SuperECO Autopilot

Pilot's Manual

By Aircraft Automation LLC

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1 The SuperECO Autopilot operation

1.1 Purpose

This Pilot's Manual provides a general description, basic operation procedures, in-flight operation procedures and operating parameters configuration for the Aircraft Automation SuperECO Autopilot.

Note:

The SuperECO Autopilot is a tool provided to assist pilots with cockpit workload. The ability of the autopilot to provide proper assistance is directly proportional to the pilot's knowledge of its operating procedures. It is highly recommended that the pilot develops a profound understanding of the autopilot its controls, its operation modes, and operations procedures. Pilots should also be familiar with the SuperECO instrument operations.

Note:

THE AUTOPILOT AND ITS INSTRUMENT ARE FOR EXPERIMENTAL AIRCRAFT ONLY AND CAN ONLY BE USED FOR DAY VFR FLIGHT GUIDANCE, PILOT SUPERVISION IS REQUIRED AT ALL TIMES. IFR NOT APPROVED.

FLUTTER WARNING: BALANCE YOUR MOVING

SURFACES AFTER INSTALLING TRIM TABS

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CONTROL WARNING: This autopilot needs very little authority to fly your airplane. DO NOT INSTALL VERY LARGE TRIM TABS THAT WILL UNABLE THE PILOT TO EASILY CONTROL THE AIRPLANE IN CASE OF A SERVO RUNAWAY.

1.2 General Description

The SuperECO Autopilot is a 3 1/8" standard instrument standalone autopilot. It does integrate an Electronic Attitude Direction Indicator (EADI), an Electronic Horizontal Situation Indicator (EHSI), and a Digital Flight Control System (DFCS) into a single unit.

Its air speed indicator, attitude indicator, altimeter, horizontal situation indicator (HSI), and directional gyro instruments (all AHRS based) are backed-up by a battery.

The system is composed by one display instrument with an automatic dimmer sensor, a push-knob and two buttons as cockpit controls, and two model airplane servos, harness, pushrods and respective trim tabs for the roll and the pitch axis. A Mini USB port is also included for software updates. The total weight of the system is 1 1/2 lbs.

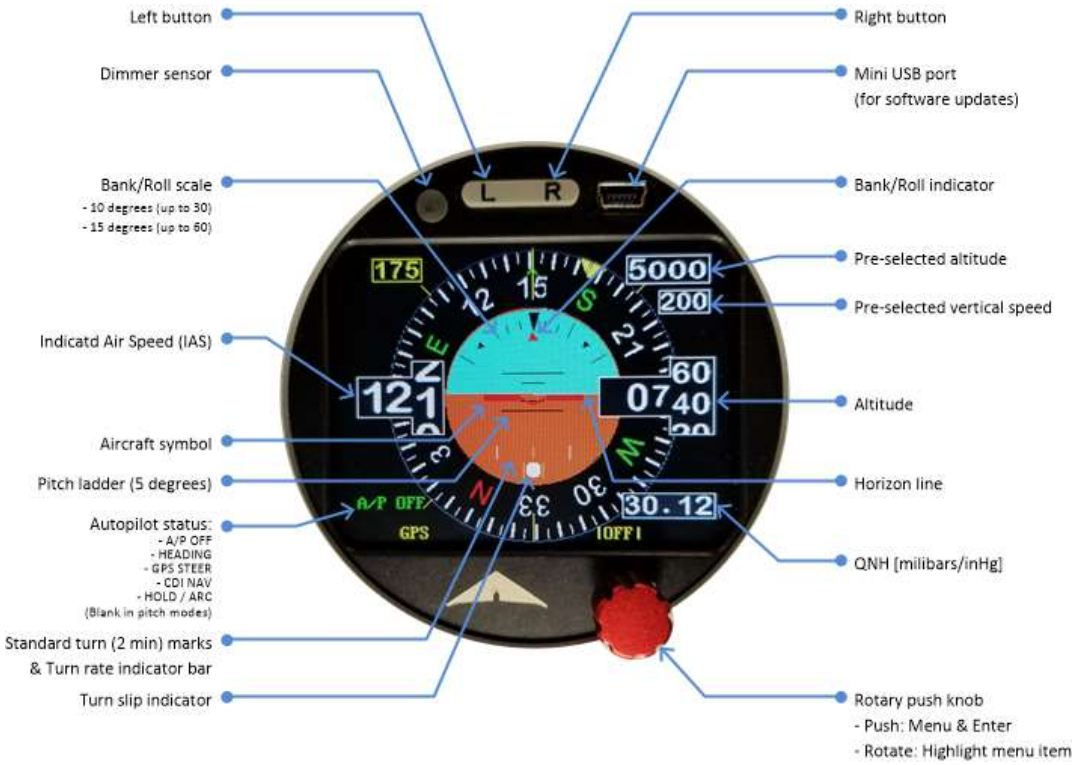

Fig 1: SuperECO controls / EADI display

An Autopilot status flag indicates the autopilot status, and a BATT flag indicates the use of the internal battery, when the equipment is not powered by the aircraft power bus.

