitude. When density altitude is selected the Altimeter scale and current altitude value adjust to display the density altitude. For the density altitude to display correctly the current temperature must be set on the Weather dialog. After selecting true or density altitude the *PalmEFIS* status bar will display “TA” (true altitude) or “DA” (density altitude) depending on what was selected.

To select density or indicated altitude for *PalmEFIS* to display, after starting the *PalmEFIS*, tap on the Palm dropdown menu button in the Palm graffiti area.



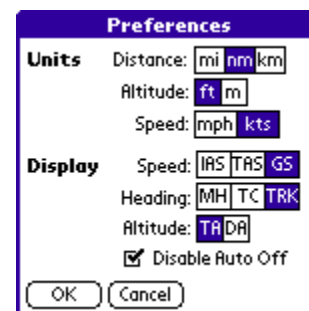
The menu bar is displayed at the top of the Palm display area. Select the **Options** menu.



The Options menu will drop down. Select the **Preferences** menu item.



The **Preferences** dialog will display once the Preferences menu item is tapped. The true altitude/density altitude selection is near the bottom of the dialog in the Altitude field. To select indicated altitude tap on the **TA** box. Density altitude is selected by tapping the **DA** box.



Select Indicated or True Airspeed or Ground Speed

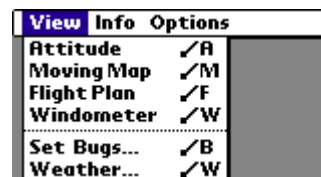
The GPS data feed supplies the ground speed of the aircraft. It is possible with variations in heading while the indicated airspeed of the aircraft is held constant to determine the true airspeed of the aircraft. When the current temperature is entered into *PalmEFIS* it can then determine the aircraft's indicated airspeed. As such *PalmEFIS* can display any of the speed

modes depending on pilot preferences or as a crosscheck of aircraft instrumentation. When the pilot selects a ground speed, true airspeed or indicated airspeed, the speed mode is displayed on the *PalmEFIS* status bar as the corresponding GS, TAS, or IAS.

To select indicated airspeed, true airspeed or ground speed for *PalmEFIS* to display, tap on the Palm dropdown menu button in the Palm graffiti area after launching *PalmEFIS*.



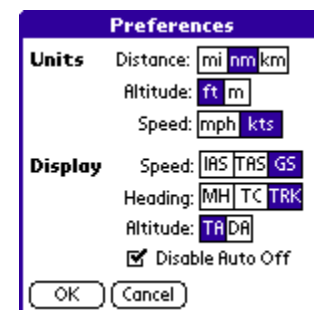
The menu bar is displayed at the top of the Palm display area. Select the **Options** menu.



The Options menu will drop down. Select the **Preferences** menu item.



The **Preferences** dialog is displayed when the Preferences menu item is tapped. Find the **Speed** field in the **Display** section of the dialog. **Indicated Airspeed** is selected by tapping on the **IAS** box. To select **True Airspeed** tap the **TAS** box. **Ground Speed** is selected by tapping on the **GS** box.



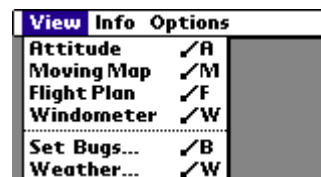
Select Magnetic Heading, True Course or Track

PalmEFIS can display the heading information with or without the magnetic variance for the current location. The heading without the magnetic information is the true course as opposed to using the magnetic variation to get the magnetic heading. The current heading mode is displayed on the *PalmEFIS* status bar as TC for true course, MH for magnetic heading or TRK for track.

To select magnetic or true course heading for *PalmEFIS* to display, tap on the Palm dropdown menu button in the Palm graffiti area after launching *PalmEFIS*.



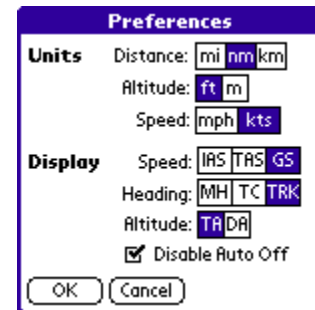
The menu bar is displayed at the top of the Palm display area. Select the **Options** menu.



The Options menu will drop down. Select the **Preferences** menu item.



The **Preferences** dialog is displayed when the Preferences menu item is tapped. In the **Display** section of the dialog is the **Heading** field. The Heading field could be set to magnetic heading (**MH**), true course (**TC**), or Track (**TRK**). Tapping on the corresponding box sets the heading mode. The selected box is shaded to show the selection.



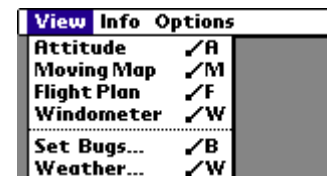
Setting the Current Temperature and Altimeter

The current temperature and Altimeter values are used for density altitude and indicated airspeed determination. The current temperature must be set before *PalmEFIS* can display the density altitude or the indicated airspeed accurately.

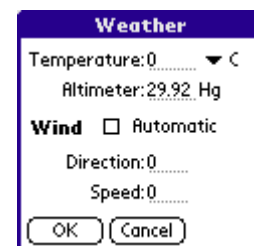
To set the current temperature or altimeter values, tap on the Palm dropdown menu button in the Palm graffiti area after launching *PalmEFIS*.



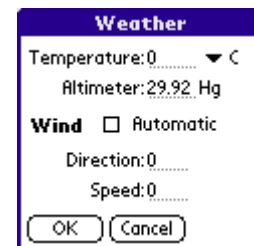
With the **View** menu displayed select the **Weather** menu item.



Enter the current temperature in the **Temperature** field. The temperature could be either Celsius or Fahrenheit. Set the temperature units in the popup list at the end of the Temperature field according to the units of the temperature value entered by tapping on the down triangle and selecting C (Celsius) or F (Fahrenheit).



Enter the current altimeter setting in the **Altimeter** field.



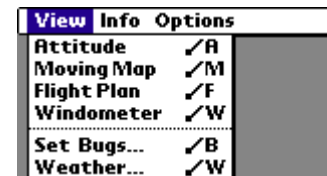
Set Wind Speed and Direction

PalmEFIS supports automatic wind speed and direction detection or pilot entered wind speed and direction. With the wind detection set in the automatic mode *PalmEFIS* determines the wind speed and direction when the aircraft changes direction with a course difference of at least 20 degrees. A new wind speed and directions is calculated after three consecutive course changes. During the automatic wind detection process the indicated airspeed must be constant. The pilot can at any time over-ride automatic wind detection and designate a wind speed and direction. This is useful during the initial portion of the flight where ATIS information is available and the automatic wind detection has not gathered enough information to accurately predict the wind conditions.

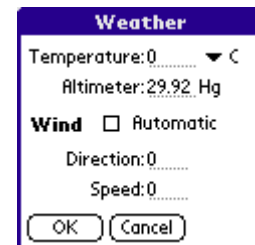
To tell *PalmEFIS* to automatically detect wind speed and direction or to manually enter it, tap on the Palm dropdown menu button in the Palm graffiti area after launching *PalmEFIS*.



With the **View** menu displayed select the **Weather** menu item.



The **Weather** dialog will appear. For automatic wind detection check the **Automatic** check box. To over-ride the automatic wind detection uncheck the **Automatic** check box and enter a wind direction in the Direction field and wind speed in the Speed field.



Operations

The Inner-Works

The *PalmEFIS* **Attitude** indicator works by comparing the rate of heading and climb change. It then takes the changes and applies several mathematical relationships to determine bank and climb rate. Because *PalmEFIS* relies on rate changes from a GPS signal there is a response time delay. This delay comes from the fact that a GPS receiver sends updates once a second and in order to detect a rate change one or more data samples must be collected. *PalmEFIS* uses artificial intelligence in the form of modified fuzzy logic to minimize the delay effects. As such *PalmEFIS* can usually track within one to two seconds of actual conditions. This has proved to be more than good enough to detect a failing instrument or even control an aircraft if the ultimate instrument failure happens.

The *PalmEFIS* **Wind Detection** is determined by capturing the flight speed changes that happen during a flight. The effects of power setting changes and climb/descent speeds variations are filtered out to leave the effect caused by the wind. With the remaining wind effects the wind speed and direction is determined. Three or more turns are necessary for each wind sample where each turn must be greater then 25 degrees. The best wind detection

results are seen when the airspeed is held constant and the turns are greater than 45 degrees.

Best Practices

The *PalmEFIS* **Attitude** indicator responds to a wide range of flight conditions. Standard rate turns, steep turns along with the range of bank rate changes. It adjusts to quick jumps into and out of turns, to follow the aircraft's flight profile as close as possible. Yet it is possible to fool the attitude indicator. For example if a bank is added and then removed in less than a second *PalmEFIS* will most likely not notice it. Slow rolls without heading change will also go unnoticed. Another flight condition that *PalmEFIS* misses is inverted flight. This means that intentional aerobatics in the clouds is not recommended. Yet *PalmEFIS* can help you recover from unintentional cloud based aerobatics. This is because it will accurately display grave yard spirals in the same manner as a gyro driven attitude indicator with a steep bank and high rate of descent. If you accidentally roll inverted in the clouds *PalmEFIS* will help you achieve a stable wings level and level forward direction flight profile. At that point gravity will take over and you know that you are upside down because you are hanging from your seat belt and shoulder harness. Then it's a matter of pushing the nose up 20 degrees, neutralizing the elevator, and using the ailerons to roll the plane upright. Here *PalmEFIS* will become effective once more as the aircraft comes upright as you slowly roll out of the aileron roll and the subsequent turn that will happen as the aircraft roll rate slows down. The good part is that *PalmEFIS* will help keep things straight and level by watching the *PalmEFIS* attitude trends and making directional changes slowly and deliberately or fly the same as you would for normal IFR flight. As always practice helps.

