



# **Avidyne PFD**

**With out Flight Director**

**Cirrus Transition Course**

01/11/05

**The system information, procedures and guidelines found in this presentation are for Reference Only.**

**The information & procedures in this presentation have been taken from the FAA Approved Airplane Flight Manual and Pilot's Operating Handbook (POH). The Information & Procedures in this presentation DO NOT SUPERSEDE the Information & Procedures in the POH. In the event of conflict, the POH shall take precedence.**



# \* Table of Contents

- ▶ General
- ▶ System Structure
- ▶ Nomenclature
  - Airspeed
  - Turn Indicator and Inclinator
  - Aircraft Attitude
  - Altitude Bug
  - Navigation Source Selection
  - Moving Map
- ▶ Flight Director
- ▶ PFD Initialization
- ▶ PFD Flying Procedures
- ▶ PFD Failures
- ▶ Limitations



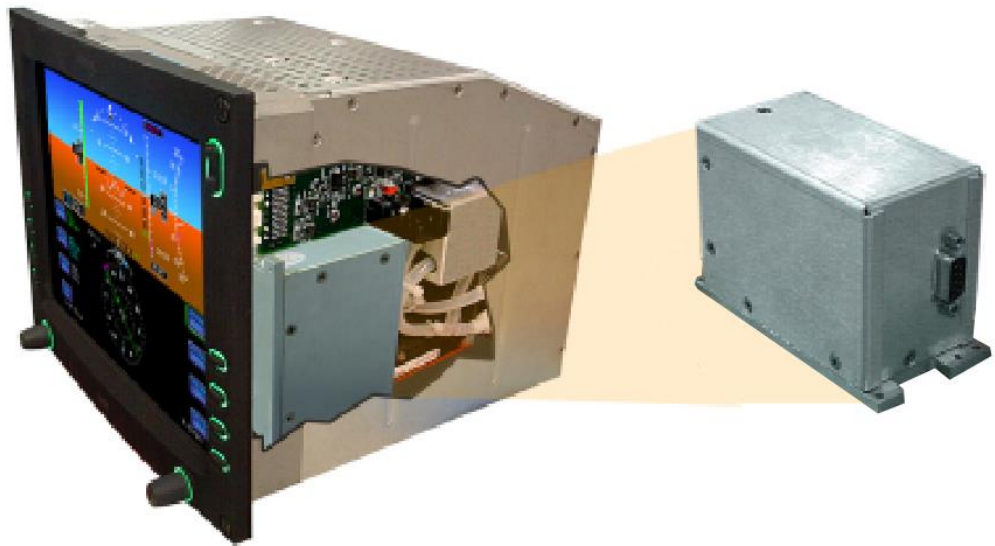
# General

- ▶ The Avidyne PFD incorporates the functionality of:
  - Horizontal Situation Indicator (HSI)
  - Vertical Speed Indicator
  - VOR/LOC/GS Indicators
  - Attitude Indicator
  - Airspeed Indicator
  - Turn Coordinator
  - Altitude, Airspeed & VSI Bugs

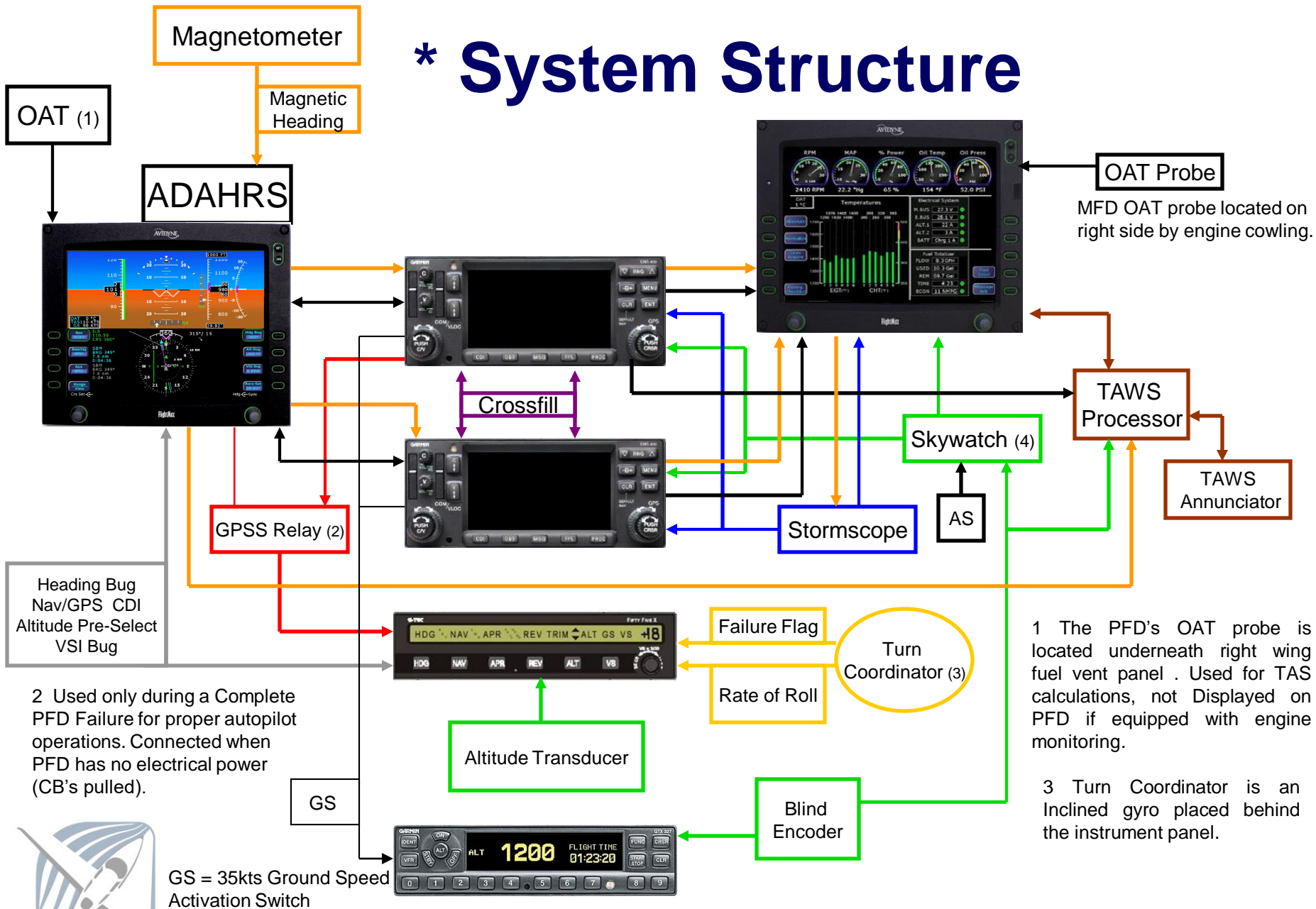


# General

- ▶ The flat panel liquid-crystal display is integrated with an Air Data / Attitude Heading Reference System (ADAHRS)
- ▶ Magnetometer (Magnetic Heading information)
- ▶ Three axis solid state gyro and accelerometer system
- ▶ AHRS Provides:
  - Pitch
  - Roll
  - Yaw



# \* System Structure



Heading Bug  
Nav/GPS CDI  
Altitude Pre-Select  
VSI Bug

2 Used only during a Complete PFD Failure for proper autopilot operations. Connected when PFD has no electrical power (CB's pulled).



