Operating Handbook

For

xCruze 110 Autopilot

Honeywell International, Inc.
9201-B San Mateo Blvd N.E.
Albuquerque, New Mexico 87113 U.S.A.
Telephone: 855-250-7027 (Toll Free U.S.A./Canada)
Telephone: 602-365-7027 (International/Direct)

Document P/N 8300-089 Rev 3
Jan 2020

Table of Contents

1. Revisions

Rev Number	Notes	Date
IR	Initial Release	5/1/2015
A	Added notes about altitude select/baro set modes	5/7/2015
B	Changed display setup to account for non-touch interface	8/11/2016
3	Formatted to BendixKing	1/31/2020

2. General Introduction

2.1. About your Autopilot

Thank you for purchasing this BendixKing product. At BendixKing, we strive to provide the highest quality avionics and autopilots available in the Experimental & Light Sport Aviation markets. The team at BendixKing are not only committed to quality, but to industry leading customer service and support.

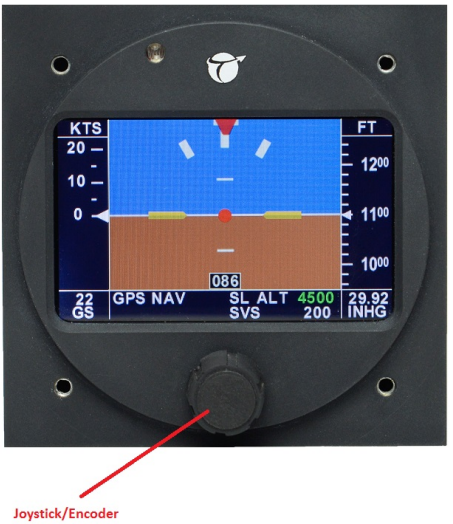
We believe that the XCruze 110 is the best stand-alone autopilot that we have ever created. By combining the functions of our very popular Vizion autopilot with the safety and easy-to-fly features of our XCruze 110 PFD, you get unparalleled utility all in one package. The XCruze 110 takes our already simple and intuitive user interfaces and takes it a step further by adding a now industry standard joystick, allowing a clean look without becoming too convoluted.

Your new XCruze 110 autopilot was created with both the VFR and IFR pilot in mind. The new Emergency Level Mode was designed primarily for the VFR pilot that inadvertently finds himself in IMC. The operation of the Altitude Select and Altitude Preselect Modes were designed to be extremely useable and useful in IFR flight, even to the extent that an Altitude Select can be entered and the vertical speed is easily adjusted to any desired value. This feature is extremely useful when initiating approaches or during step down approaches.

Please read this manual carefully and get to know your new autopilot.

2.2. Controls

The XCruze 110 AP has a single user interface for device for operation. It is a joystick/encoder combination. There are three types of control inputs: TOGGLE, ROTATE, PRESS. Toggle means to use the joystick portion, rotate means to turn the knob, press means to press the knob. If a hold is required, it will be noted along with one of the three listed inputs. Not on the face of the unit, but also integral pieces of the autopilot system are the control wheel steering button or CWS button, and the AP LEVEL button.



3. Autopilot Power Up

The autopilot master switch should be in the off position when the engine is started. After starting the aircraft engine, the autopilot master switch can be turned on at any time. The autopilot software version is displayed for a few seconds after power is applied, but it is not necessary to hold the aircraft stationary during the power up sequence. Autopilot type and software version is shown in figure 3a.

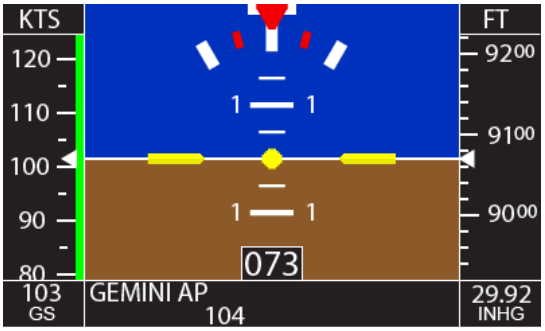


Figure 3a

Note: Before using the autopilot, an altimeter sync should be completed. See section 6.1 for altimeter sync instructions

4. Autopilot/Flight Instrument Display

The autopilot display contains both a flight instrument and the autopilot mode annunciation. The autopilot display bar is the box below the DG. It will show autopilot mode status and is where all values for autopilot options are selected.

4.1. Flight Instrument Display

4.1.1. PFD display description

The main display of the XCruze 110 Autopilot contains a PFD flight instrument. This consists of an attitude indicator, airspeed indicator, altimeter, VSI, slip/skid indicator, bank angle indicator, turn rate indicator, and a track slaved DG. A full layout of the PFD display is shown in Figure 4.1.1a

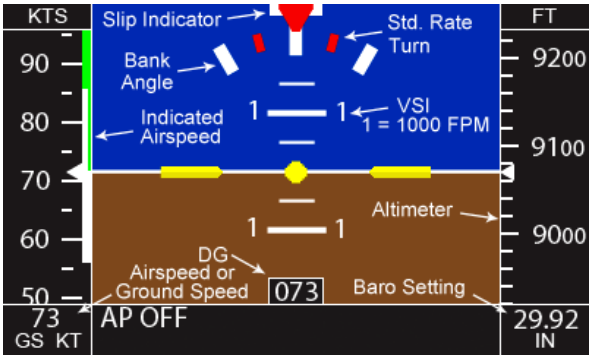


Figure 4.1.1a

4.1.2. GPS Status on DG

The DG display of the PFD is a gyroscopically enhanced GPS ground track. This enhancement creates a very easy to fly track based DG, which is free of the usual GPS based lag in many displays. The DG display gives indication of GPS signal status by changing the color of the numbers. If the autopilot is powered up before the GPS

and/or the autopilot is not receiving a valid signal from the GPS, the DG box numbers will be RED. This is shown in Figure 4.1.2a.

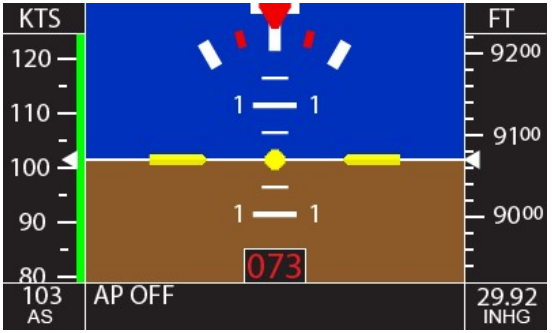


Figure 4.1.2a

If the autopilot is receiving a valid GPS signal but there is no position fix, for example inside a hangar, the DG box numbers will be YELLOW. This is shown in Figure 4.1.2b.

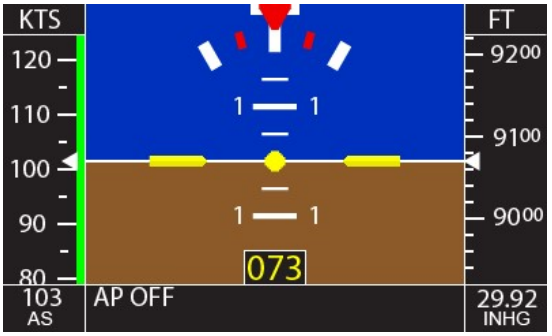


Figure 4.1.2b

If the autopilot is receiving a valid GPS signal that has a position fix, the DG box numbers will be shown in WHITE. This is shown in Figure 4.1.2c.

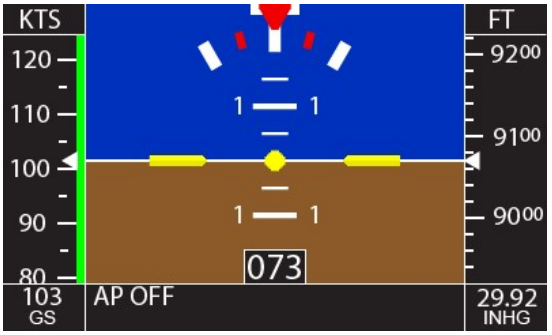


Figure 4.1.2c

If the autopilot is receiving a valid GPS signal but the signal is varying greatly from the last received signal, the DG numbers will be GRAY. This could be seen when the GPS first acquires satellites and the autopilot DG is slewing to the current reading. This should only be seen temporarily. If it remains permanently, this could indicate a problem with the GPS output. This is shown in Figure 4.1.2d.

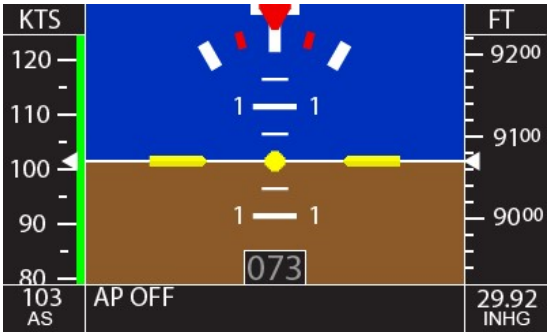


Figure 4.1.2d

If the autopilot is receiving a valid GPS signal that contains waypoint information, such as a flight plan or GPSS steering information, the DG numbers will be BLUE. This is shown in Figure 4.1.2e.