The EADI includes an IAS window, an IAS setting box (not shown here), an Altitude and Vertical Speed setting boxes, an Altitude window, Vertical Speed readings above and below the Altitude window (not shown here), and a pair QNH setting boxes. An electronic artificial horizon includes a horizon line, an aircraft symbol, and a pitch ladder calibrated in 5º steps. It also includes a bank/roll indicator, and a bank/roll scale with marks for 0º, 10º, 20º, 30º, small black triangles for 45º, and a 60º mark. Incorporated

into the EADI are also a turn rate indicator bar which extends from the center to the left of the right, a pair of standard turn (2 min) marks, and a turn slip indicator ball.

Fig 2: EHSI display

The inner portion of the EHSI includes the *Compass/GPS rose*, which is driven either by autopilot internal magnetometer (its accuracy depends on nearby disruptions and calibration) or normally, by the internal GPS magnetic track. This rose rotates so that the aircraft heading is always at the top, under the *lubber line*. An optional short green arrow allows displaying the internal magnetometer reading alongside the GPS magnetic track. This is of particular interest while flying with crosswinds.

The *Lubber line* is the fixed yellow marker at the top of the display that indicates the aircraft magnetic track.

The *Heading Bug* is a graphical depiction of the heading selected for the autopilot's HEADING/TRACK mode. To move the Heading Bug, simply turn (do not press) the push-knob. The selected heading/track will be displayed in a yellow Heading Bug box at the top left.

The *Course pointer* is the two-part green arrow, which head (a filled arrow), indicates the desired VOR or GPS course and the tail indicates the reciprocal course. The pointer is set by pressing-and-turning the autopilot *push-knob*. The yellow Heading Bug setting box will turn green and will now show the current course pointer setting. Once the desired course is selected, release the knob. The course setting mode will time out after 3 seconds, and the box will turn back to yellow, showing now the selected heading.

The *Course Deviation Indicator (CDI)* bar provides a pictorial symbolic display of the aircraft's position with respect to the selected course. When the aircraft is precisely on the VOR radial or GPS course, it does align as the center section of the course pointer. When off course or approaching a new course, it will move to one side or the other, showing the closure or deviation from the selected course. Maximum scale represents a 10 degrees deviation to either side of the pointer, and 5 degrees when in ILS.

The inner EHSI portion can also display some flags: A red **X** over the lubber line means that no satellites have been acquired by the internal GPS, and a NO GPS flag means the compass rose is not driven by the GPS. The Outbound / Inbound flags are displayed when the autopilot is in HOLD mode.

The outer portion of the EHSI display shows the current *NAV Source*, the *Autopilot status* related to the EHSI, the *next waypoint ID*, the *Distance in nm* to the next waypoint, the *Heading setting box*, and the *TO/FROM/OFF* CDI flags.

As an autopilot, the SuperECO Autopilot features both roll and pitch modes, a safety Level Flight mode (wing leveler) which combines heading and altitude hold modes; and when flying manually, an Automatic Envelop Protect (AEP) function that works as an active monitor and stick force feedback when certain roll or pitch angles are exceeded. This is very useful in those situations when the pilot gets distracted, like when consulting a navigational or approach chart or when operating a hard-to-reach control.

1.3 Basic Autopilot Control

The SuperECO autopilot instrument is operated through the following keys:

- A ROTARY KNOB AND PUSH-BUTTON ON THE BOTTOM RIGHT OF THE INSTRUMENT, SEE SECTION **1.3.1**

- TWO PUSH-BUTTONS ON THE CENTER TOP OF THE INSTRUMENT, THE ONE ON THE RIGHT IS CALLED 'R' AND THE ONE ON THE LEFT IS 'I'. SEE SECTIONS **1.3.2 AND 1.3.3**

1.3.1 The Rotary Push-Knob

This rotary knob can be turned and/or pressed (or clicked) on.

By only turning the knob will move the yellow heading bug. This will allow change of selected heading for autopilot control.

Momentary Clicking on the Rotary Knob sequentially allows selecting between the **ALT**, either **VS** or **IAS**, and **BAROMETRIC** boxes. VS or IAS selection will depend on the current selected AP altitude mode (VS or IAS). Values are changed by rotating the knob. After a value is set, or if no change is done, the setting mode will time out after 3 seconds. There is no need to click after setting values.

Turning-while-pressing on the Rotary Knob will cause the CDI needle to rotate (OBS selection). Note that after the needle begins to rotate there is no need to keep pressing on the knob. Rotate the CDI freely. This mode will time out after 3 seconds.

