

# PCEFIS VERSION 3.6 SOFTWARE SUMMARY DESCRIPTION

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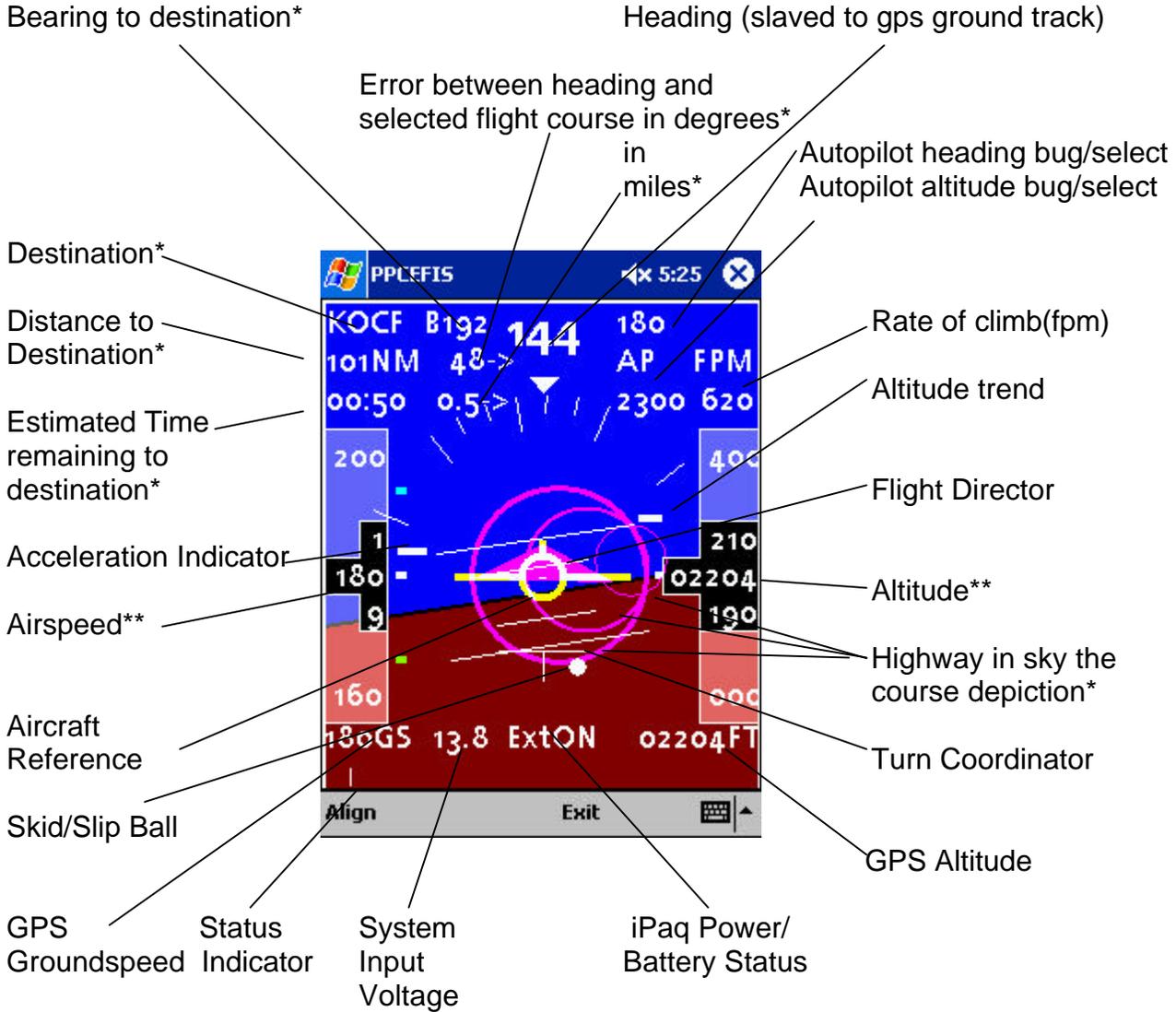
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# PCFLIGHTSYSTEMS PCEFIS

## VERSION 3.6 SOFTWARE DISPLAY SUMMARY



\*Requires use of a GPS with a destination waypoint selected.

\*\*Pressure Airspeed and Altitude provided when optional airdata interface is used, otherwise the "tapes" display GPS groundspeed and GPS Altitude when a GPS is connected.

Select/Deselect "HITS" mode by pressing the iPaq "top hat" switch in the center. When in HITS mode "top hat" switch controls autopilot target altitude and heading. When not in HITS mode "top hat" switch is used to control pitch reference "zero" setting. This allows pitch "zero" to be easily manually adjusted for different aircraft trim conditions.