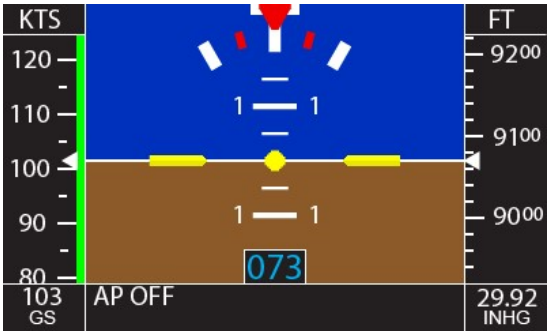


Figure 4.1.2e

4.2. Autopilot Display

The autopilot mode and selection display is in the black bar under the DG box. Lateral modes and selections are displayed on the left half of the autopilot display bar, vertical modes are displayed on the right half of the autopilot display bar.

4.2.1. Trim Annunciation

The autopilot pitch servo can detect when the aircraft is out of trim with the autopilot engaged. Feedback is shown on the display, above the autopilot display bar and to the left of the DG box. It will flash yellow with an arrow pointing either up or down when an out of trim condition is detected. An arrow pointing up means trim NOSE UP, an arrow pointing down means trim NOSE DOWN. Figure 4.2.1a shows the trim NOSE DOWN annunciation on the display.

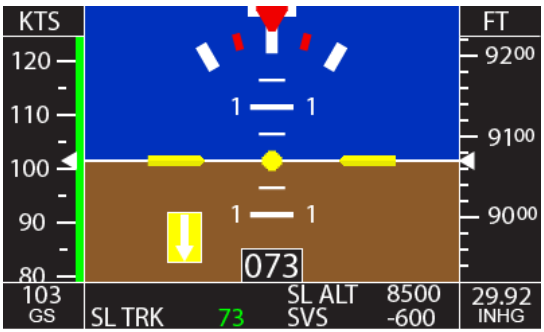


Figure 4.2.1a

Figure 4.2.1b shows the trim NOSE UP annunciation on the display.

Figure 4.2.1b

4.2.2. Min/Max Airspeed Annunciation

The display also gives a visual warning of hitting the minimum and maximum airspeed limits while the autopilot is engaged. This is shown as a flashing MIN AS or MAX AS that shows above the autopilot bar and to the left of the DG box. Figure 4.2.2a shows the MIN AS annunciation.

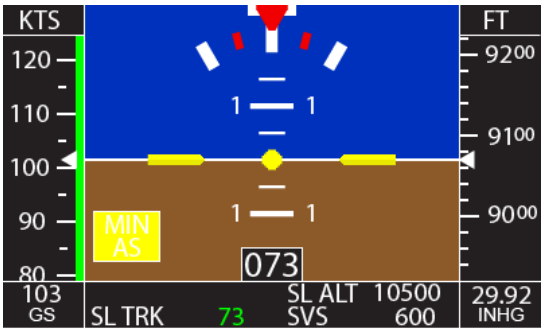


Figure 4.2.2a

Figure 4.2.2b shows the MAX AS annunciation.

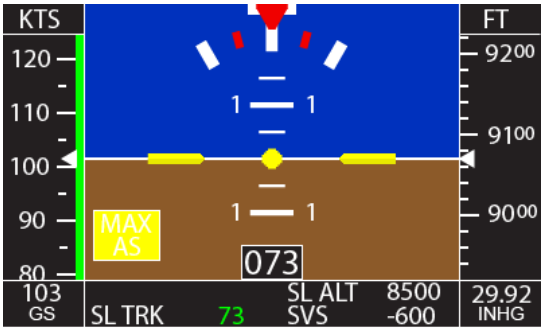


Figure 4.2.2b

5. XCruze 110 AP Setup Procedure

The display and autopilot parts of the XCruze 110 AP have several user selectable values to help tune the instrument and flight dynamics of the autopilot. Be sure to go through all of the screens before the first flight using the autopilot as there are some safety limits that need to be set.

5.1. PFD Display Setup

Before using your XCruze 110 Autopilot, there are a couple of things on the PFD display that must be setup so that the instrument can be used reliably. The setup screen for this is accessed via the joystick control. Toggle and hold the joystick to the right until VERTICAL ACT is shown then release the joystick. Next, toggle and hold the joystick down until SET DG is shown.

5.1.1. Manually Setting DG

The DG on this product is slaved to the GPS to which it is connected. In normal operation, no action is necessary here. In the event of GPS output failure, the DG will turn red, indicating a lack of GPS input. The DG will become an unslaved gyro at that time. This setup menu allows the DG to be set to a compass heading.

With SET DG shown on the screen, rotate the knob to set the DG to the desired value. Clockwise rotation numerically decreases the number. The DG may drift off the set value, correcting this is

addressed in section 5.1.2. Figure 5.1.1a shows the SET DG setup screen.

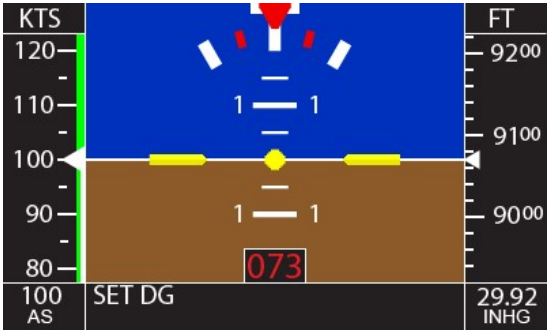


Figure 5.1.1a

5.1.2. DG Drift Adjustment

When the DG is manually set to a compass heading, it may drift off the set heading, just like all other unslaved gyros. The drift adjustment allows for removal of the DG drift rate. Rotate the knob clockwise or counter-clockwise to correspond with the desired drift removal. The values are arbitrary and do not correspond to a certain degrees per second value. Figure 5.1.2a shows the DG DRIFT adjustment screen.

Once the DG drift has been removed to satisfaction, toggle the joystick to the right to advance to the next setup screen or click the knob in to exit the setup menus.

Figure 5.1.2a

5.1.3. Slip/Skid Indicator Centering

The slip/skid indicator can be centered manually. First, verify that the aircraft is level from side to side before centering the ball. When CENTER BALL is shown on the display, rotate the knob either clockwise or counter-clockwise to center the indicator behind the red pointer. Figure 5.1.3a shows the CENTER BALL setup screen. Toggle the joystick to the right to advance to the next screen, VS0.

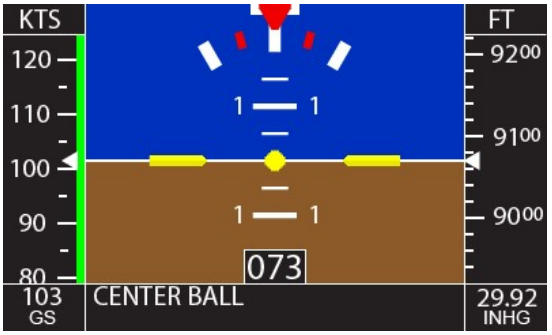


Figure 5.1.3a

5.1.4. Airspeed Indicator V-speed Values

The Vspeed values of the airspeed indicator tape are user selectable. The left side of the lower box will display which airspeed color is currently being set. The right side of the lower box displays the currently set value. Rotate the knob to adjust the value as desired. Toggle the joystick to the right to advance to the next setup screen. Repeat for each airspeed color setup screen. Repeat this process for each of the Vspeed setup screens.

The PFD display allows selection of VS0, VS, VFE, VN0, and VNE. Figure 5.1.4a shows what is displayed for the VS0 setup screen. Figure 5.1.4b shows the VNE setup screen.

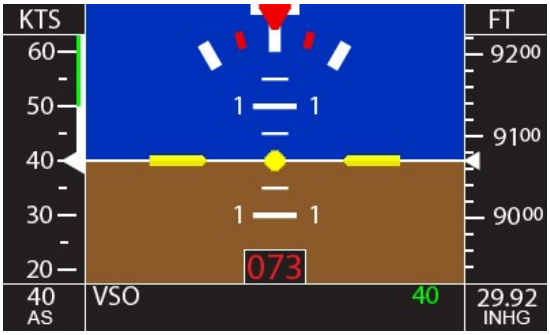


Figure 5.1.4a

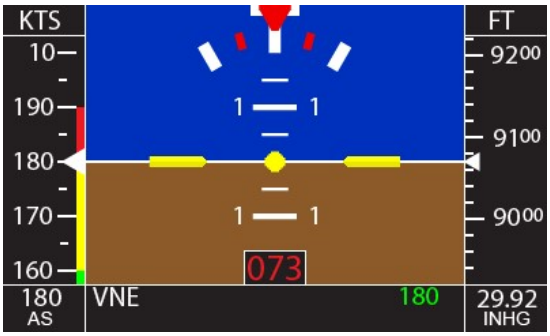


Figure 5.1.4b

5.1.5. Low Airspeed Warning

The PFD display contains a low airspeed warning for use when the autopilot is either engaged or not. This warning flashes the center dot of the horizon reference bar red when the user set airspeed is reached. It will continue flashing until the airspeed reaches 50% of the set value, so as not to give a flashing warning on landing rollout and taxi. When LOW AS WRN is showing on the display, rotate the knob to adjust the set point to the desired value. Figure 5.1.5a shows the LOW AS WRN setup screen. When the desired value is set, toggle the knob to the right to advance to the next setup screen.

Figure 5.1.5a

5.1.6. Altimeter Units

The PFD display allows the units of the altimeter to be changed between FEET or METERS. When ALT UNITS is shown on the display, the upper right side box on the display will show the currently selected altimeter units. From this screen, rotate the knob clockwise to select M, rotate counter-clockwise to select FT.

Figure 5.1.6a shows the ALT UNITS setup screen. Once the desired unit is set, toggle the joystick right to advance to the next setup screen.