The **Altimeter** can display indicated or density altitudes. In the mountains in the summer time it is useful to do a quick switch to density altitude to cross reference takeoff performance before taking the active. While this may not get you to reach for the Pilot's Operating Manual, it may get you reaching for the mixture control to increase takeoff performance.

The **Compass** displays a magnetic or true course heading. Both take into account magnetic variation, but the magnetic heading also factors in the wind effects. The true course heading is probably the more useful of the two, unless you only have a wet compass on board. The *PalmEFIS* magnetic heading is a byproduct of the wind detection calculations. As such the *PalmEFIS* magnetic heading and your wet compass may differ by a significant amount. This is because at very slow speeds with moderate crosswinds the crab angle would have to be quite large to maintain your current heading. If your wheels are still on the ground the odds are that your aircraft is not crabbed. Therein arises the error between your compass and the *PalmEFIS* headings. Letting the crab kick in after liftoff, *PalmEFIS* and your compass will once more agree.

PalmEFIS can display **Speed** as ground speed, true airspeed or indicated airspeed. Of the three the ground speed is the most useful unless your Pitot tube ices over. *PalmEFIS* gets the ground speed directly from the GPS receiver, while the true airspeed and indicated airspeed is a byproduct of the wind calculations.

The best *PalmEFIS* **Wind Detection** results are seen when the airspeed is held constant and where three consecutive turns are performed with a heading change between 25 then 45 degrees for each turn. Normal cruising, regardless of being on a flight plan, typically yields

good results. The best time to determine the wind conditions of a destination airport is during the descent into the airport. Once the descent is stabilized make two shallow turns to each side of the descent path followed by a turn back onto the descent path. If the altitude descent range is large follow this procedure several times to capture several wind detection results. This will give you a wind change profile that could tell you what to expect in the way of wind shear and other wind gust effects.

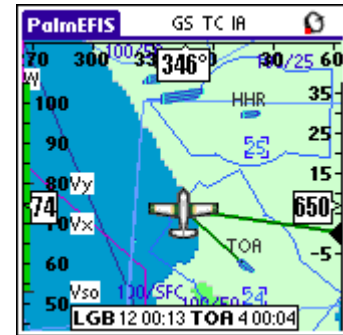
Sequence Through *PalmEFIS* Views

PalmEFIS is built on an expandable platform. This allows new views or modules to be integrated into *PalmEFIS*.

Pressing the Palm Schedule key cycles *PalmEFIS* through all *PalmEFIS* add-on views that are installed on your Palm. For example pressing the button could cycle the Attitude Indicator view to the Moving Map view if both view are installed on your Palm.

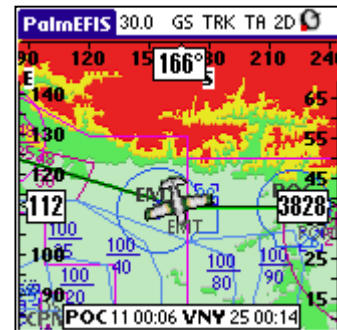


PalmEFIS Moving Map is a visual navigation tool that shows you where you are on a map and guides you to where you want to go. The *PalmEFIS* Moving Map gives you the map information that you need without the clutter. Airspaces are clearly seen and airports stand out. Topographical contours reveal the mountain pass that you are looking for. As you approach your destination zoom in to see the airport's runway layout. Zoom in further and get runway identifiers. "Cleared to land on 24R" is now a visual sequence because you can look and see it, right there on the *PalmEFIS* Moving Map.



Popup airport information on the *PalmEFIS* Moving Map makes unexpected diversions a non-event. No fumbling for the correct sectional because the information is a tap away. You will now find yourself monitoring airport traffic as you fly over. This is because *PalmEFIS* Moving Map makes it so easy. No feature pollution, *PalmEFIS* Moving Map is simply the visual navigation tool that you have always wanted.

PalmEFIS Terrain Clearance is a critical navigation tool for pilots that are traversing mountainous regions. The Terrain Clearance view quickly reveals the ground clearances that are in conflict with your aircraft and warns you about ground clearances that are within a cautionary range, day or night. Yet even while you are negotiating mountain passes the *PalmEFIS* Terrain Clearance view supplies the same airport, airspace and navigational support that is available with the *PalmEFIS* Moving Map view. The *PalmEFIS* Terrain Clearance maps are zoomable to reveal a comfortable clearance view around your aircraft.



Popup airport information is available on the PalmEFIS Terrain Clearance view just as it is on the *PalmEFIS* Moving Map.

The *PalmEFIS* Moving Map builds runtime **maps** from a digital elevation topographical, airspace, and airport datasets or layers. This allows you to selectively toggle each layer to suit your preferences.

The *PalmEFIS* Terrain Clearance view shares many of the features with the PalmEFIS Moving Map with one big exception, it displays the terrain elevations that are in conflict with your aircraft or are within a cautionary ground clearance range.

The terrain map is constantly redrawn to display the elevations that are in conflict with your

current altitude and which elevation clearances that are within the 1000 foot caution range.

Uses the *PalmEFIS* Datasets

The moving and terrain clearance maps are generated in realtime from *PalmEFIS* Datasets. Because the maps are drawn from the datasets instead of bitmaps they are very accurate. With the *PalmEFIS* Datasets the maps are ready to use without anything to build or configure. The *PalmEFIS* Datasets are available from www.HangarB17.com.

North-up Map

The moving map is oriented so that north is always up. As your aircraft turns the aircraft image on the map is rotated so that it has the same orientation as your aircraft has to true north.

Zoomable

The *PalmEFIS* Moving Map supports zooms from 120 miles to less than a mile. Over the zoom range map details are added from airspaces, to runways layouts, with varying levels of identifiers and labels being shown.

Eight direction scrolling

PalmEFIS Moving Map configures the Palm hardware buttons to select and control eight directional scrolling.

Airport Symbols and Runway Layouts

Depending on the zoom level *PalmEFIS* Moving Map draws either airport symbols or the actual airport runway layout directly on the map.

Airport Information

The *PalmEFIS* Moving Map supports pickable airport information. Tapping on an airport identifier pops up the Airport Information dialog. From the Airport information dialog communication frequencies, runway layouts, services, and airport remarks are available.

Flight Planning

The *PalmEFIS* Flight Planning is used to create flight plans and the *PalmEFIS* Flight Director works with the Moving Map to navigate them.

Rubberbanding Flight Plan Legs

The flight plan legs have a unique feature called rubberbanding flight plan legs. This means that you never have to find your flight plan leg no matter how far you deviate from your flight

plan. They stretch out to meet you where ever you are and lead you to the next fix.

Distance, Heading and ETE to Flight Plan Fixes

Along with showing where you are on a map, the *PalmEFIS* Moving Map also helps you navigate flight plans. The active flight plan leg is drawn and the To/From fixes have their identifiers, distance and ETE displayed in real-time.

Nearest Airport

Locating the nearest airport is only a button push away. Pushing the nearest airport button finds the airport closest to your current location and then leads you too it.

Setup Options

Map Options and Legend

The *PalmEFIS* Moving Map and Terrain Clearance display maps in layers where they could be turned on or off. The map layers are:

- The aircraft image.
- All airports.
- All nav aids.
- Airspaces.
- Elevation contours.

Turning on or off each layer is controlled from the Map Options dialog.

The map elevation contour color legend is part of the Map Options dialog. Bringing up dialog allows you to see which elevation range applies to each contour color.

To toggle the map layers tap on the Palm dropdown menu button in the Palm graffiti area after *PalmEFIS* is launched.



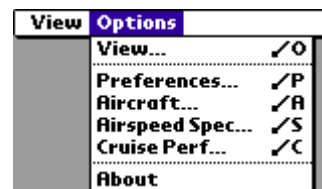
The menu bar is displayed at the top of the Palm display area. Select the **Options** menu.

View	Info	Options
Attitude	✓A	
Moving Map	✓M	
Flight Plan	✓F	
Windometer	✓W	
Set Bugs...	✓B	
Weather...	✓W	

The Options menu will drop down. Select the **View** menu item.

View	Options
View...	✓O
Preferences...	✓P
Aircraft...	✓A
Airspeed Spec...	✓S
Cruise Perf...	✓C
About	

With PalmOS 3.5 the Options menu will drop down. Select the **View** menu item.



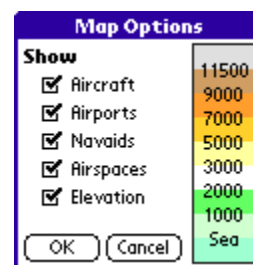
With PalmOS 3.5 the **View Options** popup list is displayed. A tap on the **Moving Map or Terrain Clearance** list item causes the Flight Plan Options to be displayed.



With PalmOS 4 and above the Options menu will drop down. Select the **Moving Map or Terrain Clearance** menu item.



The **Map Options** or **Terrain Clearance** dialog is displayed. Toggle on or off the checkbox for the map layer and press the OK button for the map to be updated. Pressing the Cancel button causes any option changes to be dropped. In this case the map will not change.