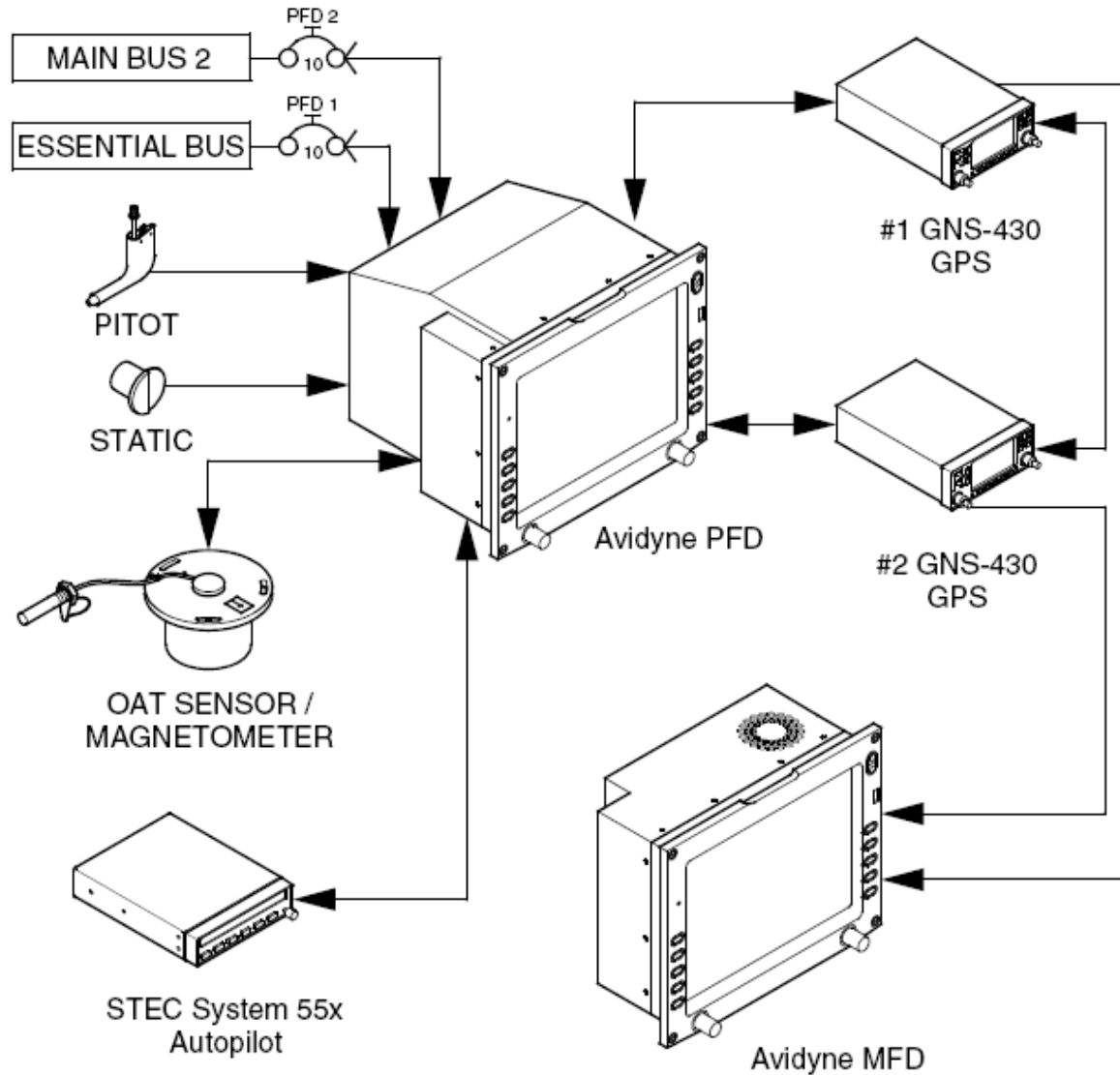
GS = 35kts Ground Speed Activation Switch

4 Skywatch has an Airspeed switch for automatic activation that is located in the pitot tube. Approximately set for 30 KIAS

1 The PFD's OAT probe is located underneath right wing fuel vent panel . Used for TAS calculations, not Displayed on PFD if equipped with engine monitoring.

3 Turn Coordinator is an Inclined gyro placed behind the instrument panel.

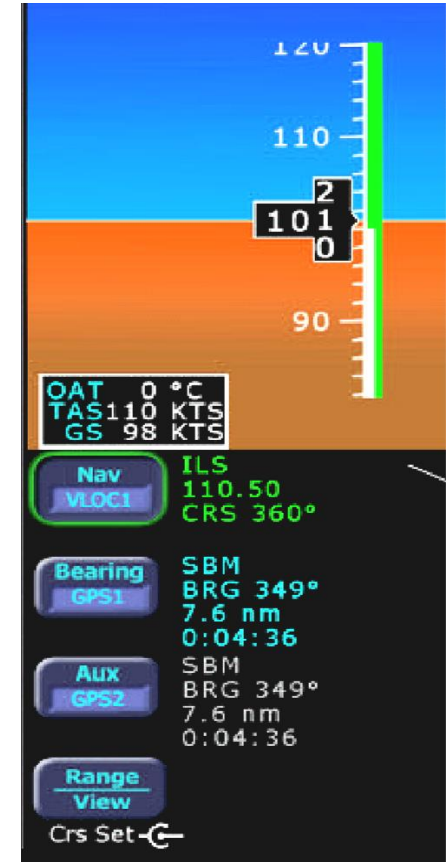
# PFD System Schematic



# Nomenclature

## ► Airspeed Tape

- Scale: 20 to 300 knots
- + / - 20 knots of current airspeed visible
- **Red Band (Low)**
  - 20 knots  $\rightarrow$   $V_{S0}$
- **White Band**
  - $V_{S0} \rightarrow V_{FE}$
- **Green Band**
  - $V_S \rightarrow V_{NO}$
- **Yellow Band**
  - $V_{NO} \rightarrow V_{NE}$
- **Red Band (High)**
  - $V_{NE}$  or greater