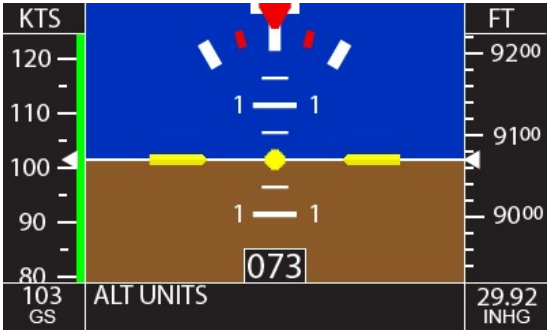


Figure 5.1.6a

5.1.7. Airspeed Units

The PFD display allows the units of the airspeed indicator to be changed between KNOTS, KPH, or MPH. When AS UNITS is shown on the display, the upper left side box on the display will show the currently selected airspeed units. From this screen, rotating the

knob clockwise will step from KTS-> KPH->MPH, respectively. Rotating the knob counter-clockwise will step from MPH->KPH->KTS, respectively. Figure 5.1.7a shows the AS UNITS setup screen. Once the desired unit is set, toggle the joystick right to advance to the next setup screen.

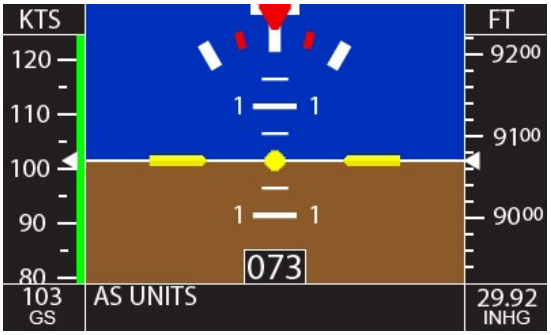


Figure 5.1.7a

5.1.8. Baro Units

The PFD display allows the units of the barometer to be changed between IN HG, HPA, or MBAR. When BARO UNITS is shown on the display, the lower right side box on the display will show the currently selected barometer units. From this screen, rotating the knob clockwise will step from INHG->HPA->MBAR, respectively. Rotating the knob counter-clockwise will step from MBAR->HPA->INHG, respectively.

Figure 5.1.8a shows the BARO UNITS setup screen. Once the desired unit is set, click the knob in to exit the setup screen.

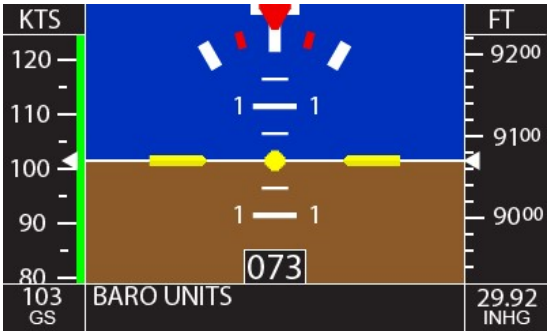


Figure 5.1.8a

5.2. Autopilot Lateral Setup

The lateral setup screen is accessed by toggling and holding the joystick to the left for two seconds. Once in the lateral autopilot setup menu, toggle the joystick to the right to advance the page, toggle to the left to reverse the page, and rotate the knob to change the value. Once lateral setup is completed, press the knob to exit. The following sections are in the order in which you will encounter them in the setup menu.

5.2.1. Lateral Activity

Selectable from **0** and **24**. This setting controls the "sensitivity" of the roll servo. A higher setting will increase the reaction speed, too high will cause jitteriness. A lower setting will decrease reaction speed, too low will cause sluggishness. Figure 5.2.1a shows the LATERAL ACT adjustment screen.

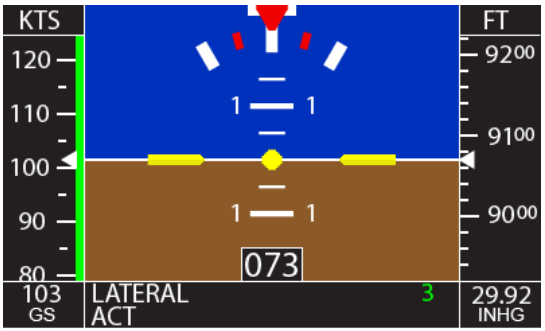


Figure 5.2.1a

5.2.2. Baud Rate

Selectable from **600** to **9600**. Most GPS settings will be either 4800 or 9600. This setting must be matched to the Baud Rate output of the GPS connected to the RS232 input of the autopilot. Consult the setup procedure for the GPS to obtain the proper baud rate setting. Figure 5.2.2a shows the BAUD RATE selection screen.

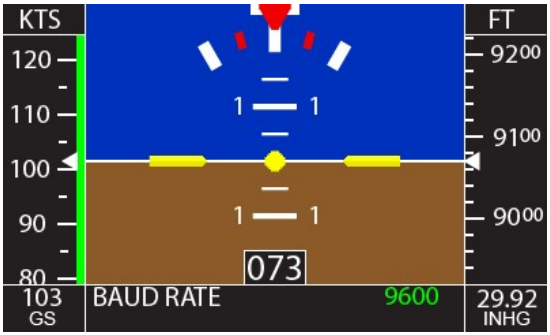


Figure 5.2.2a

5.2.3. Bank Angle

Selectable between **0**, **1**, and **2**. This setting controls the bank angle in GPS Nav mode or the Track Selector Mode. It does not affect GPSS mode. 0 provides approximately 12° of bank, 1 provides 18°, and 2 provides 24°, regardless of airspeed. The BANK ANGLE setup screen is shown in figure 5.2.3a.

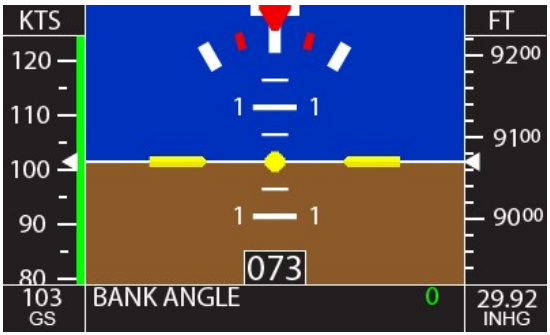


Figure 5.2.3a

5.2.4. Lateral Microactivity

Selectable from **0** to **31**. This setting is used to reduce the effects of lost motion in the system. Cable operated systems will need to use a higher value. Most pushrod control systems can use a value of 0. Obtain factory assistance before making large adjustments to this setting. The LMICRO ACT setup screen is shown in Figure 5.2.4a.

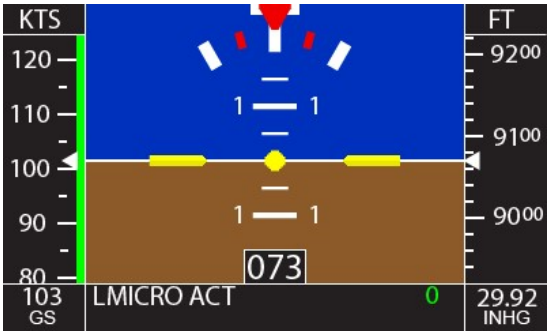


Figure 5.2.4a

5.2.5. GPSS Gain

Selectable from **16** to **32**. This setting is used to adjust the gain of the GPS Steering signal from a source device. Increasing the setting will result in a higher bank angle at a given point, up to the maximum of the internal limiter. The GPSS GAIN setup screen is shown in Figure 5.2.5a.

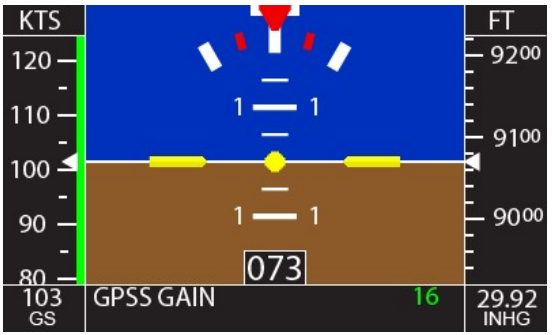


Figure 5.2.5a

5.2.6. Yaw Damper

Selectable between **0** and **1**. Setting this to **1** will engage an installed yaw damper with the autopilot. Leave this set at **0** if no yaw damper is installed. The YAW DAMPER setup screen is shown in Figure 5.2.6a.

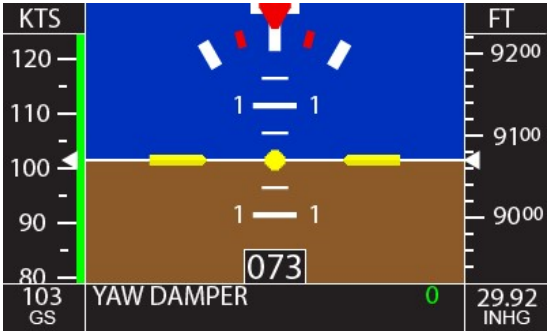


Figure 5.2.6a

5.3. Vertical Setup

The vertical setup screen is accessed by toggling and holding the joystick to the right for two seconds. Once in the vertical autopilot setup menu, toggle the joystick to the right to advance the page, toggle to the left to reverse the page, and rotate the knob to change the value. Once vertical setup is completed, press the knob to exit. The following sections are in the order in which you will encounter them in the setup menu.