Operations

The Inner-Works

The *PalmEFIS* Moving Map and Terrain Clearance view are tuned for the cockpit environment. The mapping functionality is simplified as much as reasonable and then tied to the Palm hardware buttons to minimize the effects of vibrations. The Palm touch screen is only used for selecting **airport information** so that a vibrating fingertip is not mistaken for a map scrolling command. On the ground dragging the Palm stylus across the map works great for scrolling the map but this does not work in the air.

The **map data** is built to allow large geographical areas to be loaded onto the Palm. The map data is divided into areas about the size of Sectional Charts so that you could load as much or as little data that you need or as Palm memory space allows. The map data is generated from US Department of Defense DAFIF databases and USGS 250k datasets.

Best Practices

Getting started with *PalmEFIS* Moving Map and Terrain Clearance is pretty much a load and go operation. You can load the *PalmEFIS* Moving Map software and the map datasets onto your Palm, connect your GPS and go flying. Once the euphoria dies down it is then time to figure out how to create flight plans and activate them. But you could wait for that until you are ready to go somewhere. That's because the *PalmEFIS* Moving Map and Terrain Clearance views are perfectly happy following you around the sky without flight plans.

A fun trick when you are aimlessly exploring the skies is to press the **Nearest Airport** button. While there are no sudden surprises, after canceling the Airport Information dialog a leg will be drawn on the moving map to the nearest airport. As you fly around the nearest airport is updated and changed to another airport when it becomes the closest.

The *PalmEFIS* Moving Map **datasets** are arranged and named the same as the USGS digital elevation data patches. Each patch is about the size of a sectional map, except that they are arranged on a grid that does not overlap. Each dataset has the airport, airspace, and topographical information for the area. The naming convention for each dataset forces natural groupings to occur for easy loading and unloading of the datasets on your Palm.

The *PalmEFIS* Moving Map operations are:

- Sequence Through *PalmEFIS* Views
- Zooming and Scrolling
- Activate a Flight Plan
- Toggling Fix To/From Details and GPS Enable
- Airport Information
- Nearest Airport

Sequence Through *PalmEFIS* Views

PalmEFIS is built on an expandable platform. This allows new views or modules to be integrated into *PalmEFIS*.

Pressing the Palm Schedule key cycles *PalmEFIS* through all *PalmEFIS* modules or views that are installed on your Palm. For example pressing the button could cycle the Attitude Indicator view to the Moving Map view if both view are installed on your Palm.



Zooming and Scrolling

Zooming and scrolling on the *PalmEFIS* Moving Map and Terrain Clearance is controlled by the Palm's Scroll key and the two keys just to its left and right, The Address List and the To Do keys, or PalmEFIS operation keys. Zooming is the default operation that is assigned to the Palm scroll keys. To change from zooming to scrolling first press one of the operation keys to select the scroll direction and then press the scroll key to pan scroll the map.

Repeatedly pressing the Address List key sequences the Moving Map or Terrain Clearance through the zoom and scroll operations, while pressing the To Do key sequences the operations in the reverse order. The selected operation is assigned to the Palm Scroll key. For example when the operation is zooming the Palm Scroll key zooms the map in and out. When the operation is sequenced to scrolling up and down the Palm Scroll key scrolls the map up and down. An icon on the bottom of the map displays the current Scroll key operation.



The operations sequence is:

1. Zoom in and out.



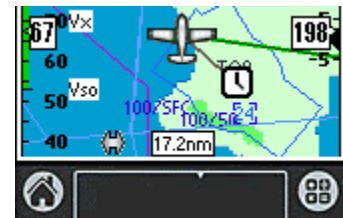
2. Scroll up and down.



3. Scroll up and down on a bottom left to top right diagonal.



4. Scroll right and left.



5. Scroll up and down on a top left to a bottom right diagonal.



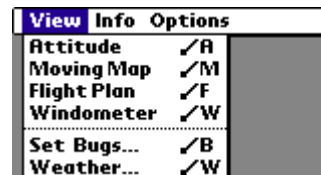
Activate a Flight Plan

Flight plans are created with the *PalmEFIS* Flight Plan Editor. After the flight plan is created it is activated two different ways depending on which *PalmEFIS* view is active.

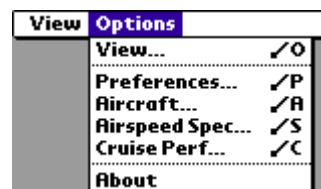
To activate a flight plan from the **Moving Map** and **Terrain Clearance** views tap on the Palm dropdown menu button in the Palm graffiti area after *PalmEFIS* is launched.



The menu bar is displayed at the top of the Palm display area. Select the **Options** menu.



With PalmOS 3.5 the Options menu will drop down. Select the **View** menu item.



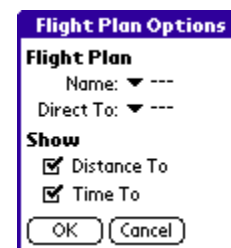
With PalmOS 3.5 the **View Options** popup list is displayed. A tap on the **Flight Director** list item causes the Flight Plan Options to be displayed.



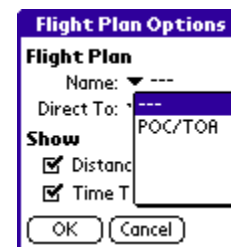
With PalmOS 4 and above the Options menu will drop down. Select the **Flight Director** menu item.



On the **Flight Plan Options** dialog, tap on the **Name** popup list to see the available flight plans. Also note that the level of details to **show** on flight plan fixes is controlled from this dialog. Enabling or disabling the **Distance To** and **Time To** check boxes tells the *PalmEFIS* Flight Director whether to only display the fix label or also add the distance and time to the fix.



Selecting a flight plan in the Name popup list **activates** it. To **deactivate** a flight plan select the first “---” list item.



To fly directly to a flight plan fix tap on the **Direct To** popup list. A list will display showing all the flight plan fixes. Selecting a fix from the list overrides the Flight Director's auto leg selection features and **turns on** the selected fix to fly directly to it. The Direct To fix is **turned off** by selecting the first "---" list item.



Toggling Fix To/From Details and GPS Enable

The flight plan To/From fix details can be displayed in multiple formats. The first format shows the To and From fixes along with their distance to it and the ETE. The other format displays just the To fix with the heading and distance and the ETE.

To toggle the **To/From fix details** tap on the Calculator button in the Palm silkscreen area.

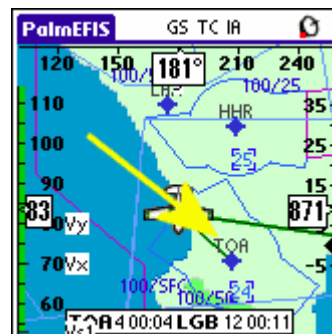


If the GPS has been **disabled** because of a scrolling operation the first tap **enables** the GPS and subsequent taps toggle the fix details.

Airport Information

The *PalmEFIS* Moving Map defers the picking of airport information and displaying of details airport information to the *PalmEFIS* Flight Director. The detailed airport information includes communication frequencies, runway layout diagrams, services, and remarks. Airport identifier picking is also available from the *PalmEFIS* **Attitude**, and **Windometer** views.

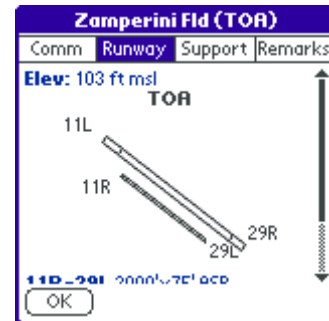
To see the airport details tap on an **airport identifier** with the Palm stylist.



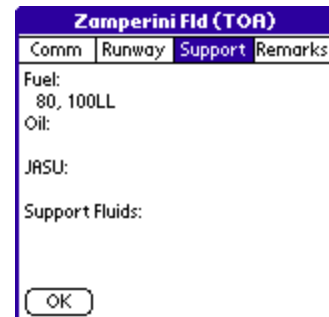
The Airport Information dialog is presented with the airport's **communications** frequencies.

Zamperini Fld (TOA)			
Comm	Runway	Support	Remarks
A/D: 124.30			
127.20			
ATIS: 125.60			
CTAF: 124.00			
GND: 120.90			
MISC: 122.90			
TWR: 124.00			
135.60			
OK			

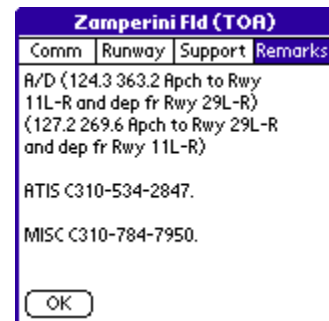
Tapping on the **Runway** button brings up the airport runway diagram.



Tapping on the **Support** button display the services offered by the airport.



Tapping on the Remarks button brings up the misc. airport remarks. Press the OK push button when you are finished viewing the airport information. When the OK button is tapped the dialog disappears showing the moving map below.



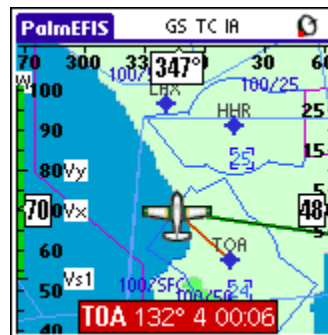
Nearest Airport

The Nearest Airport feature is tied to the Palm hard Memo button. This button activates the nearest airport search from the *PalmEFIS Attitude*, *Windometer*, *Terrain Clearance* views along with the **Moving Map** view.