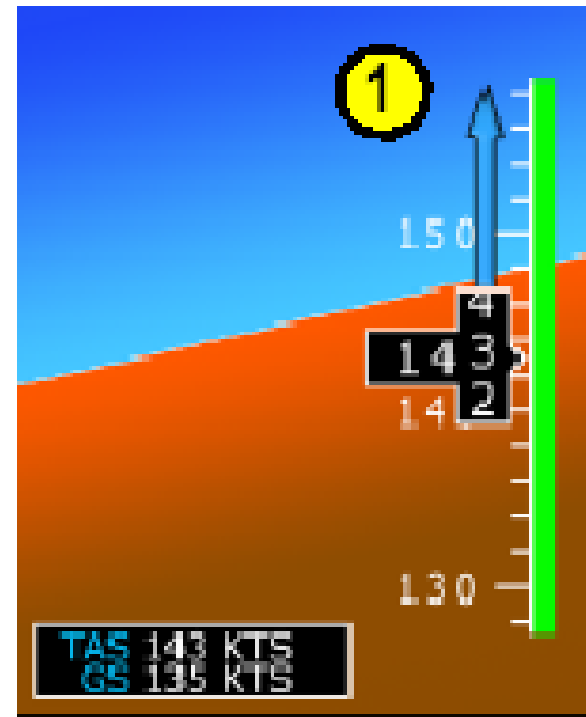




# \* Nomenclature

## 1 Airspeed Trend Indicator

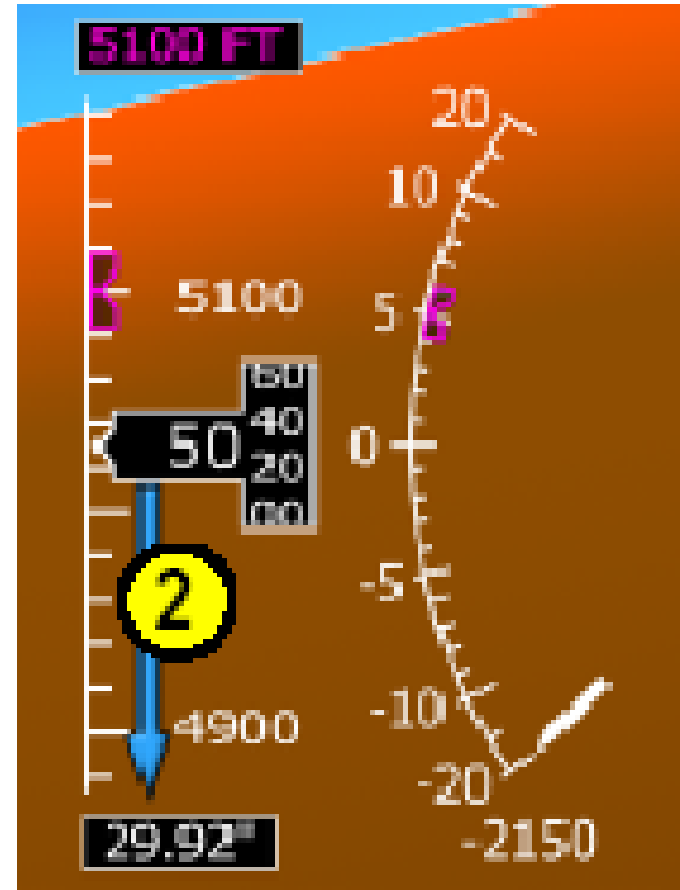
- Depicted as a **Blue** band
- Visible when airspeed changes at a rate greater than .8 knots / second
- Indicates where the airspeed is predicted to be in 6 seconds.



# Nomenclature

## 2 Altitude Trend Indicator

- Depicted as a **Blue** band
- Indicates where the altitude is predicted to be in 6 seconds
- An arrowhead indicates a value beyond the current tape field of view.



# \* Nomenclature

## Turn Indicator and Inclinometer

- The **Blue** rate of turn indicator displays the current rate of turn.
- The indicator is marked for 1/2 and full standard rate of turn.
- Typical bank angles for a standard rate of turn are approximately  $27^\circ$  in cruise conditions\*.

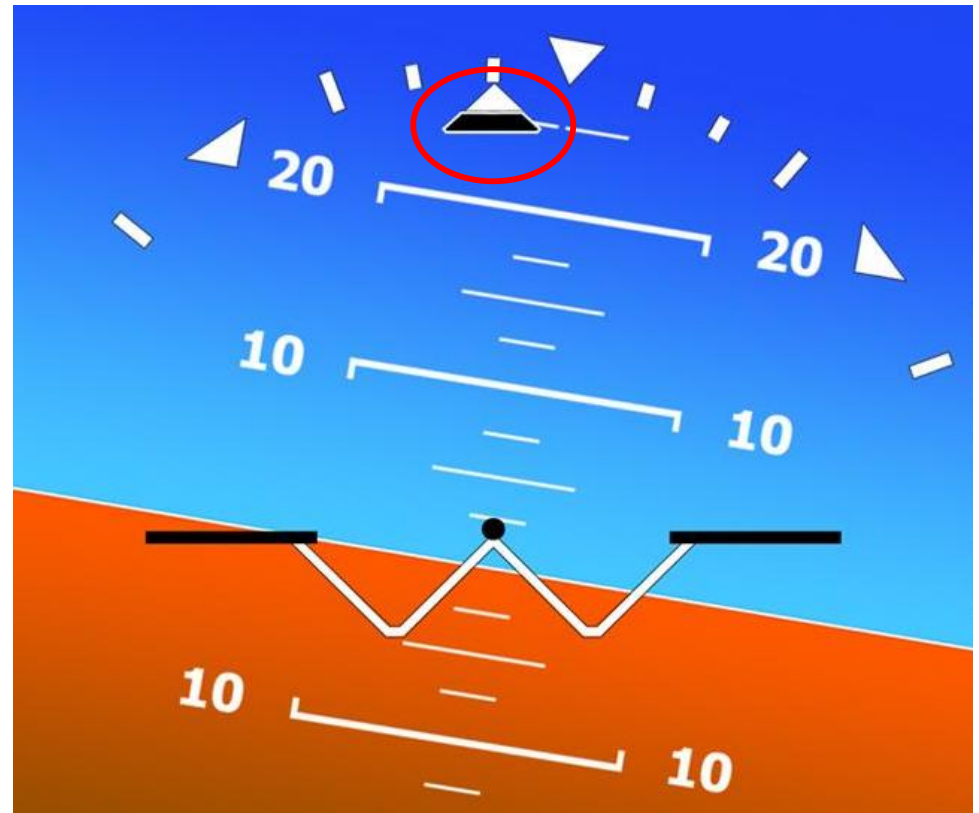


Note : When a blue arrowhead is present it indicates a value beyond 1 1/2 standard rate.