5.3.1. Vertical Activity

Selectable from **0** and **24**. This setting controls the "sensitivity" of the pitch servo. A higher setting will increase the reaction speed, too high will cause jitteriness. A lower setting will decrease reaction speed, too low will cause sluggishness. The VERTICAL ACT setup screen is shown in Figure 5.3.1a

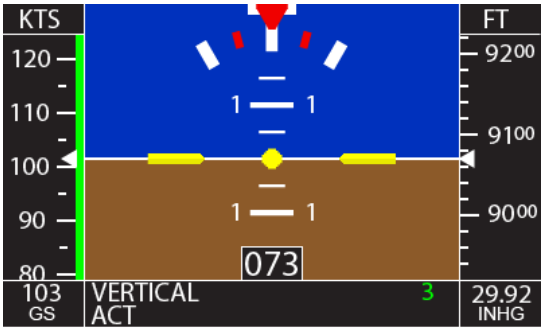


Figure 5.3.1a.

5.3.2. Minimum Airspeed

Selectable from **0** to **399**. This setting adjusts the minimum airspeed, in knots indicated, that the autopilot will fly. Irrespective of what units are selected for the indicator, this value must be set in knots. When this airspeed is reached in flight, the autopilot will flash a warning on the screen (see Figure 4.2.2a) and drop the nose of the aircraft to maintain this airspeed. The MIN AIRSPD setup screen is shown in Figure 5.3.2a.

Figure 5.3.2a

5.3.3. Maximum Airspeed

Selectable from **0** to **399**. This setting adjusts the maximum airspeed, in knots indicated, that the autopilot will fly. Irrespective of what units are selected for the indicator, this value must be set in knots. When this airspeed is reached in flight, the autopilot will flash a warning on the screen (see Figure 4.2.2b) and raise the nose of the

aircraft to maintain this airspeed. The MAX AIRSPD setup screen is shown in Figure 5.3.3a

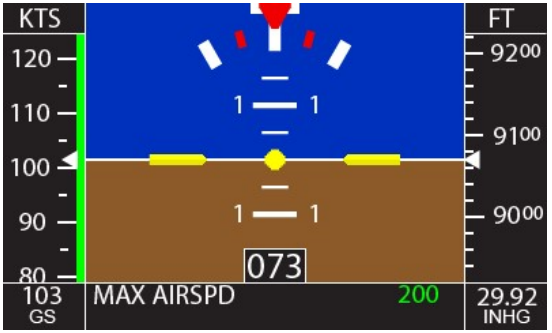


Figure 5.3.3a.

5.3.4. Pitch Servo Reversal

Selectable between **0** and **1**. This setting allows reversal of the direction of travel and trim annunciation of the pitch servo without a wiring change. The PITCH REV setup screen is shown in Figure 5.3.4a.

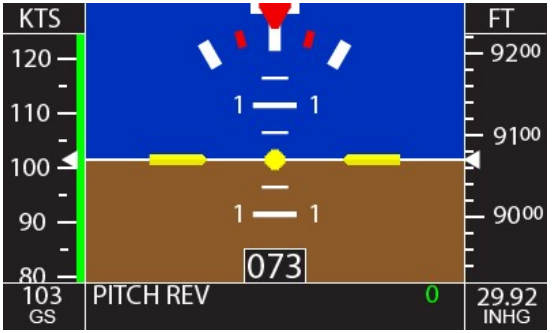


Figure 5.2.4a

5.3.5. Static Lag

Selectable from **0** to **4**. This setting is used to tune out gentle oscillations in the pitch axis. Increasing the setting will dampen an oscillation, but will also make the autopilot less reactive to altitude deviations. The STATIC LAG setup screen is shown in Figure 5.3.5a.

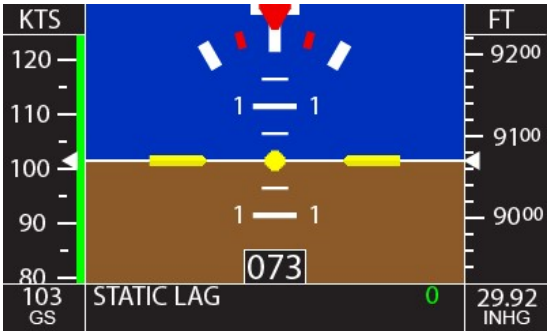


Figure 5.3.5a

5.3.6. Vertical Microactivity

Selectable from **0** to **31**. This setting is used to reduce the effects of lost motion in the system. Cable operated systems will need to use a higher value. Most pushrod control systems can use a value of 0. Obtain factory assistance before making large adjustments to this setting. The vertical axis PMICRO ACT setup screen is shown in Figure 5.3.6a.

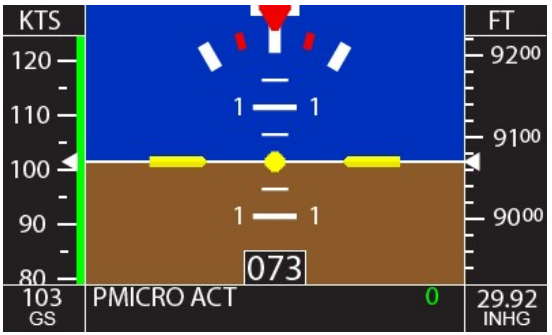
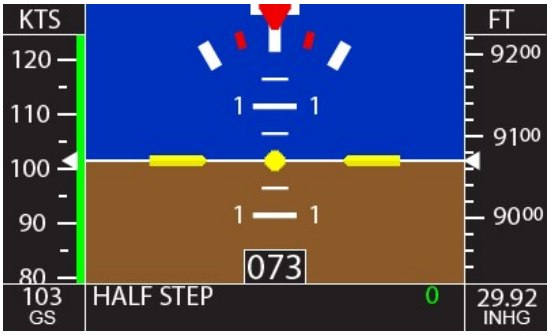


Figure 5.3.6a

5.3.7. Half Step

Selectable between **0** and **1**. This setting is used to tune out an almost imperceptible pitch oscillation where one step of the servo is too much adjustment. Set to **1** to enable. The HALF STEP setup screen is shown in Figure 5.3.7a.


KTS
120
110
100
90
80
103
GS
1
1
1
1
073
HALF STEP
0
FT
9200
9100
9000
29.92
INHG
Figure 5.3.7a

6. Autopilot Operation

6.1. Syncing the altimeter

Sync the altimeter as part of pre-takeoff checklist!

The autopilot has a built in altimeter that must be synced to the aircraft altimeter for proper operation of the altitude select and pre-select modes.

This is accessed by toggling the joystick to the right twice (not in a setup mode, or in the altitude select setup screen). The first toggle of the joystick is the altitude select setup screen, the second toggle is the altimeter sync setup screen. The barometer setting will be highlighted green.

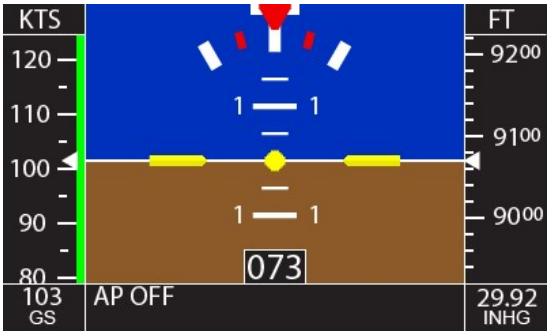
Rotate the knob to set the barometer setting to the current value. Then press the knob to enter save that setting and move to the altimeter sync value. The altimeter setting will be highlighted green.

Rotate the knob to sync the display altimeter to field elevation then press the knob to exit the altimeter sync setup.

NOTE: Irrespective of the units for the barometer that are set on the display, the barometer setting MUST be performed in IN HG. The correct baro units will be displayed in the lower right box of the screen once the baro setup screen has been exited.

The altimeter sync setting moves in 10 foot increments only (unless altimeter settings are obtained from a remote EFIS unit). Irrespective of the altitude units set on the display, the altimeter sync MUST be performed in FT. The correct altitude will be displayed on the tape once the baro setup screen has been exited.

Each time the power is cycled on the autopilot, the altimeter will return to a barometer setting of 29.92. When the autopilot is disengaged, the transition to altimeter sync setup screen is shown in Figure 6.1a.



Toggle joystick right, twice

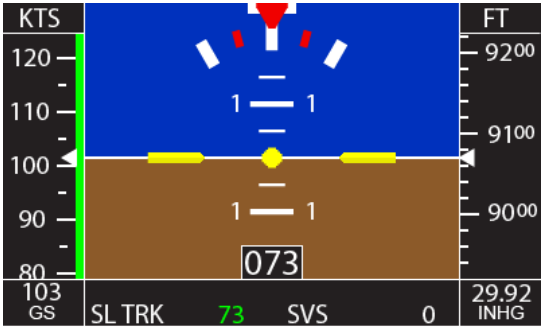
Rotate the knob then press the knob

Rotate knob then press knob

Figure 6.1a

NOTE: If the sync page is entered by accident, pressing the knob twice will exit back to the normal operation screen.

Figure 6.1b shows the transition from a normal autopilot engaged operating home screen (TRK mode and SVS mode in this case) to the altimeter sync setup screen.



Toggle joystick right, twice

Rotate knob then press knob

Rotate knob then press knob

Figure 6.1b

6.2. Engaging/Disengaging the autopilot

6.2.1. Engaging the autopilot

The autopilot can be engaged in one of four ways:

1) Press the knob on the autopilot face;

2) Press and hold the CWS button for 1.5 seconds (if equipped) (See section 6.5.3 for **Control Wheel Steering Mode**).

3) Remotely from an EFIS or other system, which has a connection to the autopilot (if equipped).

4) Using the AP Level button (if equipped). (See section 6.5.1 for **Emergency Level Mode**).

When engaged using the knob or CWS button, the autopilot will synchronize to the current ground track and the current vertical speed, as shown in Figure 6.2.1a. The aircraft is flying a track of 073 degrees and a positive vertical speed of 600 fpm.