To toggle on or off the nearest airport search press the Palm number 4 hardware button or the Memo button.



The nearest airport button is a three-state button. With the first press of the button the nearest airport is located and the Flight Director will direct you to the airport it located. With the **Moving Map** and **Terrain Clearance** views displayed the Flight Director draws the nearest airport as a third flight plan leg. The nearest airport identifier, heading, distance and ETE are displayed in a box at the bottom of the moving map. The background color on the box depends on whether the airport is within gliding distance. Green is shown when gliding is an option and red when the airport is too far.



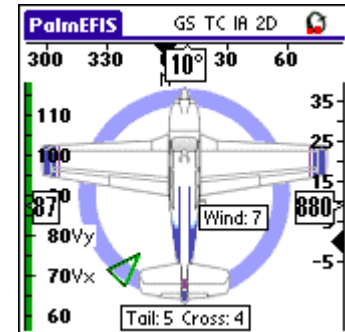
The second press of the nearest airport button displays the Airport Information dialog so that communications frequencies for the airport can be entered into your radios.

Zamperini Fld (TOA)			
Comm	Runway	Support	Remarks
A/D: 124.30			
127.20			
ATIS: 125.60			
CTAF: 124.00			
GND: 120.90			
MISC: 122.90			
TWR: 124.00			
135.60			
OK			

The third press of the nearest airport button toggles the feature off. If the nearest airport feature is left on the airport database will be rescanned every few seconds to see if there is a nearer airport. When a nearer airport is located it is displayed as the nearest airport.

8. PalmEFIS Windometer

PalmEFIS Windometer is *PalmEFIS* without an attitude. *PalmEFIS* Windometer has all the speed, altitude, and heading capabilities of *PalmEFIS* but focuses in on wind detection as its primary feature. While *PalmEFIS* is geared more towards the IFR pilot that wants one more redundancy or crosscheck, *PalmEFIS* Windometer is directed towards the VFR pilot that wants to see the one thing that they can't on that severe clear day. The wind! Now the wind can be monitored during that burger run and as you arrive at the burger stop you will already know that weather advisory that no one seems to want to tell you about. Its OK! They're eating, and soon you will be too. So now when you have the *PalmEFIS* Windometer and you hear another pilot pleading for the wind information you can tell them "its 260 at 12, but you would already know that if you too had the *PalmEFIS* Windometer."



Features

PalmEFIS Windometer focuses on the **wind direction** and speed, and the effect that the wind has on the aircraft. Yet it still has the Heads Up display style where the **aircraft speed** is on the left edge of the display, the **aircraft direction** is on top, with the **current altitude** displayed on the right edge. Front and center on the *PalmEFIS* Windometer display are the direct wind effects on your aircraft. This will graphically display the wind direction with respect to your aircraft direction along with the current wind speed. *PalmEFIS* Windometer works with statically entered wind speeds and directions or it can automatically determine the wind components. The rest of the *PalmEFIS* Windometer functionality could be thought of as a visual flight calculator where you can switch between Ground Speed, True Airspeed, Indicated Airspeed, Magnetic Heading, True Course, Indicated Altitude or Density Altitude. Except the difference is that the *PalmEFIS* Windometer is a flight computer that constantly updates itself based on the current flight conditions.

Aircraft Speed

The aircraft speed is configurable to display Ground Speed, True Airspeed, or Indicated Airspeed. The speed could also be set to use knots or mph units.

Compass

The compass shows either the True Course or Magnetic Heading.

Altimeter

The altimeter displays True Altitude or uses the outside air temperature, atmospheric pressure and current altitude to determine and display the Density Altitude.

Wind Direction and Speed Detection

PalmEFIS can work with statically entered wind speeds and directions or it can automatically determine the wind conditions from the wind effects on your flight profile.

Head Wind and Cross Wind Components

To assist a pilot with their landing or headwind decisions *PalmEFIS* breaks the wind conditions into their head and crosswind components and displays them as an overlay on the Attitude Indicator view.

Speed, Heading and Altitude Bugs

The aircraft speed indicator, compass and altimeter all support bugs to mark the targeted speed, heading and altitude.

Setup Options

Setting the *PalmEFIS* Windometer options allows the pilot to configure it to their preferences or to use it in the same way as a flight calculator. The *PalmEFIS* Windometer options are:

- Set Bugs
- Select True or Density Altitude
- Select Indicated or True Airspeed or Ground Speed
- Select Track, True Course or Magnetic Heading
- Setting the Current Temperature and Altimeter
- Set Wind Speed and Direction

Set Bugs

PalmEFIS has Bugs for targeted trip speed, heading and altitude. The bugs are displayed as black triangles on the speed, heading and altitude scales in a position that represents the bug value.

To set a speed, heading or altitude bug tap on the Palm dropdown menu button in the Palm graffiti area after starting *PalmEFIS*.



The Palm dropdown menu bar will appear with the **View** menu highlighted. Select the **Set Bugs** menu item.

View	Info	Options
Attitude		✓A
Moving Map		✓M
Flight Plan		✓F
Windometer		✓W
Set Bugs...		✓B
Weather...		✓W

When the Set Bugs menu item is selected, *PalmEFIS* displays the **Bugs** dialog. Here the current heading, altitude and speed bugs are displayed. To change a bug setting drag Palm stylist over the value to change and then enter a new value in the Palm graffiti area.



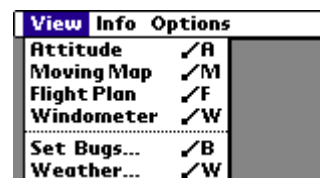
Select True or Density Altitude

PalmEFIS can display the altitude as true altitude or density altitude. When density altitude is selected the Altimeter scale and current altitude value adjust to display the density altitude. For the density altitude to display correctly the current temperature must be set on the Weather dialog. After selecting true or density altitude the *PalmEFIS* status bar will display “TA” (true altitude) or “DA” (density altitude) depending on what was selected.

To select density or indicated altitude for *PalmEFIS* to display, after starting the *PalmEFIS*, tap on the Palm dropdown menu button in the Palm graffiti area.



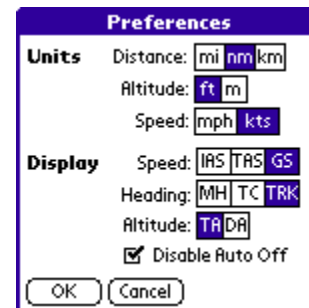
The menu bar is displayed at the top of the Palm display area. Select the **Options** menu.



The Options menu will drop down. Select the **Preferences** menu item.



The **Preferences** dialog will display once the Preferences menu item is tapped. The true altitude/density altitude selection is near the bottom of the dialog in the Altitude field. To select indicated altitude tap on the **TA** box. Density altitude is selected by tapping the **DA** box.



Select Indicated or True Airspeed or Ground Speed

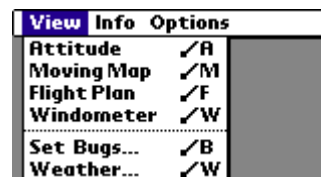
The GPS data feed supplies the ground speed of the aircraft. It is possible with variations in heading while the indicated airspeed of the aircraft is held constant to determine the true airspeed of the aircraft. When the current temperature is entered into *PalmEFIS* it can then determine the aircraft’s indicated airspeed. As such *PalmEFIS* can display any of the speed

modes depending on pilot preferences or as a crosscheck of aircraft instrumentation. When the pilot selects a ground speed, true airspeed or indicated airspeed, the speed mode is displayed on the *PalmEFIS* status bar as the corresponding GS, TAS, or IAS.

To select indicated airspeed, true airspeed or ground speed for *PalmEFIS* to display, tap on the Palm dropdown menu button in the Palm graffiti area after launching *PalmEFIS*.



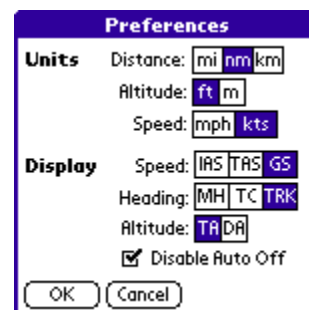
The menu bar is displayed at the top of the Palm display area. Select the **Options** menu.



The Options menu will drop down. Select the **Preferences** menu item.



The **Preferences** dialog will display once the Preferences menu item is tapped. Find the **Speed** field in the **Display** section of the dialog. **Indicated Airspeed** is selected by tapping on the **IAS** box. To select **True Airspeed** tap the **TAS** box. **Ground Speed** is selected by tapping on the **GS** box.



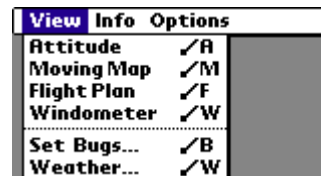
Select Magnetic Heading, True Course or Track

PalmEFIS can display the heading information with or without the magnetic variance for the current location. The heading without the magnetic information is the true course as opposed to using the magnetic variation to get the magnetic heading. The current heading mode is displayed on the *PalmEFIS* status bar as TC for true course or MH for magnetic heading.

To select magnetic or true course heading for *PalmEFIS* to display, tap on the Palm dropdown menu button in the Palm graffiti area after launching *PalmEFIS*.



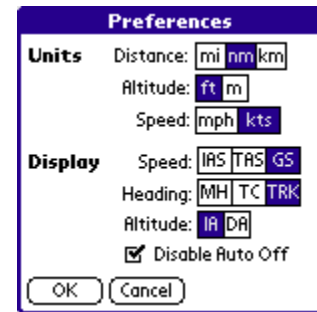
The menu bar is displayed at the top of the Palm display area. Select the **Options** menu.