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## System Functional Description

The PPCEFIS software performs two major functions which include digital signal processing of the IMU data and the processing required to graphically display the attitude/artificial horizon data.

The PPCEFIS software performs approximately one half of the digital signal processing of the IMU sensor data. This allows the signal processing algorithms to be easily enhanced in the future, by simply installing an updated PPCEFIS.EXE program onto the PDA. INS signal processing techniques are rapidly evolving and new techniques are continuously being developed. Allowing the PDA to perform a portion of the digital signal processing allows these new techniques to be implemented in the future, without the need to update the IMU module. This prevents the IMU module from becoming obsolete as new signal processing techniques become available.

The PPCEFIS software performs all of the graphical display capability of the system. This allows new display techniques to be added in the future by installing an updated PPCEFIS.EXE program onto the PDA. This further allows the system to remain “state-of-the-art” through software upgrades.

New PPCEFIS display capabilities are continuously being developed. At the current time the PPCEFIS contains several different types of data displays, all of which are simultaneously displayed.

The primary display is the Attitude/Artificial Horizon display. This display is an EFIS attitude display and looks much like a conventional attitude/artificial horizon gyro display. Pitch is denoted with a scale which has a minor divisions at +/- 5 degrees of pitch and major divisions at +/- 10 degrees of pitch. A roll display scale is also provided which has minor divisions at +/- 10 and 20 degrees of roll and major divisions at +/- 30 and +/- 60 degrees of roll. A roll angle pointer is located at the top of the attitude display. This roll angle pointer is an inverted white triangle. The roll angle pointer is called the “triangle reference pointer” The roll angle can be read from the scale marking directly below this roll angle pointer.

The display also simultaneously contains a turn coordinator display. This display is at the bottom center of the display and is located at the top of a small vertical line (this line is the skid/yaw reference line for the ball indicator). The turn coordinator display consists of a turn rate indicator line (which is a horizontal line which tilts to depict turn rate – the same as a turn coordinator) and a slip/skid ball indicator. The turn rate indicator line depicts the rate of turn of the aircraft and is useful to keep the aircraft heading stable. The slip/skid ball indicator depicts slip and skid information in exactly the same manner as the classical ball slip/skid indicator.

There are several other types of information depicted on the PDA display. This information includes a linear acceleration indicator. The linear acceleration indicator is a small horizontal

bar that is positioned on the left side of the display. This pointer depicts the type of acceleration on the pitch axis of the aircraft. If the bar moves upward the pitch acceleration is toward an upward bias. If the bar moves downward, the pitch acceleration is toward a downward bias. During a climb the bar will move upward and during a descent the bar will move downward. The bar will also move when the aircraft is accelerating or decelerating, this can be useful to evaluate the aircraft acceleration during the take-off roll, and the level of braking effectiveness after touchdown on the runway. During normal straight and level flight this bar should be located at the center reference marker and the slip/skid indicator should be centered at its reference line. If these conditions do not exist, then this indicates that the IMU and PCEFIS software are not properly calibrated. This means that the "Align" function should be run during straight and level flight to allow the system to recalibrate. You can also adjust the pitch reference, without using the "Align" by using the "top hat" button located at the bottom of the iPaq. Pressing the upper part of the top hat button will move the pitch reference upward, pressing the bottom part of the top hat button will move the pitch reference downward. This allows a convenient way to adjust the pitch "zero" setting at anytime. It can also be used on the ground to properly set the pitch attitude reference for tailwheel aircraft.

An activity status indicator is provided at the bottom left of the display. This activity indicator should always be flipping from vertical to horizontal. This indicates that the iPaq and PCEFIS system are both functioning. If the activity indicator is not "flipping" then the system is NOT WORKING and must not be used for any purpose – check all connections, power supplies, and reset the iPaq (using the reset button) before continuing to use the PCEFIS if the activity indicator ever stops "flipping".

The PDA displays a power supply system input voltage level indicator as a text readout at the bottom of the display. When running on external power this will display the aircraft system voltage, when running on internal battery it displays the internal battery voltage. When the power supply/battery reaches 7 volts the IMU will no longer operate properly so the system will automatically stop functioning and display a low battery voltage error display. The battery must be replaced, or the IMU must be connected to a power source having a voltage of 8 to 32 volts to continue operation. After this is done, the "align" function must be run to ensure that the system is properly calibrated.