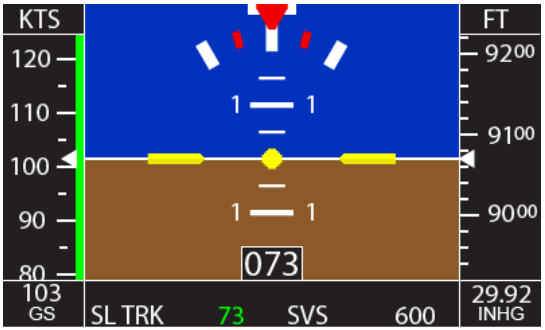


Figure 6.2.1a

6.2.2. Disengaging the autopilot

The autopilot can be disengaged in one of three ways:

1) Press and hold the knob on the face of the autopilot for 1.5 seconds;

2) Press the CWS button (if equipped).

3) Remotely from an EFIS or other systems, which has a connection to the autopilot (if equipped).

When disengaged, the autopilot will release control of both servos. An example of a disengaged autopilot is shown in Figure 6.2.2a.

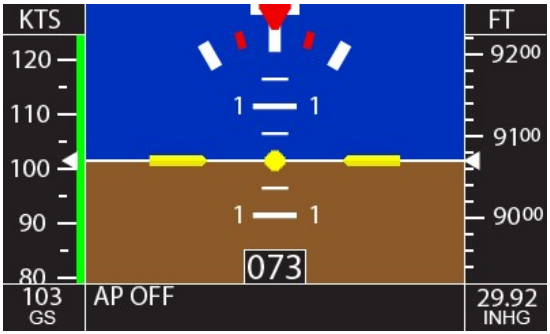


Figure 6.2.2a

6.3. Normal Lateral Autopilot Modes

6.3.1. Track Select Mode

The track select mode, or SL TRK mode is the default lateral mode that is activated when the autopilot is engaged. When the autopilot is engaged it will synchronize to the track being flown at that time. This mode allows the user to select a desired track for the autopilot to fly. The selected track can be adjusted by turning the knob.

1) 5° increments when turning the knob.

2) 1° increments when pressing and holding the knob in while turning it.

To access the track select mode from GPS Nav mode (see section 6.3.2) or GPSS mode (see section 6.3.3), toggle the joystick to the left one time. Figure 6.3.1a shows the transition from GPS Nav mode to track select mode.

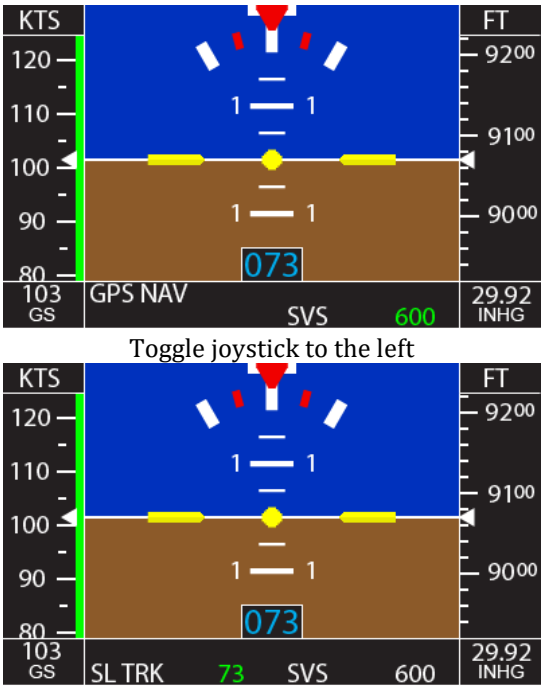


Figure 6.3.1a

6.3.2. GPS NAV Mode (RS232 Only)

The GPS Nav mode allows the autopilot to follow a direct-to or multi-leg flight plan from the connected handheld, non-IFR GPS, or IFR GPS without ARINC 429 connection. This mode uses only RS232 data and will not anticipate any turns or fly any procedure turns/approaches. This mode is accessed from the track select mode by toggling the joystick to the left.

To access the GPS Nav mode from track select mode, toggle the joystick to the left. Figure 6.3.2a shows the transition from track select mode to GPS Nav mode.

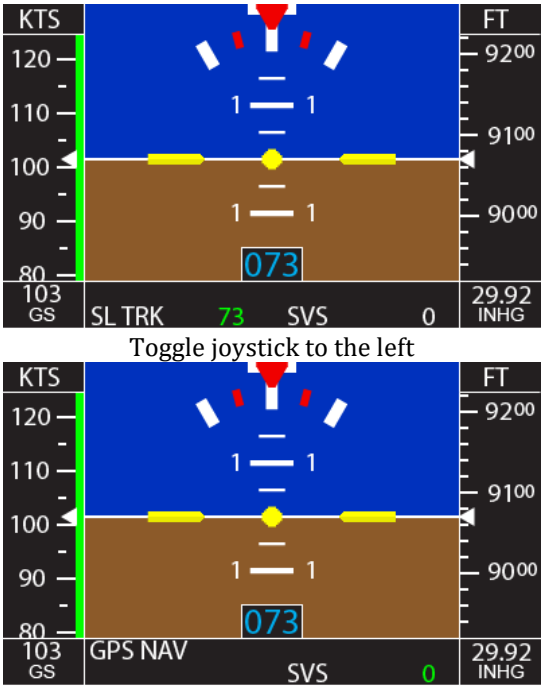


Figure 6.3.2a

6.3.3. GPSS Mode

The GPSS mode allows the autopilot to follow a direct-to or multi-leg flight plan from an IFR GPS or an external steering source such as an EFIS. This mode uses ARINC 429 data. This mode will anticipate upcoming turns, rounding the corners instead of overshooting the next course. It will also fly procedure turns and approaches. This mode is accessed from the track selector mode by toggling the joystick to the left. When in GPSS Mode, the autopilot display will show **GPSS** on the display. *If ARINC 429 steering inputs are present, GPS Nav mode will be skipped.*

To access the GPSS mode from track select mode, toggle the joystick to the left**.** Figure 6.3.3a shows the transition from track select mode to GPSS mode.

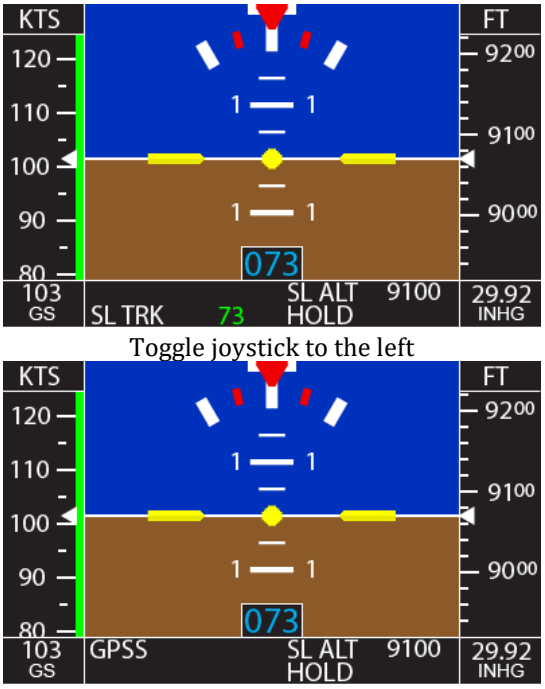


Figure 6.3.3a

6.4. Normal Vertical Autopilot Modes

6.4.1. Vertical Speed Mode

The vertical speed mode or SVS mode is the default vertical mode that is activated when the autopilot is engaged (as long as an altitude pre-select has not been entered).

When the autopilot is engaged it will synchronize to the vertical speed being flown at that time. If the aircraft vertical speed is less than 400 fpm in either direction, the autopilot will go to zero vertical speed.

The SVS mode allows the user to select a desired vertical speed for the autopilot to fly. The selected vertical speed can be adjusted by toggling the joystick up for climb and down for descent. The selected vertical speed moves in 100 fpm increments and is always in feet per minute, irrespective of airspeed units set in the display.

Once the SVS is set the autopilot will continue climbing or descending at the selected vertical speed until the user stops the climb or descent. Figure 6.4.1a shows the SVS change from 0 to 600 fpm negative.