The Options menu will drop down. Select the **Preferences** menu item.



The **Preferences** dialog will display once the Preferences menu item is tapped. In the **Display** section of the dialog is the **Heading** field. The field could be set to magnetic heading (MH), true course (TC) or Track (TRK). Tapping on the corresponding box sets the heading mode.



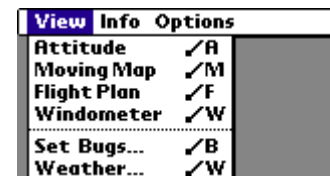
Setting the Current Temperature and Altimeter

The current temperature and Altimeter values are used for density altitude and indicated airspeed determination. The current temperature must be set before *PalmEFIS* can display the density altitude or the indicated airspeed accurately.

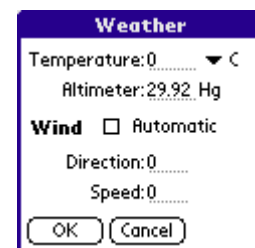
To set the current temperature or altimeter values, tap on the Palm dropdown menu button in the Palm graffiti area after launching *PalmEFIS*.



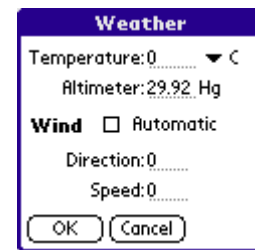
With the **View** menu displayed select the **Weather** menu item.



Enter the current temperature in the **Temperature** field. The temperature could be either Celsius or Fahrenheit. Set the temperature units in the popup list at the end of the Temperature field according to the units of the temperature value entered by tapping on the down triangle and selecting C (Celsius) or F (Fahrenheit).



Enter the current altimeter setting in the **Altimeter** field.



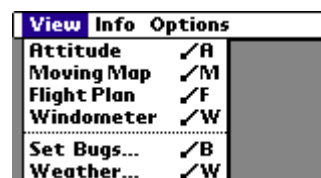
Set Wind Speed and Direction

PalmEFIS supports automatic wind speed and direction detection or pilot entered wind speed and direction. With the wind detection set in the automatic mode *PalmEFIS* determines the wind speed and direction when the aircraft changes direction with a course difference of at least 20 degrees. A new wind speed and directions is calculated after three consecutive course changes. During the automatic wind detection process the indicated airspeed must be constant. The pilot can at any time over-ride automatic wind detection and designate a wind speed and direction. This is useful during the initial portion of the flight where ATIS information is available and the automatic wind detection has not gathered enough information to accurately predict the wind conditions.

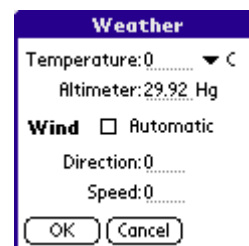
To tell *PalmEFIS* to automatically detect wind speed and direction or to manually enter it, tap on the Palm dropdown menu button in the Palm graffiti area after launching *PalmEFIS*.



With the **View** menu displayed select the **Weather** menu item.



The **Weather** dialog will appear. For automatic wind detection check the **Automatic** check box. To over-ride the automatic wind detection uncheck the **Automatic** check box and enter a wind direction in the Direction field and wind speed in the Speed field.



Operations

The Inner-Works

The *PalmEFIS* **Wind Detection** is determined by capturing the flight speed changes that happen during a flight. The effects of power setting changes and climb/descent speeds variations are filtered out to leave the effect caused by the wind. With the remaining wind effects the wind speed and direction is determined. Three or more turns are necessary for each wind sample where each turn must be greater then 25 degrees. The best wind detection results are seen when the airspeed is held constant and the turns are greater then 45 degrees.

Best Practices

The best *PalmEFIS* **Wind Detection** results are seen when the airspeed is held constant and where three consecutive the turns that are performed with a heading change between 25 then 45 degrees for each turn. Normal cruising, regardless of being on a flight plan, typically yields good results. The best time to determine the wind conditions of a destination airport is during the descent into the airport. Once the descent is stabilized make two shallow turns to each side of the descent path followed by a turn back onto the descent path. If the altitude

descent range is large follow this procedure several times to capture several wind detection results. This will give you a wind change profile that could tell you what to expect in the way of wind shear and other wind gust effects.

The **Altimeter** can display indicated or density altitudes. In the mountains in the summer time it is useful to do a quick switch to density altitude to cross reference takeoff performance before taking the active. While this may not get you to reach for the Pilot's Operating Manual, it may get you reaching for the mixture control to increase takeoff performance.

The **Compass** displays a magnetic or true course heading. Both take into account magnetic variation, but the magnetic heading also factors in the wind effects. The true course heading is probably the more useful of the two, unless you only have a wet compass on board. The *PalmEFIS* magnetic heading is a byproduct of the wind detection calculations. As such the *PalmEFIS* magnetic heading and your wet compass may differ by a significant amount. This is because at very slow speeds with moderate crosswinds the crab angle would have to be quite large to maintain your current heading. If your wheels are still on the ground the odds are that your aircraft is not crabbed. Therein arises the error between your compass and the *PalmEFIS* headings. Letting the crab kick in after liftoff, *PalmEFIS* and your compass will once more agree.

PalmEFIS can display **Speed** as ground speed, true airspeed or indicated airspeed. Of the three the ground speed is the most useful unless your Pitot tube ices over. *PalmEFIS* gets the ground speed directly from the GPS receiver, while the true airspeed and indicated airspeed is a byproduct of the wind calculations.

Sequence Through *PalmEFIS* Views

PalmEFIS is built on an expandable platform. This allows new views or modules to be integrated into *PalmEFIS*.

Pressing the Palm Schedule key cycles *PalmEFIS* through all *PalmEFIS* modules or views that are installed on your Palm. For example pressing the button could cycle the Attitude Indicator view to the Moving Map view if both view are installed on your Palm.



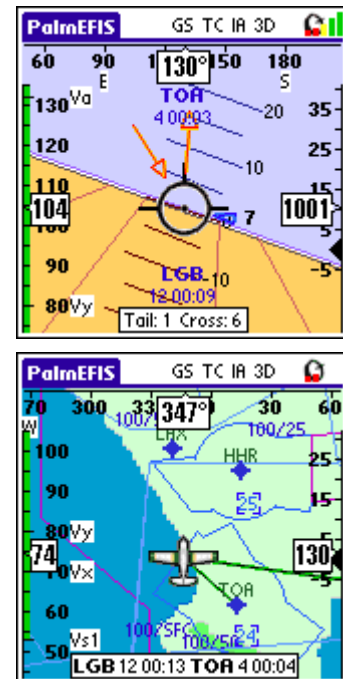
9. PalmEFIS Flight Director

The *PalmEFIS* Flight Director is a navigator that uses a flight plan to take you from where you are to where you want to go.

How many times have you looked at the Course Deviation Indicator (CDI) and wondered does each dot represent two or five miles? Or if the CDI needle is off to the left do I turn to the right? With the *PalmEFIS* Flight Director navigation is no longer a memorization test that must be coordinated with your compass. You simply fly the arrow. The Flight Director arrow always points directly to a fix. Align the arrow so that it is straight up and you will go directly to the destination. If the arrow is angled off to the right turn to the right until it once more points up and you are again on course.

Have you ever wondered why you have to select an active flight plan leg, or to reverse a flight plan? With the *PalmEFIS* Flight Director you fly your aircraft and the Flight Director determines the rest.

The *PalmEFIS* Flight Director overlays your flight plan seamlessly on the *PalmEFIS* **Attitude**, **Windometer**, and **Moving Map** views intelligently matching the display style to the corresponding view.



Features

PalmEFIS Flight Director is built to lighten the workload of every pilot. It requires less work to navigate and does it more intelligently. Once the flight plan is activated *PalmEFIS* Flight director automatically and intelligently sequences the pilot through it in either direction where the only control knob necessary is the aircraft yoke or stick. Simply put, now you can have the navigation tools of the big iron, all in the palm of your hand.

The *PalmEFIS* Flight Director introduces several new navigation features, flying the arrow and rubberbanding flight plan legs, and automatic flight plan traversal.

Automatic Flight Plan Leg Selection

Once a flight plan is activated the *PalmEFIS* Flight Director uses its automatic leg selection feature to automatically determine the active flight plan leg. This means that you do not need to select an active leg within your active flight plan nor do you need to reverse your flight plan. That is because *PalmEFIS* Flight Director is intelligent, it knows the direction that you are flying. When *PalmEFIS* Flight Director recognizes that you have deviated of course it intelligently blends you back into the flight plan by skipping forward or backwards a leg depending on which direction you are flying.

Intelligent To/From Fix Selection

PalmEFIS Flight Director uses its intelligence of knowing the direction that you are flying to select its To/From flight plan fixes. This removes the need to reverse a flight plan.

Direct To

At any time the pilot can override *PalmEFIS* Flight Director by selecting to fly directly to a flight plan fix.

Fly the Arrow

PalmEFIS Flight Director introduces a new concept to navigation, flying the arrow to a flight plan fix. Rather than looking at a line of dots and a needle that sits over the dots, *PalmEFIS* Flight Director vectors you to a fix by providing an arrow that always points at the fix. Now navigation is not a job of counting dots and multiplying by ten but turning your aircraft into the arrow until it points straight up.