# Nomenclature

## ► Inclinometer

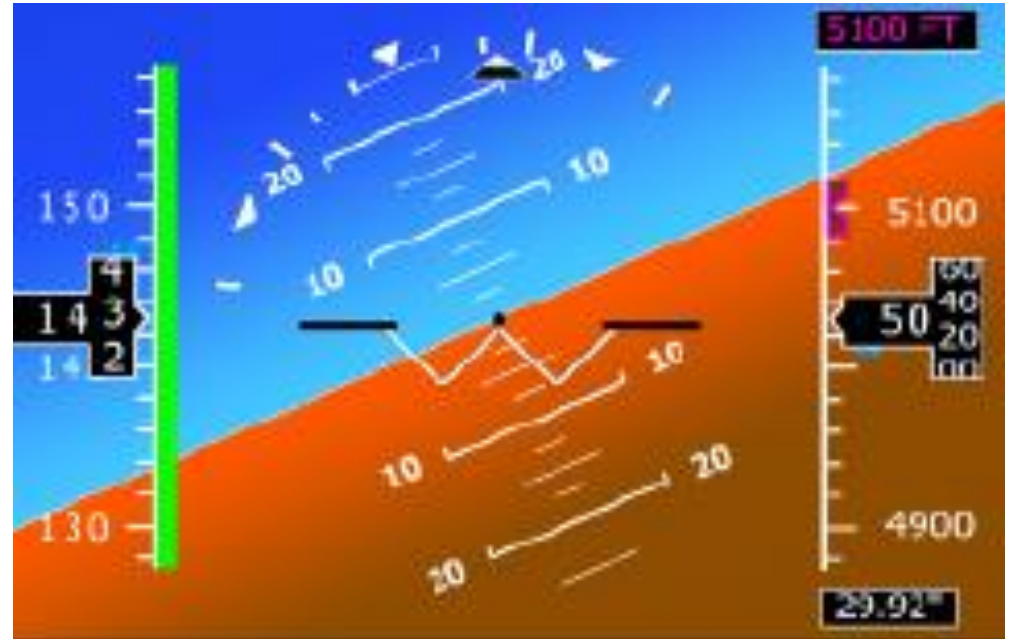
- Represented as black trapezoid below angle of bank indicator
- The black trapezoid is centered under the roll pointer in coordinated flight.
- Full scale deflection is the width of the trapezoid.



# Nomenclature

Level flight may be obtained by placing the black dot in the middle of the aircraft reference symbol (“Flying-W”) on the horizon line in cruise conditions. The pitch angle for level flight will vary with flight conditions.

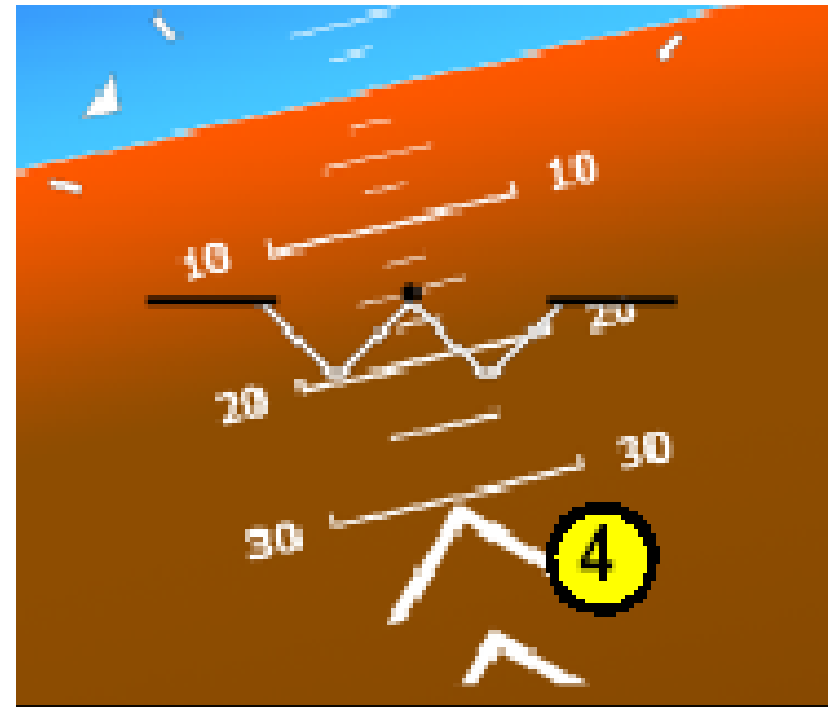
Level flight for SR-20 is 145 KIAS (approx. 75% power) and the SR-22 is 160 KIAS at 6000’ MSL at gross weight.



# Nomenclature

## ► Attitude Indicator

- Flying W – aircraft reference
- Bank Scale
  - 0°, 10°, 20°, 30°, 45°, and 60°
- Pitch Scale
  - Graduations every 2.5° within  $\pm 20^\circ$
  - Graduation every 5° for pitch  $+30^\circ / -20^\circ$
- **4** Excessive Pitch Chevrons
  - Appear at  $+50^\circ / -30^\circ$  pitch angles
  - $\pm 90^\circ$  pitch attitudes small circles appear



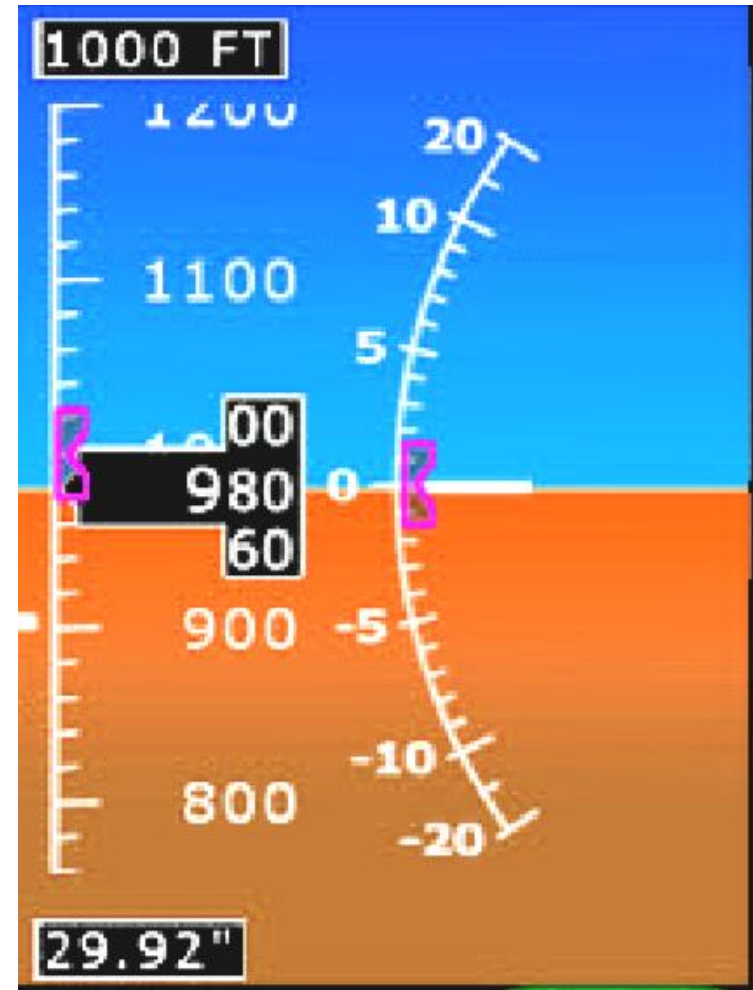
# \* Nomenclature

## ▶ Altitude Tape

- +/- 220 feet from current altitude shown
- 20 foot graduations
- -1000 to 25,000 foot scale

## ▶ Altitude Pre-select

- Digital display at top of altitude tape
- \* **Magenta** bug displayed on altitude tape when within 200 feet of selected altitude
- Digital display adjacent to “Alt Bug” line select key



# Nomenclature

**Altitude Bug Button (Alt Bug)**- When selected, allows the right knob to control the position of the altitude bug and the autopilot altitude pre-select value. The range of values is the same as the altitude tape.