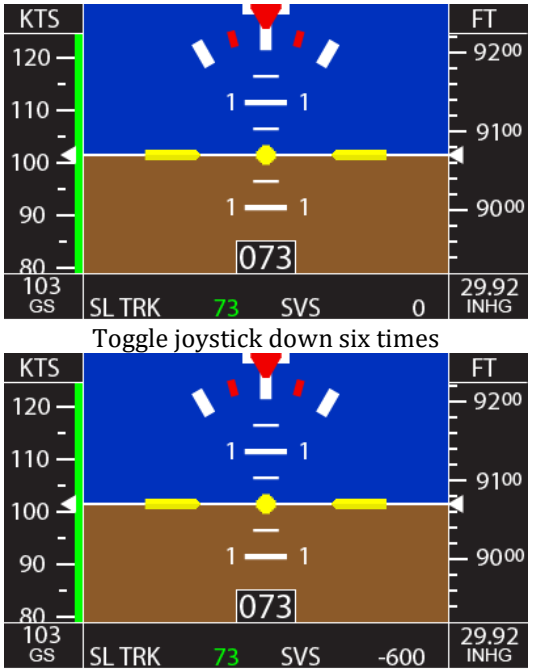
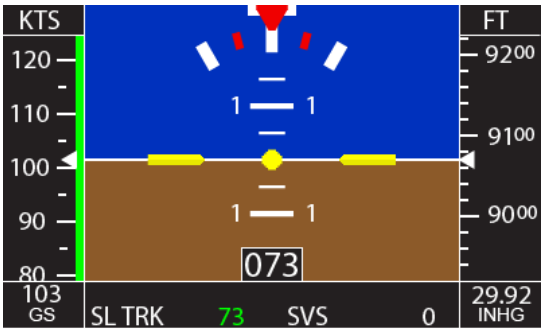
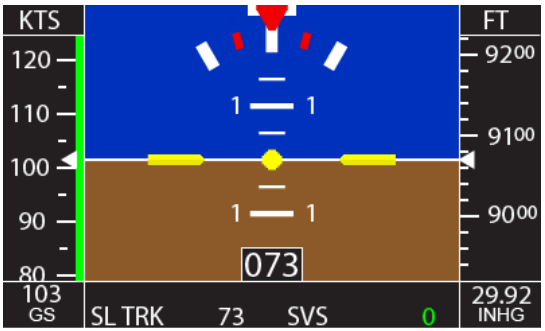


Figure 6.4.1a

Vertical speed can also be changed by moving the highlighted number to SVS. This is done by pressing the knob once if in track select mode or simply rotating the knob if in GPS Nav or GPSS modes. Figure 6.4.1b shows a sample screen of rotating the knob to change vertical speed instead of using the joystick toggle.



Press knob



Rotate knob

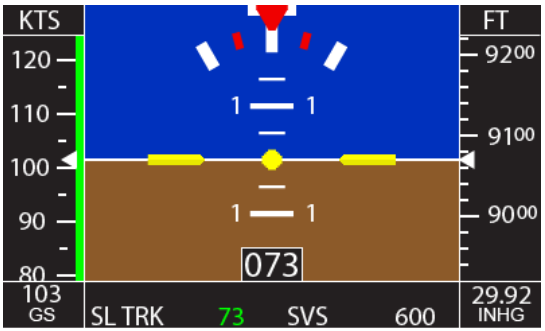
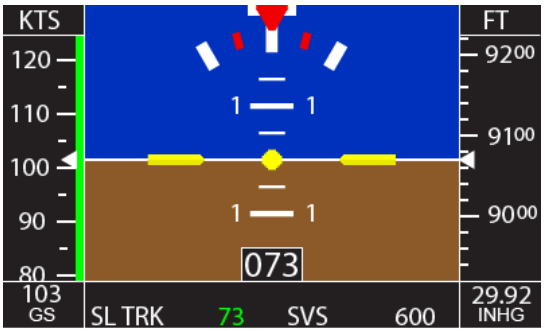


Figure 6.4.1b

6.4.2. Altitude Hold Mode

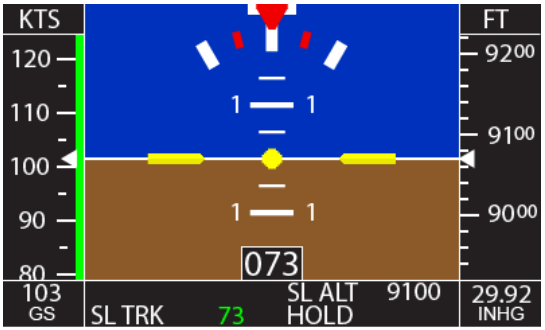
The altitude hold mode holds the selected altitude. The autopilot can hold at any 100-foot increment. When directly entering the ALT HOLD mode, the autopilot will go to the nearest 100-foot increment. Always be sure you've synced the altimeter before using the altitude hold mode.

This mode is accessed from the track select mode, GPS Nav mode, GPSS mode, and SVS mode by toggling the joystick to the right one time and then pressing the knob. Toggling the joystick once brings up the altitude select setup screen but pressing the knob once selects the current altitude, which puts the autopilot into altitude hold mode. The transition from SVS to ALT HOLD mode is shown in figure 6.4.2a.



Toggle joystick to the right

Press knob


KTS
120
110
100
90
80
FT
9200
9100
9000
073
103
GS
SL TRK
73
SL ALT
HOLD
9100
29.92
INHG
Figure 6.4.2a

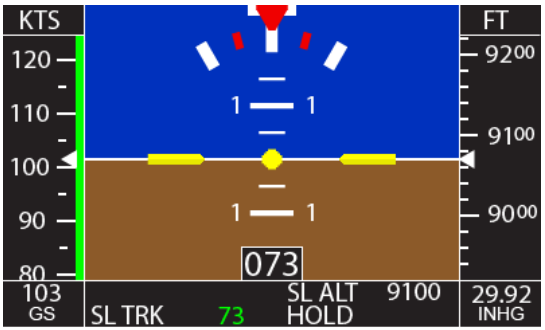
6.4.3. Altitude Select Mode

Sync the altimeter before performing altitude select (see section 6.1)

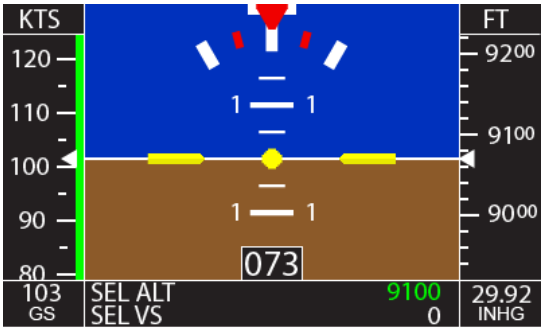
The altitude select mode allows the user to select a target altitude above or below the current altitude, as well as a vertical speed to transition to that altitude. This mode is accessed by toggling the joystick to the right one time.

With autopilot engaged, toggle the joystick to the right one time, rotate the knob to select the target altitude, press the knob to save the target altitude and advance to the vertical speed select, rotate the knob to select the desired vertical speed, press the knob to begin the transition. The sequence for entering altitude select is shown in Figure 6.4.3a

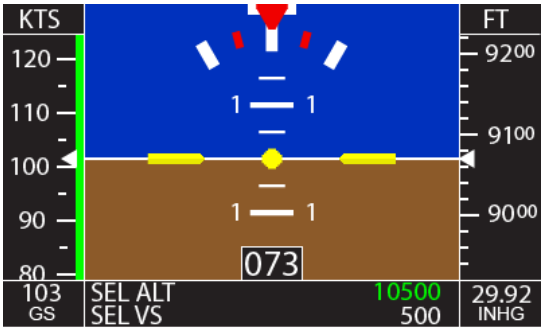
1) 100 foot increments when turning the knob or using the joystick toggle up or down.



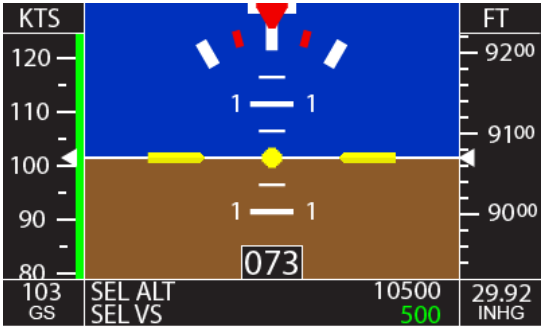
Toggle joystick to the right one time



Rotate knob



Press knob



Rotate knob

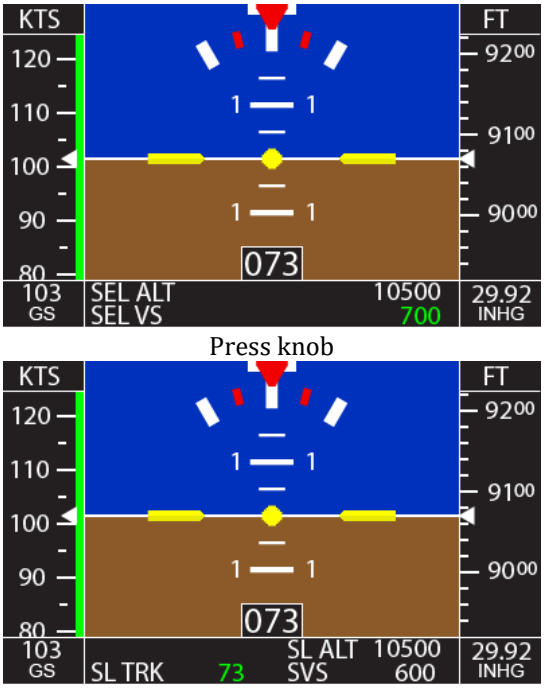


Figure 6.4.3a.

NOTE: The selected vertical speed will default to 500 fpm up or down, depending on the target altitude. If the target altitude is less than 500 feet from the current altitude, the default vertical speed will be scaled down with the altitude change.

Irrespective of the units set on the display, the altitude select and vertical speed select modes MUST be set in feet and feet per minute.

The vertical speed can be adjusted at any time during the altitude transition. This is done by simply toggling the joystick up or down to increase or decrease vertical speed.

The target altitude can be adjusted any time during the transition as long as the target has not yet been reached. Press the knob until the SL ALT number is highlighted green. Then rotate the knob to the new target. If the SL ALT number is rotated to the current altitude, the autopilot will enter ALT HOLD mode immediately.