Rubberbanding Legs

As your flight progresses through a flight plan it constantly updates relative to your current position to the active flight plan fixes. If you divert off course the Flight Director follows you by angling the direction arrow towards the fixes or **rubberbanding** the flight plan legs to your current position.

Identifier, Heading, Distance and ETE

The Flight Director displays the **To/From** fix's **identifier**, **distance** and **ETE** of the flight plan's active leg. When the Attitude or Windometer views are active the To fix information is displayed on top of the display and the From fix information on the bottom. If the Moving Map view is active the To/From fix information is displayed on the bottom of the display.

Airport Information

Airport Information is always a tap away. The airport information provides a list of airport communication frequencies, runway layout diagrams, services, and remarks.

Nearest Airport

At any time when the Nearest Airport button is pressed, the *PalmEFIS* Flight Director finds the nearest airport and provides you with its communication frequencies, runway layout diagrams, and then directs you to the airport. While *PalmEFIS* Flight Director directs you to the nearest airport it constantly monitors and displays whether you are within gliding distance of the airport. If you are within gliding distance of the nearest airport, the arrow of segment is displayed as a green color. Otherwise it is red.

Glide Distance

The Flight Director monitors the glide relationships between your current position and altitude, and the altitude of the airports in your flight plan. When the Attitude or Windometer view is displayed and you are flying the arrows, the arrows will be green if you are within gliding distance and red otherwise.

Operations

The Inner-Works

The *PalmEFIS* Flight Director uses artificial intelligence to determine which flight plan leg to activate and how to arrange the To/From fixes. It uses the same logic that you would use for this determination. The factors that it uses are which flight plan fix is closest to the current position? Which fix is most inline with the current heading? Is the current position close enough to a flight plan fix to consider “rounding a corner” and heading to the next fix? These questions are answered within the *PalmEFIS* Flight Director as rules where the two dominate rules are which fix is the closest and which fix is most inline with the current heading. These two rules play the role of picking the active flight plan leg and which fix is the “To” fix within that leg.

Best Practices

Simplicity is central to the *PalmEFIS* Flight Director. Once the flight plan is activated you “operate” the *PalmEFIS* Flight Director by flying your airplane. With your current position the Flight Director selects a flight plan leg and arranges it’s To and From fixes based on your current heading. If the Flight Director’s From fix is really your To fix or you want to turn back it’s a simple matter of turning towards the From fix. This tells the Flight Director to exchange the To and From fixes and arrange them according to your new heading.

The To and From airport identifiers that are displayed are pickable. Tapping on the displayed airport identifier label pops up the **Airport Information** dialog. The Airport Information dialog contains the airport’s communications frequencies, runway layout diagrams, services, and remarks.

Flight plan **rubberbanding legs** has many benefits. The first is that you never have to find a flight plan leg on the moving map. Is the leg to the left or right of your current position? This disorientation is easy with north up maps. With rubberbanding legs the flight plan legs find you. Determining on or off course is determined by whether the To and From legs create a straight line. If you are off course there will be an angle between the two legs. The greater the angle the farther that you are off course. To get back on course fly into the To fix or into the angle. One of the nicest benefits of rubberbanding legs is to circumnavigate an airspace. The airspace is avoided by flying an avoidance flight path until the To fix leg no longer intersects the airspace and then turn into the To runner banding leg.

The **Nearest Airport** action has two benefits. The first is most obvious in that it finds that nearest airport when an emergency arises, such as a restroom break. The second is a byproduct of the fact that the Flight Director rescans for the nearest airport every couple of seconds. When the Flight Director finds a nearer airport to your current position, it becomes

the nearest airport. This allows you to track the nearest airport to your current position as you progress towards your destination. This works this way whether a flight plan is active or not.

The *PalmEFIS* Flight Director operations are:

- Sequence Through *PalmEFIS* Views
- Activate a Flight Plan
- Airport Information
- Nearest Airport

Sequence Through *PalmEFIS* Views

PalmEFIS is built on an expandable platform. This allows new views or modules to be integrated into *PalmEFIS*.

Pressing the Palm Schedule key cycles *PalmEFIS* through all *PalmEFIS* modules or views that are installed on your Palm. For example pressing the button could cycle the Attitude Indicator view to the Moving Map view if both view are installed on your Palm.



Activate a Flight Plan

Flight plans that are created with the *PalmEFIS* Flight Plan Editor are activated two different ways depending on which *PalmEFIS* view is active.

Activate a flight plan from the *PalmEFIS* Attitude, Moving Map or Windometer views

To activate a flight plan from the **Attitude** or **Windometer** views tap on the Palm dropdown menu button in the Palm graffiti area after *PalmEFIS* is launched.



The menu bar is displayed at the top of the Palm display area. Select the **Options** menu.

View	Info	Options
Attitude	✓A	
Moving Map	✓M	
Flight Plan	✓F	
Windometer	✓W	
Set Bugs...	✓B	
Weather...	✓W	

With PalmOS 3.5 the Options menu will drop down. Select the **View** menu item.

View	Options
View...	✓O
Preferences...	✓P
Aircraft...	✓A
Airspeed Spec...	✓S
Cruise Perf...	✓C
About	

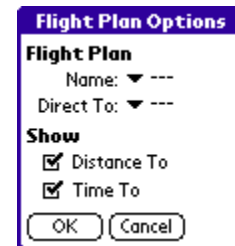
With PalmOS 3.5 the **View Options** popup list is displayed. A tap on the **Flight Director** list item causes the Flight Plan Options to be displayed.



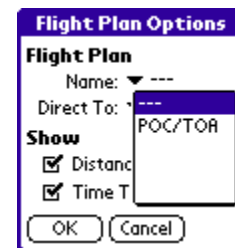
With PalmOS 4 and above the Options menu will drop down. Select the **Flight Director** menu item.



The **Flight Plan Options** dialog is displayed. Tap on the **Name** popup list to see the available flight plans. Also note that the level of details to **show** for a flight plan fix is controlled from this dialog. Enabling or disabling the **Distance To** and **Time To** check boxes tells the *PalmEFIS* Flight Director whether to only display the fix label or also add the distance and time to the fix.



Selecting a flight plan in the Name popup list **activates** it. To **deactivate** a flight plan select the first “---” list item.



To fly directly to a flight plan fix tap on the **Direct To** popup list. A list will display showing all the flight plan fixes. Selecting a fix from the list overrides the Flight Director's auto leg selection features and **turns on** the selected fix to fly directly to it. The Direct To fix is **turned off** by selecting the first “---” list item.



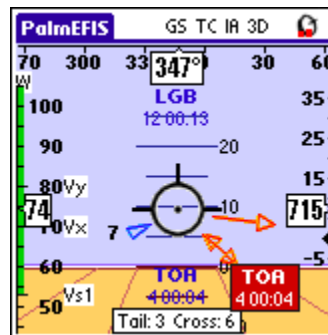
Nearest Airport

The Nearest Airport feature is tied to the Palm hard Memo button. This button activates the nearest airport search from the *PalmEFIS* **Attitude**, **Windometer**, and **Moving Map** views.

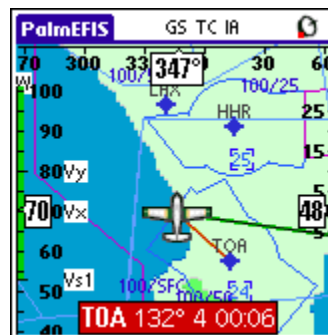
To toggle on or off the nearest airport search press the Palm number 4 hardware button or the Memo button.



The nearest airport button is a three-state button. With the first press of the button the nearest airport is located and the Flight Director will direct you to the airport it located. If the **Attitude** or **Windometer** views are active the Flight Director depicts the nearest airport as an **arrow** that is shorter than the To/From arrows. The nearest airport identifier, distance to, and ETE is displayed in a box to the right of the From airport information. The color of the nearest airport arrow and information box depends on the glide performance of your aircraft. If you are within **gliding distance** they will be green. The color is red otherwise.



If the **Moving Map** view is displayed then the Flight Director draws the nearest airport as a third flight plan leg. The nearest airport identifier, heading, distance and ETE are displayed in a box at the bottom of the moving map. The background color on the box depends on whether the airport is within gliding distance. Green is shown when gliding is an option and red when the airport is too far.



The second press of the nearest airport button displays the Airport Information dialog so that communications frequencies for the airport can be entered into your radios.

Zamperini Fld (TOR)			
Comm	Runway	Support	Remarks
A/D: 124.30			
127.20			
ATIS: 125.60			
CTAF: 124.00			
GND: 120.90			
MISC: 122.90			
TWR: 124.00			
135.60			

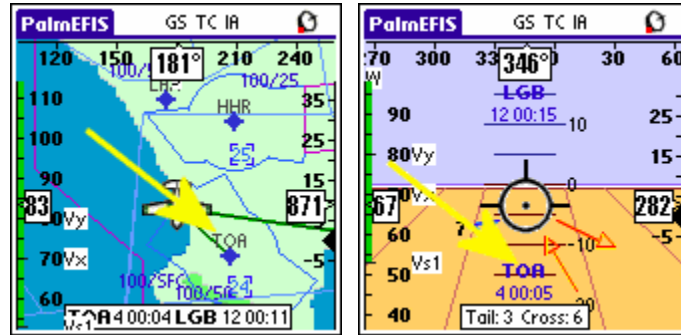
OK

The third press of the nearest airport button toggles the feature off. If the nearest airport feature is left on the airport database will be rescanned every few seconds to see if there is a nearer airport. When a nearer airport is located it is displayed as the nearest airport.