The Alt Bug has three resolution setting modes: 1,000 ft, 100 ft, and 10 ft.

The default adjustment position is at the 1,000 ft mode and each button press steps the adjustment position down one place.

The selected numeric value appears in the button and in the Altitude Pre-select window on top of the altitude tape.





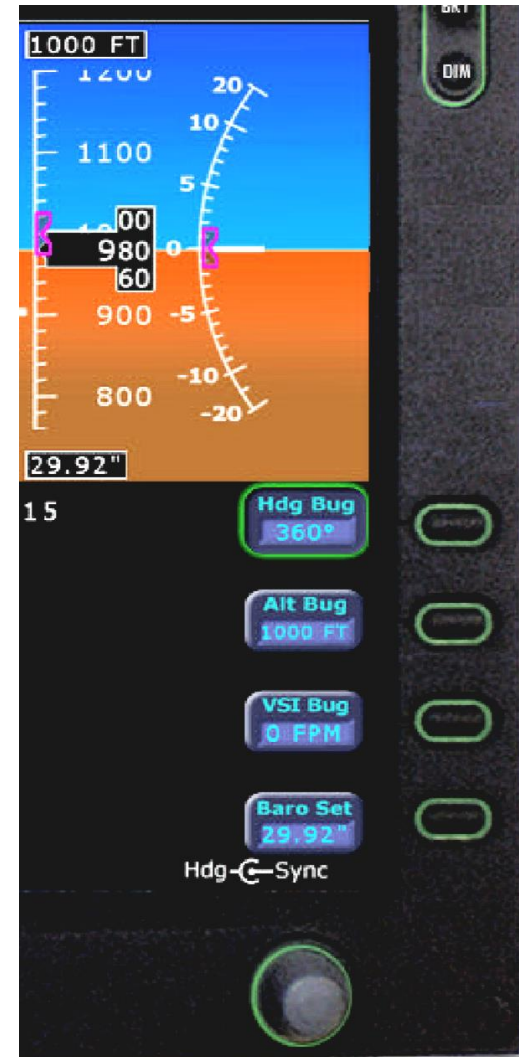
# \* Nomenclature

## Barometric Correction Setting Button

**(Baro Set)**- When selected, allows the right knob to control the value of the barometric correction setting. The range of allowable values is 29.50" to 31.50".

The selected value appears in the button label and in the Barometric Correction Setting window.

Pushing in the right hand knob will Sync the altimeter setting to 29.92"

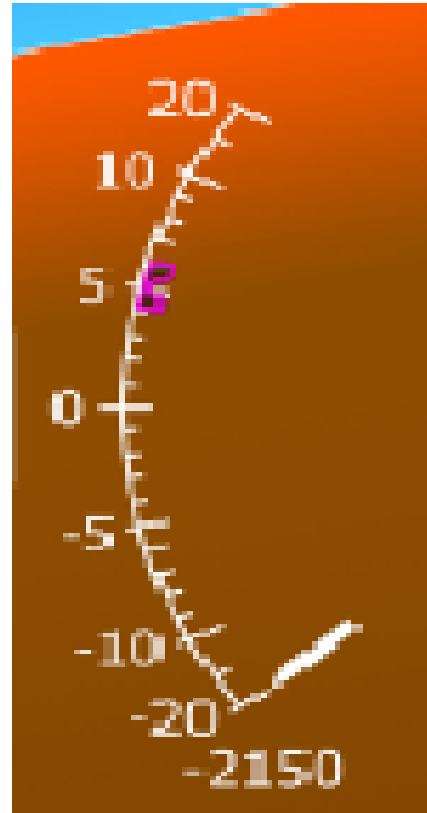


\* Note: Revision 5.0 and higher, the altimeter setting will be remembered even after a shut down.



# Nomenclature

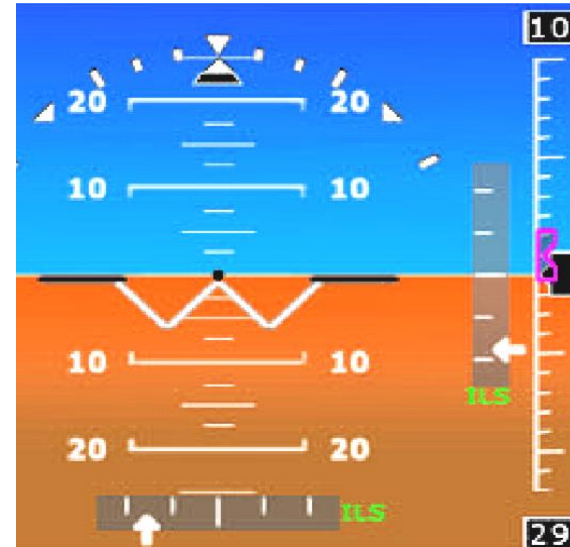
- ▶ **Vertical Speed Indicator**
  - Analog presentation between +2000 & -2000 fpm
  - Digital presentation in excess of 2000 fpm
- ▶ **Vertical Speed Preselect**
  - **Magenta Bug** displayed between +/- 1600 fpm
  - Digital presentation adjacent to “VSI Bug” line select key
  - Pushing in the right hand knob will Sync the VSI bug within 50FPM of current vertical speed.



# Nomenclature

## ► Navigation selection

- Active source selection cycled using “Nav” line select key
- Available sources:
  - GPS 1
  - VLOC 1
  - GPS 2
  - VLOC 2
- Displayed as **Green** needle on heading indicator
- Localizer and glideslope displayed adjacent to attitude indicator