Next to the system input voltage display is a status display for the iPaq power. When the iPaq is running from external power this will display "ExtON". When the iPaq is running from its internal batteries the unit will display the approximate amount of battery life remaining – such as "90%iB" which indicates that the iPaq has approximately 90% battery life remaining. Note that the iPaq may automatically turn itself off it reaches around 50%iB. If the iPaq ever turns itself off you must run the "Align" function before using the PCEFIS, otherwise the display will not be correct. The iPaq power status will display "IBat?" if external power is lost and the software can't determine the amount of remaining battery power. For normal usage the iPaq status should always be "ExtON". If "ExtON" is not displayed then you have either lost aircraft electrical power, or the PCEFIS system has become disconnected from the aircraft supply. In either event action must be taken or you will lose PCEFIS functionality when the iPaq battery becomes discharged.

## AHRS GPS Interface Option

The AHRS (Attitude Heading Reference System) option consists of an interface connector which enables the gyro module to be connected to any standard GPS serial output (NMEA 4800 baud). This connector is the bottom connector on the gyro module. Pin 2 of the connector must be connected to an NMEA 4800 baud data signal and pin 5 must be connected to the GPS unit ground. When the GPS is connected, and at least 4 satellites are received, the system will automatically display the additional GPS derived data. The data will not appear if there is no valid GPS data being received. When valid GPS data is available the AHRS option provides the following additional information onto the EFIS display:

Directional Gyro Heading slaved to GPS Ground Track - at the top of the display

Rate of Climb – digital readout, in feet per minute, at top right of display and an altitude trend bar located on the right side of the display.

Altitude “TAPE display” – at the right side of the display. This will show GPS altitude unless the optional airdata interface is used.

Ground Speed “TAPE display” – at the left side of the display. This will show GPS ground speed unless the optional airdata interface is used.

If a waypoint has been selected in the GPS then the following information will be also displayed on the PDA screen:

Destination waypoint Identifier – This is located in the top left of the screen and is the identifier of the waypoint you are currently configured to navigate to.

Distance to designation – this is the distance to the currently selected waypoint in Nautical Miles.

Bearing to Destination – This is the current bearing (compass direction) to the destination .

Heading/course error in degrees – this is the difference between your current heading and the course between your origin waypoint and your destination waypoint.

Heading/course error in miles– this is the distance in nautical miles the selected course is from your current position.

Estimated time remaining to the destination – This displays the estimated amount of time remaining until you reach the selected waypoint.

Course indicator circle – this is a purple circle which depicts the location of the selected course, relative to the aircraft.

## **HIGHWAY IN THE SKY MODE**

NOTE: NONE OF THE PCEFIS FUNCTIONS ARE INTENDED FOR PRIMARY AIRCRAFT CONTROL FUNCTIONS. THEY ARE TO BE USED ONLY AS BACKUP INDICATORS – NEVER USE ANY OF THE PCEFIS DISPLAYS AS PRIMARY AIRCRAFT CONTROL INDICATORS. THIS IS ESPECIALLY TRUE WITH THE HIGHWAY IN THE SKY MODE OF OPERATION!!

The “Highway In The Sky” (HITS) mode is selected by pressing the center of the “top hat” button of the iPaq. This mode requires that a GPS destination waypoint is selected. When the HITS mode is selected there are three new major items displayed on the screen. The HITS course depiction, a flight director, and an autopilot heading/altitude selection.

The HITS course is depicted by three purple circles. These circles represent the desired flight path. The intent is to keep the aircraft flying through the center of the circles.

The Flight Director is a purple triangle which can be thought of as a “lead aircraft”. The intent is to follow this “lead” aircraft to remain on course. **IMPORTANT NOTE – THE FLIGHT DIRECTOR IS ONLY A GENERAL GUIDELINE – NEVER USE IT AS A PRIMARY FLIGHT INSTRUMENT – IT WILL PROVIDE ROLL AND PITCH COMMANDS WHICH MANY AIRCRAFT ARE UNABLE TO FLY – NEVER, EVER, RELY ON THE Flight Director to control your aircraft.**

The autopilot functions are provided to enable you to set a “heading bug”( or autopilot target heading) and “altitude bug” (or autopilot target altitude) . The “altitude bug” is used as also use as the altitude target for the Flight Director. The flight director will prompt you to fly the aircraft to this target altitude. A future autopilot option will use these values to control the target altitude and heading for an optional autopilot module.

To adjust the heading and altitude target values, use the “top hat” button. Pressing the top of the button increments the altitude target value, pressing the bottom of the button decrements the altitude target value. Pressing the left side of the button decrements the heading target value. Pressing the right side of the button increments the heading target value.