Airport Information

The *PalmEFIS* Flight Director supports airport identifier picking to see its detailed airport information. The detailed airport information includes communication frequencies, runway layout diagrams, services, and remarks. Airport identifier picking is available from the *PalmEFIS* **Attitude**, **Windometer**, and **Moving Map** views.

To pick an **airport identifier** to see the airport details tap on the identifier with the Palm stylus.



The Airport Information dialog is presented with the airports **communications** frequencies.

Zamperini Fld (TOA)			
Comm	Runway	Support	Remarks
A/D: 124.30			
127.20			
ATIS: 125.60			
CTAF: 124.00			
GND: 120.90			
MISC: 122.90			
TWR: 124.00			
135.60			
OK			

Tapping on the **Runway** button brings up the airport runway diagram.

Zamperini Fld (TOA)			
Comm	Runway	Support	Remarks
Elev: 103 ft msl			
TOA			
11L			
11R			
29L			
29R			
11D-29L 3000x75' acb			
OK			

Tapping on the **Support** button display the services offered by the airport.

Zamperini Fld (TOA)			
Comm	Runway	Support	Remarks
Fuel:			
80, 100LL			
Oil:			
JASU:			
Support Fluids:			
OK			

Tapping on the Remarks button brings up the misc. airport remarks. Press the OK push button when you are finished viewing the airport information.

Zamperini Fld (TOA)			
Comm	Runway	Support	Remarks
R/D (124.3 363.2 Apch to Rwy 11L-R and dep fr Rwy 29L-R) (127.2 269.6 Apch to Rwy 29L-R and dep fr Rwy 11L-R)			
ATIS C310-534-2847.			
MISC C310-784-7950.			
<input type="button" value="OK"/>			

10. *PalmEFIS* Flight Planning

PalmEFIS Flight Planning is full-featured flight planning in a small package. It is built to work in the same manner as the familiar flight plan worksheets that we have worked by hand. The flight planning is tuned to support pilot's decision-making processes of the preflight. Yet the *PalmEFIS* Flight Planning is easy enough that it will actually be used.

Simply put *PalmEFIS* Flight Planning makes flight planning fun and no longer the chore.

Flight Plan Editor

Name: ▼ POC/TOR %Power: ▼ 75
Start Fuel: [32] Rem: 28 |

Fix	Rt	MH	Dist	ETE	Fuel
POC	0	215	25	00:12	3
LGB	0	252	9	00:05	1
TOR					
Totals:					34 00:17 4

[OK] [New] [Delete] [Cancel]

Based on the entered Fixes, altitudes and percent power PalmEFIS Flight Planning populates the rest of the flight plan. This includes:

- Magnetic Heading
- Distance
- ETE
- Fuel burn.
- Total distance
- Total time
- Total fuel used
- Fuel remaining

Features

PalmEFIS Flight Planning features a flight plan in a format that you are used to seeing. It simply empowers the flight plan that you have been filling out by hand. But it also has the features that you were wishing for as you sharpened your pencil and reached for your calculator.

Full Featured Flight Plan Editor

PalmEFIS Flight Planning provides all the features that a pilot expects while building and maintaining a flight plan. The Flight Plan Editor builds new flight plans, edits them, and provides the ability to delete old flight plans. When editing a flight plan fixes could be changed, inserted and deleted.

Finding Fixes

Finding fixes for a flight plan is simple and non-intrusive. If you know the airport identifier enter it directly. Otherwise enter any part of the airport name or identifier and *PalmEFIS* Flight Planning locates the fix for you.

Airport and Navaid Database

PalmEFIS Flight Planning uses the airport and navaid database of the *PalmEFIS* Dataset for

the fix location as it builds a flight plan.

Heading, Distance, ETE and Fuel Usage

PalmEFIS Flight Planning has for its use a detailed airport database to locate fixes. This means that by selecting a fix *PalmEFIS* Flight Planning automatically determines heading, distance, ETE and fuel usage between two fixes. These values are then totaled to display the trip's distance, time and complete fuel burn.

Wind Effects

The wind effects are reflected in the *PalmEFIS* Flight Plan. The wind speed and direction is taken from the *PalmEFIS* Weather dialog or the in-flight wind detection and back calculated into the flight plan results.

What-if Analysis

With *PalmEFIS* Flight Planning knowing how your aircraft performs at a given power setting and altitude you can play with the Percent Power and Altitude settings to see the effect they have on the total time and fuel for the trip. Taxi fuel burns are also included in the trip totals to yield the most accurate estimates.

Operations

The Inner-Works

Internally *PalmEFIS* Flight Planning **interpolates** your aircraft **cruise performance** chart in two dimensions. It can work with altitudes and percent power settings that are not in your chart. All this takes into account the **maximum performance** of your aircraft over an altitude range. For example if you are targeting 10,000 feet as your cruise altitude and the maximum power your aircraft can produce for that altitude is 70%, the flight plan percent power will be trimmed back to 70% while letting the lower altitude legs achieve a higher percent power rating.

The interpolation uses linear curve fitting and as such it induces a little **error** into the results. The error effects are that the intermediate speeds will be determined to be a little slower than reality and the fuel burns a little higher. Both are errors on the safe side.

Best Practices

At this stage of your flying you know how to create flight plans. With *PalmEFIS* Flight Planning using a familiar flight plan layout you will find flight planning quite intuitive. The what-if analysis is where the fun begins.

PalmEFIS Flight Planning uses four control parameters for its **what-if analysis**, **Altitude**, **Percent Power**, and the **Wind direction and speed**. Changing any of these three parameters effects the speed, ETE, and the fuel used. When working on long trips these three parameters can be juggled to insure you have the proper fuel reserves when the destination is reached.

The **detected wind** speed and direction is fed into the flight plan. This means that as the winds aloft change during a flight, they have a real-time effect on the flight plan totals. So if the destination is in question you can pull up the flight plan to check whether a fuel stop is necessary or if a power change will do the trick.

Remember that the **taxi fuel burn** is subtracted from the remaining fuel amount that is displayed on the flight plan.

The *PalmEFIS* Flight Planning operations are:

- Accessing the Flight Plan Editor
- Creating Flight Plans
- Editing Flight Plans
- Deleting Flight Plans

Accessing the Flight Plan Editor

Flight plans are created, edited and deleted with the *PalmEFIS* Flight Plan Editor. The Flight Plan Editor is also where what-if analysis is performed on an existing flight plan.

It should be noted that PalmEFIS Flight Planning generates the flight plan names. It uses the first and last fixes of the flight plan as the name.

Pressing the Palm Search silkscreen button accesses the Flight Plan Editor.



When the Flight Plan Editor dialog appears it is ready to create a **new** flight plan. If you want to **edit** or perform what-if analysis on an existing flight plan tap on the **Name** popup list.

The screenshot shows the 'Flight Plan Editor' dialog. At the top, there are fields for 'Name: ---', '%Power: 75', 'Start Fuel: 0', and 'Rem:'. Below these is a table with columns: 'Fix', 'Alt', 'MH', 'Dist', 'ETE', and 'Fuel'. The table has several empty rows. At the bottom, there is a 'Totals:' section and four buttons: 'OK', 'New', 'Delete', and 'Cancel'.

Previously created flight plans are listed to select.

This screenshot shows the 'Flight Plan Editor' dialog with a list of existing flight plans. The 'Name' field now shows 'S ---' and a popup menu is open, displaying 'POC/TOR' and 'st ETE Fuel'. The rest of the interface, including the table and buttons, remains the same as in the previous screenshot.

The selecting of a flight plan populates it into the Flight Plan Editor, ready for your next step.

Fix	Alt	MH	Dist	ETE	Fuel
POC	0	215	25	00:12	3
LGB	0	252	9	00:05	1
TOR					

Totals: 34 00:17 4

OK New Delete Cancel

Creating Flight Plans

Flight plans are created with the Flight Plan Editor.

The editor initially loads it defaults to an empty flight plan form that is ready to create a flight plan. If the Flight Plan Editor is populated with a flight plan press the **New** push button at the bottom of the dialog. This clears the editor and readies it for entering a new flight plan.

Fix	Alt	MH	Dist	ETE	Fuel

Totals: 0 00:00 0

OK New Delete Cancel

The first step is to enter a **new fix**. This is done by tapping on the first fix cell with the Palm stylist.

Tapping on the fix cell opens the Find Fix dialog. If you already know the airport identifier enter it in the **Fix** field and press the **OK** push button.

Find Fix

Fix: ▼ Airport

OK Find Cancel

If you are unsure of the airport identifier enter any part of the airports name or identifier and press the **Find** push button.

Find Fix

Fix: LPC ▼ Airport

- Lompoc (LPC)
- Brackett Fld (POC)

OK Find Cancel

The first 10 fixes that match your entry are listed. From the list select your airport and press the **OK** push button.

It is possible to enter **custom fixes** or waypoints into your flight plan by tapping on the Airport popup list and selecting the Waypoint list item. Fill in the prompted fix name and its latitude and longitude coordinates.

Find Fix

Fix: ▼ Waypoint

Latitude: 000000

Longitude: 000000

OK Find Cancel

The entered fix is populated in the Flight Plan Editor. As two or more fixes are entered into the flight plan the magnetic heading, distance, ETE and fuel used fields are automatically populated and totals are updated.