# Nomenclature

## ► Bearing selection

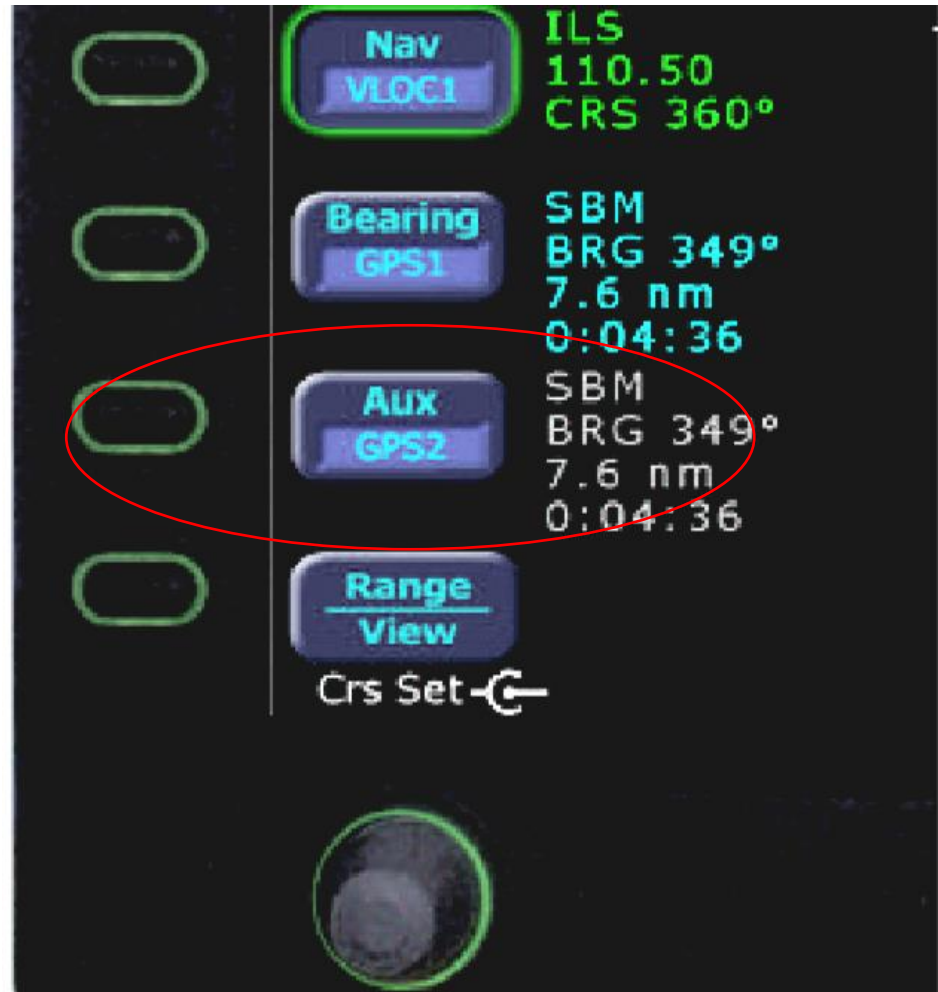
- Data source cycled using “Bearing” line select key
- Available sources:
  - GPS 1
  - VLOC 1
  - GPS 2
  - VLOC 2
- Displayed as **Blue** double-barbed needle on heading indicator
- Acts as a RMI, a course can not be set



# Nomenclature

## ▶ Aux selection

- Data source cycled using “Aux” line select key
- Displayed digitally adjacent to “Aux” status indicator
  - Includes Bearing to
  - Distance & time to active waypoint show up only with a GPS waypoint
- No needle representation on HSI



# \* Nomenclature

## ▶ Range / View selection

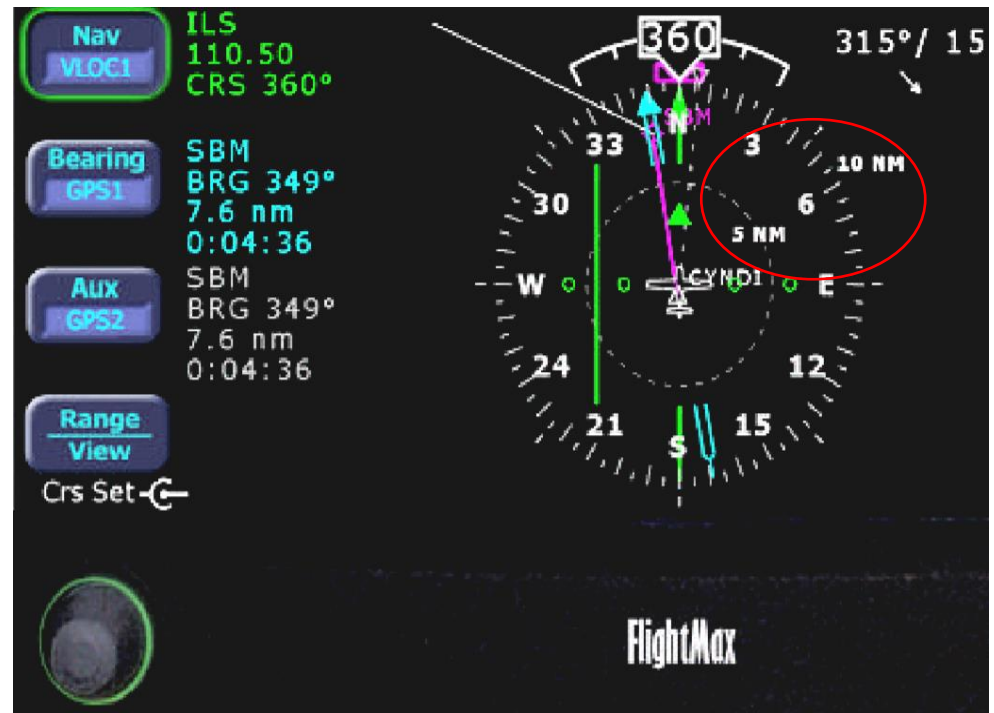
- View is cycled by pressing “Range/View” line select key
- Available views:
  - 360° w/ Moving Map
  - 360° w/o Moving Map
  - 120° w/ Moving Map
  - 120° w/o Moving Map



# Nomenclature

## ► Range / View selection

- Range adjusts view of moving map
- Adjusted using Left knob
- Available ranges:
  - 2 NM
  - 5 NM
  - 10 NM
  - 20 NM
  - 50 NM
  - 100 NM
  - 200 NM



# Nomenclature

## ▶ Compass Rose

- Heading digitally represented at top of heading indicator

## ▶ Heading Bug

- Digitally displayed adjacent to “HDG Bug” line select key
- Magenta Bug displayed over compass rose
- Pushing in the right hand knob will Sync the heading bug to current heading.





# \* Nomenclature

## Wind Vector

- Shows current wind in knots & direction
- Can GPS 1 or 2 Derived depending on NAV source used

## Projected Ground Track

- Shows your current ground track
- Can GPS 1 or 2 Derived depending on NAV source used



# Flight Director



# PFD Initialization



# \* Initialization

## Software Revision 04 & Below

- ▶ Requires approximately 3 minutes to align
- ▶ Countdown begins when unit is 40 seconds from completing the initialization process
- ▶ Air data will become valid prior to attitude information
- ▶ Red X's indicate invalid data
- ▶ Brightness Default: 75%