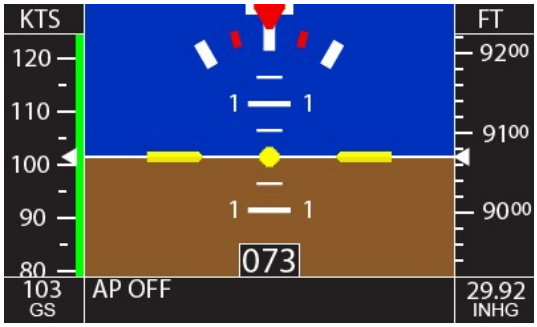
6.4.4. Altitude Pre-Select Mode

Sync the altimeter before performing altitude pre-select (see section 6.1)

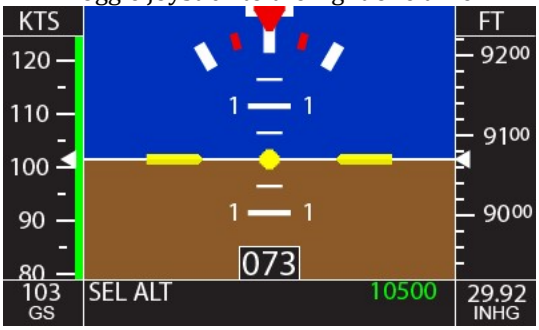
The altitude pre-select mode allows the user to pre-select a target altitude before takeoff. Once engaged, the autopilot will proceed in a climb to the selected target altitude and synchronize to the current vertical speed, if greater than 500 fpm. Otherwise it will choose 500 fpm. This mode is accessed by toggling the joystick to the right one time while the autopilot is disengaged.

From autopilot disengaged, toggle the joystick to the right one time, rotate the knob to select the target altitude, press the knob to store the pre-selected altitude. The sequence for entering an altitude pre-select is shown in figure 6.4.4a.

1) 100 foot increments when turning the knob.



Toggle joystick to the right one time



Rotate knob

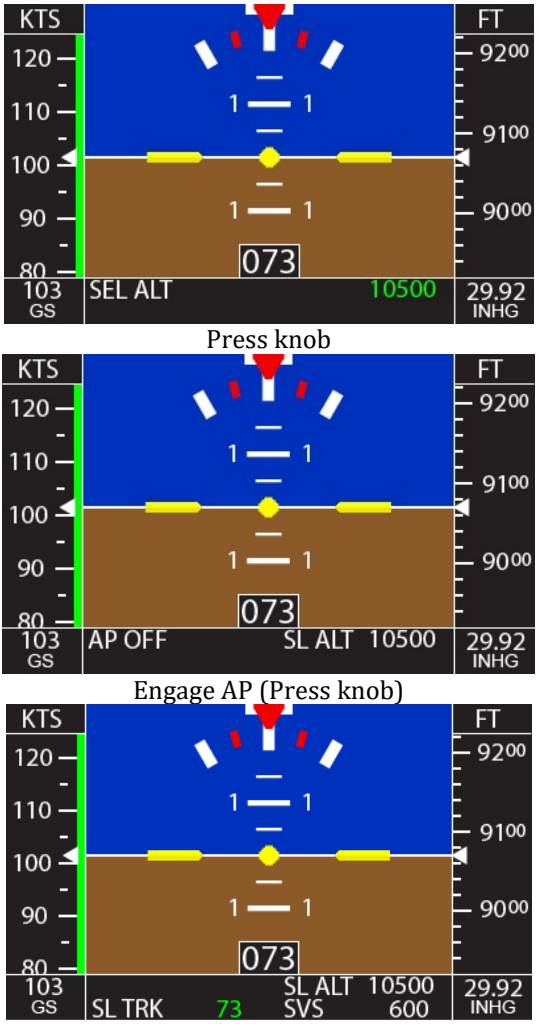


Figure 6.4.4a

Once a target altitude is selected, it will be displayed in the top right of the autopilot display bar. This is shown in the fourth picture of Figure 6.4.4a.

When the autopilot is engaged, it will synchronize to the current vertical speed, as long as the current vertical speed is above 500 fpm, otherwise it will synchronize to 500 fpm.

The vertical speed and target altitude can be adjusted during the transition. See section 6.4.3.

6.4.5. GPSV Mode

The vertical GPS Steering mode or GPSV mode is engaged automatically with GPSS mode if the vertical steering signal is present and the autopilot is in altitude hold mode. This mode is displayed with the addition of GPSV to the GPSS that appears in the upper left of the autopilot display bar. If the autopilot is engaged during a climb or descent, the autopilot must be put into altitude hold mode (see section 6.4.2) to get GPSV. The only exception is if the autopilot is engaged remotely from an EFIS. Figure 6.4.5a shows the autopilot in GPSS and GPSV.

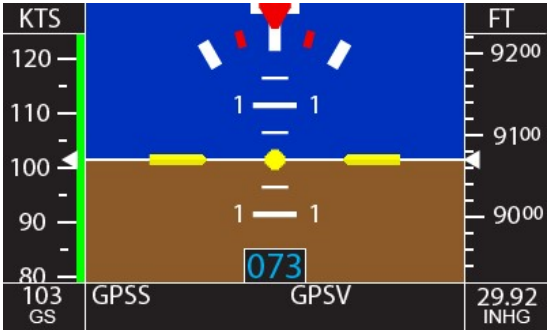
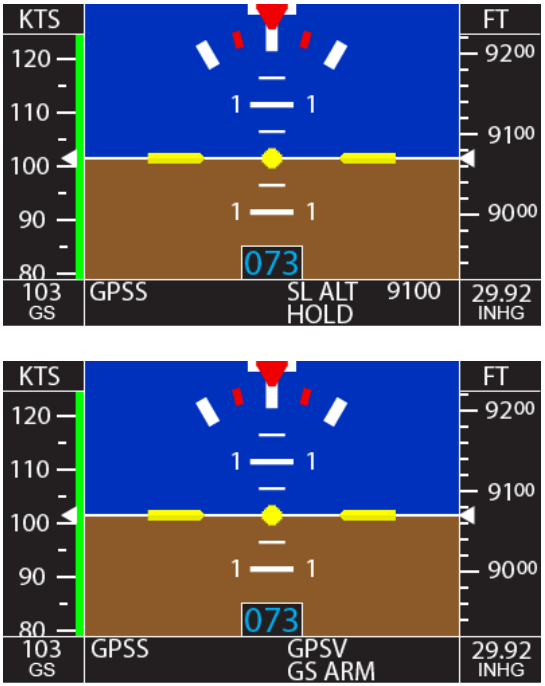


Figure 6.4.5a

6.4.6. Vertical Approach Mode

The vertical approach mode allows the autopilot to couple to and track the glide slope of a GPS LPV approach. This mode is only available in GPSS mode. To access this mode, the autopilot must be in GPSS mode and be in altitude hold mode (section 6.4.2) at the proper altitude for the approach. Once altitude hold is reached, the approach mode automatically engages. It is displayed by GPSV in the top right of the autopilot display bar and GS ARM in the lower right. When the glide slope is intercepted it will change to GPSV in the top right of the autopilot display and GS CPLD in the lower right.

Figure 6.4.6a shows the sequencing on the display.



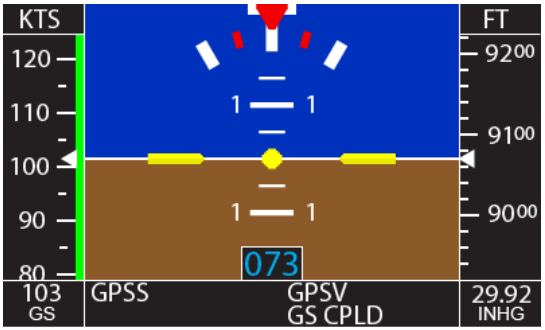


Figure 6.4.6a

In the event that the GPS sends out a flagged vertical steering signal, the autopilot will display GS FLG and maintains the current altitude. This will happen if the current altitude is above the glide slope. Figure 6.4.6b shows the GS FLG display.

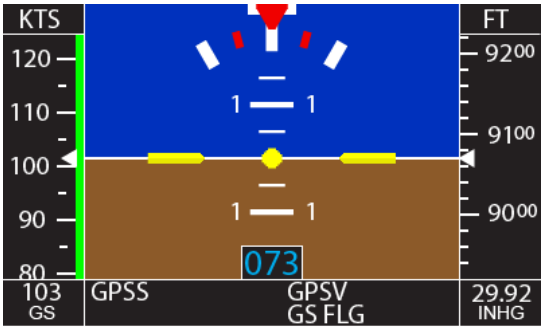


Figure 6.4.6b

6.4.7. Missed Approach Mode

This mode allows the autopilot to break off from a coupled glide slope and initiate a 500 fpm climb while maintaining the current track, but staying in GPSS mode. This mode can only be initiated while coupled to an LPV glide slope with the display showing GS CPLD. To use the Missed Approach Mode, toggle the joystick either up or down while the display shows GS CPLD. Figure 6.4.7a shows the autopilot in the Missed Approach Mode.

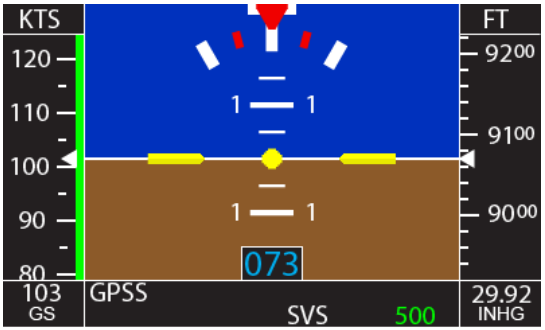


Figure 6.4.7a

6.5. Other Autopilot Modes

6.5.1. Emergency Level Mode

This mode allows the autopilot to be engaged into track hold mode and zero vertical speed mode from ANY attitude or any state, with the press of a single button. Figure 6.5.1a shows the display when the Emergency Level Mode is engaged. To engage the Emergency Level mode, press the AP LVL button (if equipped).