Flight Plan Editor

Name: ▼ POC/TOR %Power: ▼ 75
Start Fuel: [32] Rem: 28 |

Fix	Alt	MH	Dist	ETE	Fuel
POC	0	215	25	00:12	3
LGB	0	252	9	00:05	1
TOR					
Totals:				34 00:17	4

[OK] [New] [Delete] [Cancel]

Editing Flight Plans

Flight plan editing allows you to add or insert fixes, remove fixes, set cruise altitudes, change the starting fuel amount, and change the percent power for the flight.

The first step to editing a flight plan is to load it into the Flight Plan Editor. Tap on the Name popup list and **select** the flight plan to edit.

Flight Plan Editor

Name: --- %Power: 75

S --- Rem:

POC/TOR

Fix	S	st	ETE	Fuel
	POC/TOR			

Totals:

OK New Delete Cancel

Extending your flight plan is done by tapping on the first empty fix cell at the bottom of you flight plan.

Flight Plan Editor

Name: ▼ POC/TOR %Power: ▼ 75
Start Fuel: 32 Rem: 28 |

Fix	Alt	MH	Dist	ETE	Fuel
POC	0	215	25	00:12	3
LGB	0	252	9	00:05	1
TOR					
Totals:				34 00:17	4

[OK] [New] [Delete] [Cancel]

The Find Fix dialog is displayed and you can select a fix just as when you were creating the flight plan.

Editing, inserting or deleting fixes done by tapping on an existing fix. A popup menu is presented to select an operation.

Selecting to **Edit** the fix populates the fix in the Find Fix dialog. The fix could then be changed to another fix.

If **Insert Fix** is selected the Find Fix dialog is presented to enter a fix. The new fix is then inserted before the flight plan fix that was tapped on.

Selecting **Delete** removes the fix from the flight plan. If all the fixes are deleted from the flight plan the flight plan is deleted.

Tapping on an **Altitude** cell or **Start Fuel** trigger field presents the Number Pad dialog. The Number Pad is a mini calculator that facilitates operations such as adding 1000 feet to your current altitude or 5 more usable gallons.

If the **altitude** is the flight plan's first altitude all altitude fields are populated with the new altitude. As altitude values are changed the Flight Plan Editor recomputes the ETE and fuel burn based on your aircraft cruise specifications.

Tapping on the **% Power** popup list and selecting a power setting specifies the percent power for the flight plan. If a leg altitude is too high to achieve the selected power rating the power rating is truncated to the power that the aircraft produce at the leg altitude.

The screenshot shows the 'Flight Plan Editor' window. At the top, it displays 'Name: POC/TOA', '%Power: 75', 'Start Fuel: 0', and 'Rem: -4'. Below this is a table with columns: Fix, Alt, MH, Dist, ETE, Fuel. The first row (POC) has values: 0, 215, 25, 00:12, 3. A popup menu is open over the first row, showing options: Edit, Insert Fix, and Delete. At the bottom, there are buttons: OK, New, Delete, and Cancel. The 'Totals' row shows: 34, 00:17, 4.

The screenshot shows the 'Flight Plan Editor' window with the 'Number Pad' dialog open. The dialog has a numeric keypad with buttons for digits 1-9, 0, a decimal point, and a plus/minus sign. There are also buttons for 'OK' and 'Cancel'. The background shows the same flight plan table as the previous screenshot, but the popup menu is not visible.

The screenshot shows the 'Flight Plan Editor' window with the '% Power' popup list open. The list shows power settings from 50 to 95. The current selection is 75. The background shows the flight plan table with updated values: POC Alt 0, MH 215, Dist 25, ETE 00:12, Fuel 3; LGB Alt 0, MH 252, Dist 9, ETE 00:05, Fuel 1. The 'Totals' row shows: 34, 00:17, 4.

After each edit operation has completed the complete flight plan is recomputed.

Deleting Flight Plans

Flight plans are deleted from the *PalmEFIS* Flight Plan Editor. The delete flight plan is permanently removed from you Palm Handheld.

To delete a flight plan it must be loaded into the Flight Plan Editor. Tap on the Name popup list and **select** the flight plan to delete.

Flight Plan Editor

Name: --- %Power: 75

Rem:

Fix S POC/TOR

Totals:

OK New Delete Cancel

Once selected the flight plan is populated in the Flight Plan Editor. Press the **Delete** push buttons on the bottom of the Editor dialog.

Flight Plan Editor


Name: ▼ POC/TOR %Power: ▼ 75

Start Fuel: 32 Rem: 28

Fix	Alt	MH	Dist	ETE	Fuel
POC	0	215	25	00:12	3
LGB	0	252	9	00:05	1
TOR					
Totals:				34 00:17	4

Since the delete is permanent you will be prompted to make sure that you did not hit the delete button by mistake. Press the **Yes** push button to delete the flight plan.

Flight Plan Delete

 **Delete the flight plan?**

The Flight Plan Editor is then returned to a new condition ready to create a new flight plan.

Flight Plan Editor

Name: ▼ --- %Power: ▼ 75

Start Fuel: 0 Rem: ▼

Fix	Alt	MH	Dist	ETE	Fuel

Totals:

OK New Delete Cancel

11. PalmEFIS Datasets

The *PalmEFIS* Flight Director, Flight Planning and Moving Map products use the PalmEFIS Datasets. Within the Datasets are the airport information, nav aids, airspace information and topographical elevation data.

The PalmEFIS Datasets are built to provide quality data within a small memory footprint and then it is subdivided into regions about the size of a sectional map. This allows a large number of regions to be loaded onto a Palm without the need to reload new datasets.

The airport information contains the following details:

- Airport identifier
- Type
- Elevation
- Runway layout diagrams
- Communication frequencies
- Services

The navaid information contains the following details:

- Navaid identifier
- Type
- Elevation
- Communication frequencies

The airspace information contains the following details:

- Type
- Minimum elevation
- Maximum elevation
- Shape data

The topographical data contains the following details:

- Coordinates
- Elevation contours

All PalmEFIS databases start with a “pedb” prefix. The PalmEFIS Datasets end with one of the following postfixes:

- ARPT for airport and navaid information.
- BDRY for airspace information.
- DEM for topographical data.

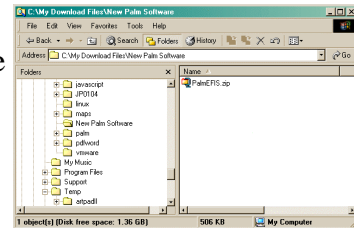
Each region contains datasets with the three postfixes. Between the “pedb” prefix and the postfix is the region name. The dataset naming convention caused all the datasets for a region to be grouped together when viewing them on the Palm. This allows a region to be easily removed if it is no longer needed or if memory on your Palm needs to be freed up.

PalmEFIS Dataset Installation

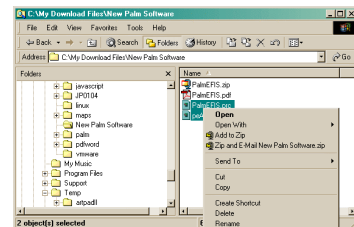
The *PalmEFIS* Datasets are self-configuring. If *PalmEFIS* sees a *PalmEFIS* Dataset on the PDA it uses it.

To install a *PalmEFIS* Dataset first go to the www.HangarB17.com site and download the dataset(s).

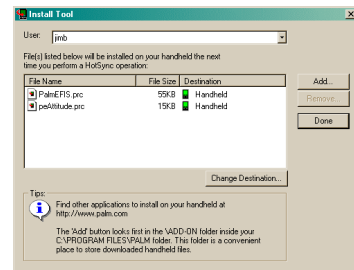
Locate the downloaded dataset(s), The Windows Explorer is very useful for this. They will be in a zip file. Expand the zip file into the directory that they were downloaded.



Select all the files that end with a “pdb” extension. Using the mouse right-click on the selected files. A popup menu will be displayed with “Open” as the first menu item. Select the “Open” menu item.



The selected “pdb” files are then opened into the Palm Install Tool. They are now ready to be installed on your PDA with a HotSync operation.



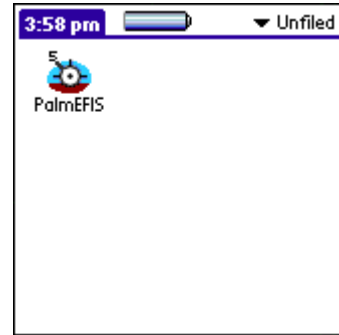
Pressing the HotSync button on the Palm cradle starts the HotSync operation that will install the *PalmEFIS* software.



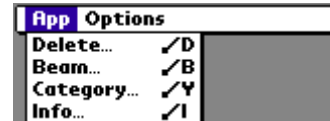
Removing *PalmEFIS* Datasets

The *PalmEFIS* Datasets are self-configuring. If *PalmEFIS* sees a *PalmEFIS* Dataset on the PDA it uses it. Conversely if the *PalmEFIS* Dataset is removed it is no longer used.

From any PalmOS category activate the dropdown menu.



Select the **App** menu's **Delete** menu item.



From the Delete dialog select the *PalmEFIS* Dataset region that you wish to remove. Notice that there are three “pedb” database files per region. They are the airport, airspace and topographical information. To remove a region select each of the three files, pressing the **Delete** button between each selection.



12. Legal

PalmEFIS is not to be used as a primary means of aircraft navigation and attitude control. It is not FAA certified for VFR or IFR purposes. The intent of *PalmEFIS* is as an assisting tool to the pilot's primary flight instrumentation. Pilots using *PalmEFIS* assume all risk as to how or when the tool is used.