# Initialization

## Software Revision 04 & Below

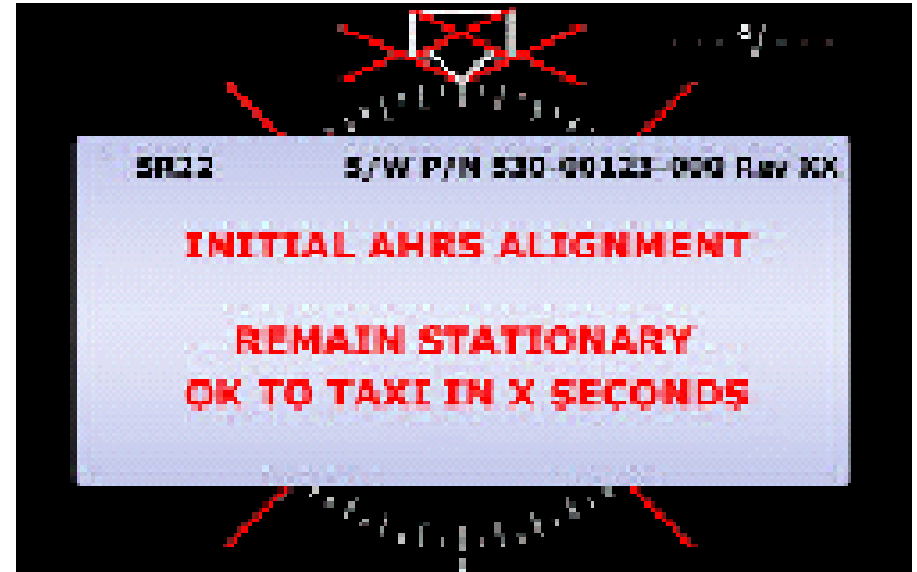
- ▶ **Default configuration:**
  - **HDG Bug: 360°**
  - **Altitude Bug: Nearest hundred feet**
  - **VSI Bug: 0**
  - **Baro Set: 29.92 in. Hg**
  - **Nav: GPS 1**
  - **Bearing: Off**
  - **Aux: Off**
  - **View: 360° w/ Moving Map**



# Initialization

## Software Revision 05 & above

- ▶ The Initialization screen displays immediately after power is turned on.
- ▶ The first initialization box is displayed for 30 seconds in normal alignments. It is imperative to remain stationary during that time.
- ▶ The third line, **OK TO TAXI IN X SECONDS**, indicates when it is permissible to taxi while the system is still aligning.
- ▶ Air data (airspeed, altitude, vertical speed) will become valid prior to attitude data.



\* NOTE: For faster alignments (3 minutes recommended Rev 05 PFD or less), it is recommended that the aircraft not be moved until alignment is complete. The OK TO TAXI screen is provided for increased flexibility during ground operations, but it may extend alignment time.



# Initialization

## Software Revision 05 & above

- ▶ At the completion of that 30 second period, the following message is displayed.
- ▶ This display will be up for approximately 90 seconds during which movement is acceptable.
- ▶ Movement beyond that 90 second window will extend overall warm-up duration.



\* Note that the overall software version number is listed in the box as is the aircraft that the V-speeds are set up for.

# Initialization

## Software Revision 05 & above

- ▶ When the system is approaching its final alignment phase, the message changes to indicate that the pilot should bring the aircraft to a stop as soon as it is practical.\*
- ▶ **Final AHRS Alignment** screen will change to show a 40 second count down timer
- ▶ Typical total alignment time is 3 minutes but may take longer if the aircraft is subjected to forward motion at this time.



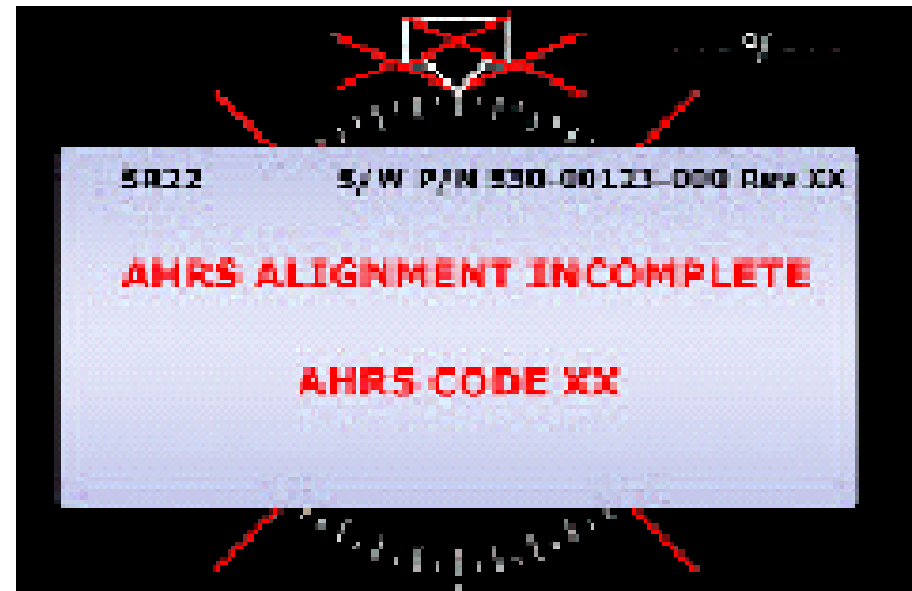
\*Note: The **Ready for Final AHRS Alignment** screen will be presented for several seconds, even if and after the aircraft is stationary.



# Initialization

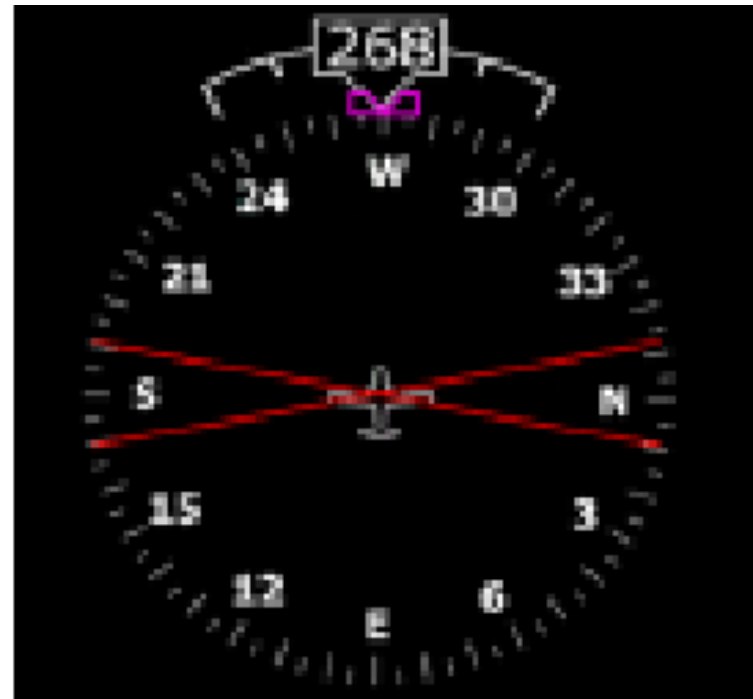
## Software Revision 05 & above

- In the event that the AHRS is unable to complete its alignment, the following display is presented.
- If this occurs, wait approximately an extra 2 minutes in this state.
- If the system picks back up on the alignment, a normal PFD will result.
- If the display does not clear itself, contact a service center and provide the displayed error code.