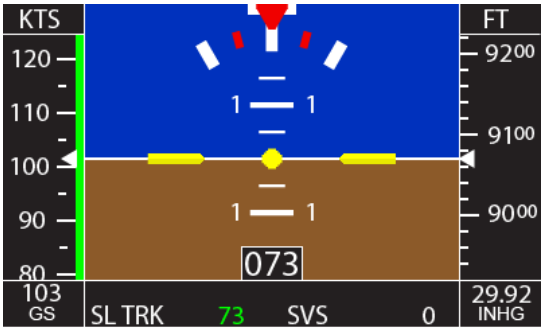


Figure 6.5.1a

6.5.2. Gyro Backup Mode

This mode is the lateral mode available when the RS232 signal from the GPS is lost and there is no ARINC 429 steering command. It allows selection of a bank angle in either the left or right direction up to 30° of bank. This mode is essentially a wing leveler. Use the knob to select the desired bank angle. This mode allows the selection of the bank angle from 1-5°, then in 5° increments after that. Figure

6.5.2a shows the gyro backup mode screen with a 10° right bank selection.

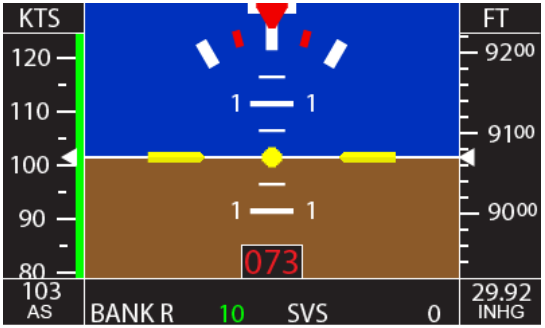


Figure 6.5.2a

Altitude select, altitude hold, and vertical speed select modes are still accessible when no GPS signal or fix is available. Figure 6.5.2b shows a zero bank angle with an altitude select set at 10500 feet. (see section 6.4.3 for altitude select mode)

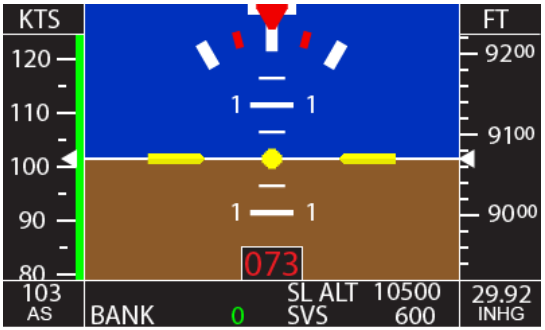


Figure 6.5.2b

6.5.3. Control Wheel Steering Mode

This mode allows the autopilot to be temporarily disengaged to make a quick course change and/or vertical speed change. This mode is accessed by pressing and holding the control wheel steering switch (if equipped). While the switch is held, the display will show the autopilot is in CWS Mode. Figure 6.5.3a shows the CWS mode screen.

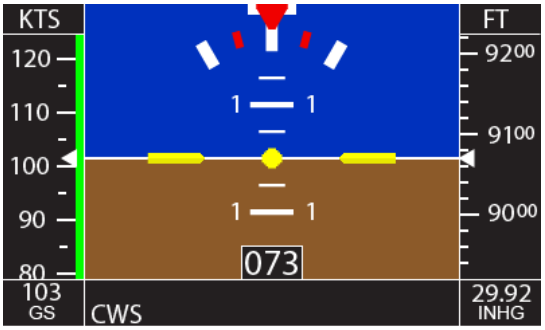


Figure 6.5.3a

When the button is released, the autopilot will hold the new track and the new vertical speed, if greater than 400 fpm in either direction. If the vertical speed at time of release is less than 400 fpm, then the autopilot will hold zero vertical speed. Figure 6.5.3b shows the screen after release at a vertical speed of 800 fpm up.

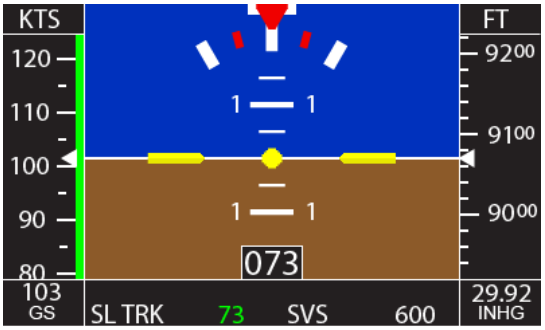


Figure 6.5.3b

7. Quick Reference Cards

The following Quick Reference Card will give a quick overview of the XCruze 110 AP controls.

7.1. XCruze 110 AP Quick Reference

Power Up – After engine start!!! (stationary aircraft not required)

GPS Status

Red DG – No GPS signal
Yellow DG – No position fix
White DG – GPS is OK
Gray DG – GPS signal is varying or has a large error from last
Blue DG – Flight plan or GPSS information is being received

Engage Autopilot

Press knob
or
Push and hold CWS switch for 2 seconds and release
or
Press AP LVL button

Disengage Autopilot

Press and hold knob for 2 seconds
or
Press CWS switch

Lateral Modes

Track Mode

Rotate knob to select desired track

GPS Steering Mode (GPSS)

Toggle joystick to left one time.

Gyro Back-Up Mode (Bank) – Only with GPS failure
Rotate knob to select desired bank angle (up to 30 degrees)

Vertical Modes

Altimeter Sync (AP disengaged or engaged)
Toggle joystick right two times ->
Set current barometer setting, press knob ->
Sync altimeter, press knob

Altitude Pre-Select Mode (AP disengaged)
Toggle joystick right one time ->
Select altitude, press knob
AP will sync to current vertical speed when engaged, or default to 500 fpm if current vertical speed is less than 500 fpm

Altitude Select Mode (AP engaged)
Toggle joystick right one time ->
Select altitude, press knob ->
Select vertical speed, press knob

Altitude Hold Mode
Automatically entered when target altitude is reached
or
Toggle joystick right one time ->
Press knob (without adjusting target altitude)

Vertical GPS Steering Mode (unless remote engage)
Toggle joystick left one time to enter GPSS mode ->
Enter altitude hold mode

8. Suggested Autopilot Settings

The following section will give suggested starting points for the settings of the XCruze 110 AP based on several popular Experimental-Amateur Built aircraft.

Note: Baud is not listed, as it is a GPS specific selection.

8.1. Van's Aircraft RV's

RV-4

Lat Activity - 3
Bank Angle - 1
Microactivity - 0
GPSS Gain - 16
Vrt Activity - 1
Min Airspeed - 60
Max Airspeed - 180
Static Lag - 0
Microactivity - 0
Half-Step - 0

RV-6

Lat Activity - 4
Bank Angle - 1
Microactivity - 0
GPSS Gain - 16
Vrt Activity - 3
Min Airspeed - 65
Max Airspeed - 180
Static Lag - 0
Microactivity - 0
Half-Step - 0

RV-7

Lat Activity - 4
Bank Angle - 1
Microactivity - 0
GPSS Gain - 16
Vrt Activity - 3
Min Airspeed - 65
Max Airspeed - 180
Static Lag - 0
Microactivity - 0
Half-Step - 0

RV-9

Lat Activity - 4
Bank Angle - 1
Microactivity - 0
GPSS Gain - 16
Vrt Activity - 3
Min Airspeed - 60
Max Airspeed - 170
Static Lag - 0
Microactivity - 0
Half-Step - 0

RV-10

Lat Activity - 4
Bank Angle - 1
Microactivity - 0
GPSS Gain - 16
Vrt Activity - 9
Min Airspeed - 70
Max Airspeed - 180
Static Lag - 0
Microactivity - 0
Half-Step - 0

8.2. Lancair

Lancair 235/320/360

Lat Activity - 5
Bank Angle - 1
Microactivity - 0
GPSS Gain - 16
Vrt Activity - 3
Min Airspeed - 70
Max Airspeed - 190
Static Lag - 0
Microactivity - 0
Half-Step - 0

Lancair Legacy

Lat Activity - 6
Bank Angle - 1
Microactivity - 0
GPSS Gain - 16
Vrt Activity - 5
Min Airspeed - 75
Max Airspeed - 195
Static Lag - 0
Microactivity - 0
Half-Step - 0

Lancair IV-P Piston

Lat Activity - 7
Bank Angle - 1
Microactivity - 0
GPSS Gain - 16
Vrt Activity - 6
Min Airspeed - 80
Max Airspeed - 200
Static Lag - 0
Microactivity - 0
Half-Step - 0

Lancair IV-P Turbine

Lat Activity - 16
Bank Angle - 1
Microactivity - 4
GPSS Gain - 16
Vrt Activity - 7
Min Airspeed - 80
Max Airspeed - 200
Static Lag - 0
Microactivity - 0
Half-Step - 0

Lancair ES

Lat Activity - 6
Bank Angle - 1
Microactivity - 0
GPSS Gain - 16
Vrt Activity - 5
Min Airspeed - 80
Max Airspeed - 190
Static Lag - 0
Microactivity - 0
Half-Step - 0

8.3. Glasair Aviation

Sportsman 2+2

Lat Activity - 8
Bank Angle - 1
Microactivity - 4
GPSS Gain - 16
Vrt Activity - 8
Min Airspeed - 55
Max Airspeed - 150
Static Lag - 0
Microactivity - 4
Half-Step - 0


BendixKing