# Initialization all revisions

- ▶ Until a flight plan is activated in GPS/Nav 1, the HSI will show a red “X” in place of the CDI.
- ▶ Or a valid navigation signal is detected in VLOC mode.

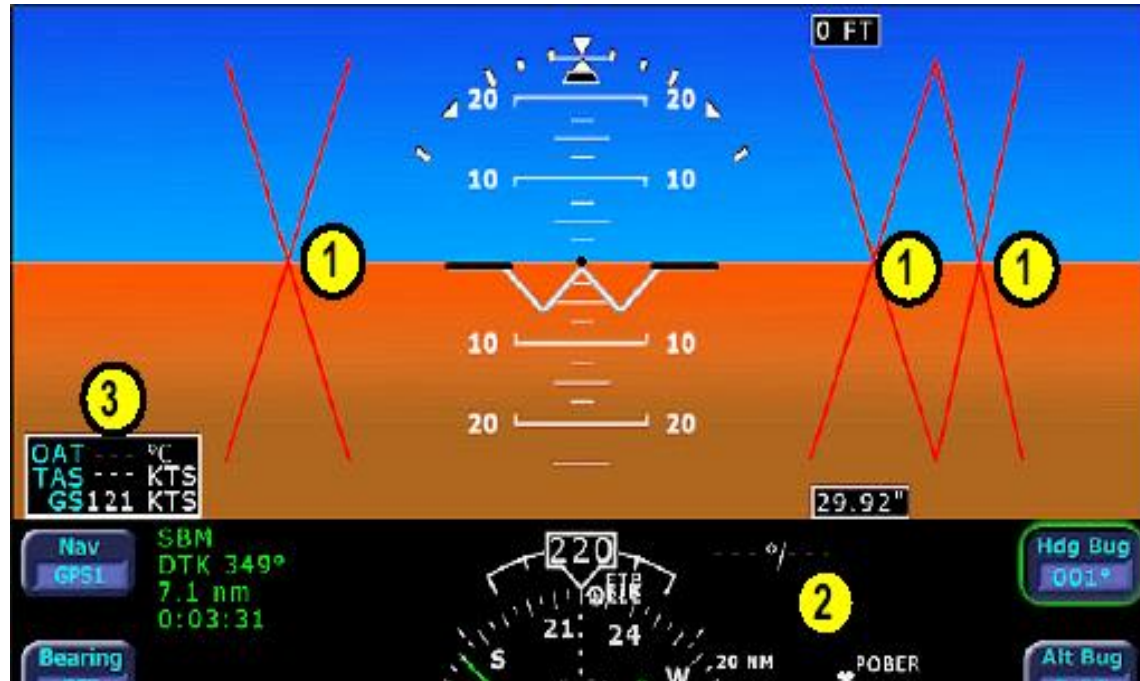


# PFD Failures



# Failures

- ▶ **Air Data Failure**
  - Shown by **Red X's**
  - Airspeed, Altimeter and VSI disappear
- ▶ **Refer to standby instrumentation**



\* Note OAT and TAS (3) will be replaced by dashes along with wind speed and direction (2).





# Failures

## ► Cross Check Attitude

- The pilot should scan standby instruments
- The warning message is automatically removed when the self-check monitor confirms the PFD attitude is valid.



# Failures

- ▶ Recoverable Attitude Data Failure
- ▶ Occurs when:
  - Attitude change exceeds 90° per second
  - Small power fluctuation
- ▶ Gyros are reset by pressing “Fast Erect” line select key
- ▶ 10 Second Timer will start once button is pressed



**\*Note you must Maintain Straight & Level Flight before and after pressing the “FAST ERECT” button.**

# Failures

## ▶ Non-recoverable Failure

- Cannot be corrected in flight
- USE Standby Instruments
- If in IMC proceed to nearest VFR conditions do not re-enter IMC





# Failures

- ▶ **Lamp or LCD failure**
  - **Bezel Keys are lit, no display screen**
  - **Check Brightness Controls**
  - **Take system off line by use of CB's, to ensure predictable autopilot operations.**



# PFD Limitations



# Limitations

1. The PFD integrates with separately approved sensor installations. Adherence to limitations in appropriate installation POH supplements is mandatory.
2. The Avidyne FlightMax Entegra-Series PFD Pilot's Guide, P/N 600-00081-000, Revision 03, or latest revision, must be available to the pilot during all flight operations.
3. Flight under Instrument Flight Rules (IFR) is not permitted with the PFD or any standby indicator (attitude indicator or magnetic compass) inoperative. *Refer to Kinds of Operation Equipment List.*

• **Note** •

***The Avidyne PFD software version is displayed on the PFD during system startup.***

4. *Serials 0002 and subsequent before installation of PFD software version 530-00123-XXX-REV05 (where X can be any digit from 0 to 9)*

**Backcourse approaches are prohibited.**



# Limitations

***When the PFD is coupled with the Autopilot System, the following Limitations apply:***

5. Autopilot operation is prohibited above 185 KIAS.
6. The autopilot must not be engaged for takeoff or landing.
7. The autopilot must be disengaged for missed approach, go-around, and balked landing.
8. Flaps must be set to 50% for autopilot operation in Altitude Hold at airspeeds below 95 KIAS.
9. Flap deflection is limited to 50% during autopilot operations.
10. The autopilot must be disconnected in moderate or severe turbulence.
11. Minimum engage height for the autopilot is 400 ft AGL.



# Limitations

## • WARNING •

***Autopilot may not be able to maintain all selectable vertical speeds. Selecting a vertical speed that exceeds the aircraft's available performance may cause the aircraft to stall.***

12. Minimum speed with the autopilot engaged is 1.2Vs for the given configuration.

***For VOR/GPS and ILS glideslope and localizer intercept, capture, and tracking, the following limitations apply:***

- a. The autopilot must be disengaged no later than 100 feet below the Minimum Descent Altitude
- b. The autopilot must be disconnect during approach if course deviation exceeds 50%. The approach should only be continued by “hand-flying” the airplane.
- c. The autopilot must be disengaged at the Decision Height.
- d. 12 knot maximum crosswind component between the missed approach point and outer marker.
- e. The intercept of the localizer shall occur at least 5 miles outside of the outer marker.



# Limitations

- f. If the crosswind component is greater than 12 knots and less than 17 knots, the intercept shall occur at least 10 miles outside of the outer marker.
- g. The intercept angle shall be no greater than a 45-degree intercept.
- h. The ILS is flown at normal approach speeds, and within any STC or TC speed constraints and as defined in this flight manual.
- i. The flaps should be extended in the approach configuration prior to the Outer Marker. No further changes in the flap configuration should be made throughout the autopilot coupled approach.
- j. The glideslope is approached in such a manner to allow automatic arming of the glideslope, or if the glideslope is manually armed no more than 15% above the glideslope.



# SRV and SR20's with S-Tec 55SR Autopilots

Bearing Pointer and AUX Navigation information will not be shown.  
VSI Bug will not be shown