1.3.2 The Right ("R") button – Alt/IAS-VS/QNH

The autopilot MAIN MENU can be displayed by pressing the Right ("R") button once. You can easily exit the menu by pressing the push-knob again, over the <<< BACK option. You can also exit the menu by pressing the L or R buttons.

Fig 3: SuperECO Menu

Options are selected by rotating and pressing the knob over the desired highlighted option. The '@' next to the button denotes the latest selection.

Choose one of the following:

This is the default selection when entering the MENU screen. Pressing the knob here will take you back to the MAIN SCREEN.

Pressing **OFF** will deactivate both HEADING/TRACK and ALTITUDE autopilot functions. It has the same effect as momentarily pressing the Autopilot Disengage push-button on the yoke or instrument panel.

LEVEL FLIGHT MODE. Activates the autopilot in both HEADING/TRACK and ALTITUDE modes. The airplane will fly the present heading and altitude until changed by the user. This function is also useful for recovering from unusual attitudes or inadvertent entry into IMC conditions. Pressing the yoke/panel Autopilot Disengage push-button for **three continuous seconds** will also activate the Level Flight Model.

HEADING or TRACK will activate the autopilot for Heading or Tracking mode only. The airplane will immediately turn to the **preselected HEADING BUG** direction.

GPS will track the flight plan on your external GPS system. You need to previously have a Direct GOTO waypoint, or a complete flight plan active in your navigation GPS.

NAVIGATION following your CDI needle. The autopilot will intersect radials and fly (outbound/inbound) from/to the station in the selected OBS direction. This station is a GOTO waypoint in your GPS or a VOR VHF connected through the optional SL-30 radio serial interface.

NOTE: When flying a GPS flight plan feel free to readjust the heading bug if you want to avoid weather or traffic (DETOUR). The SuperECO will follow the heading bug for one minute and then will go back on course. The time it takes to go back on course (one minute) can be changed in SERVICE MODE 10, page 5: **"Detour Time"**

ALTITUDE turns on the altitude hold/climb/descend mode. The autopilot will immediately hold, climb, or descend to the preselected altitude on the top right-hand corner of the screen.

AIRSPEED MODE. When climbing or descending the autopilot will maintain a preselected airspeed. This preselection appears just above the airspeed window. In this mode climb rate will be ignored. Airspeed will be ignored at or close to the desired altitude.

VERTICAL SPEED or CLIMB RATE MODE. When climbing or descending the autopilot will maintain a preselected climb rate. This preselection appears just below the preselected altitude window. The airspeed will be ignored.

APPROACH (OPTIONAL). This activates both **NAV** (see above) and **GS** (Glide slope) for ARINC or SL-30 VHF approaches. The autopilot will follow the RNAV GPS directions, including VNAV or a VHF ILS approach.
When selecting **APR** there will be a prompt for the minimum altitude to be flown **MDA**.
Rotate the knob to select the MDA altitude and then click on the knob.
The airplane will not fly below this altitude.

SERVICE MODE. Setting screens and other special functions.

When clicking on this, the autopilot will prompt for a password. Rotate the knob to the correct password and **click on the knob** once again.
Press the **L** button to see the appropriate service screens.
Password 0 takes you back to the normal flight mode. For other passwords see section **5 (Settings)**

SHUT DOWN THE INSTRUMENT. This is a battery instrument. It turns on with aircraft power and shuts down after one minute when power is removed.
Click on here to shut the autopilot down within 2 seconds. If it shuts down after an aircraft power failure, you will only be able to turn it on thorough an optional external push-button.

1.3.3 The Left ("L") button – Auxiliary Menu.

Pressing the left ("L") button brings up the AUXILIARY-MENU. The pages are selected by rotating the knob over the page label. Once the desired page is selected, navigate each option by pressing on the **push-knob**. To change a setting, rotate the knob left or right, and press the push-knob to set it.

In the normal Autopilot working mode, three pages can be accessed.

Page 1 GENERAL SETTINGS

Page 2 HOLD FUNCTION

Page 3 ARC FUNCTION

Page 4 MISCELLANEOUS

Page 5 NAV / APPROACH

Other Auxiliary Menu modes will appear when inputting different SERVICE MODE passwords. See section 5. SETTINGS

To return to the autopilot main screen press "L" again.

The next three sections describe the different Auxiliary Menus in the normal Autopilot mode:

1.3.3.1 Page 1. GENERAL SETTINGS

YAW CONTROL: Activate and Deactivate **YAW** control. **YAW** control will always deactivate when pressing the Autopilot Disconnect pushbutton. You can optionally activate YAW by pressing the Autopilot Disconnect button for three seconds, need to activate this option on SERVICE MODE 10, page 4: "**External PB YAW activation: YES**"

ROLL TRIM: When the autopilot is disengaged then it can be used as a TRIM system. Rotate the knob to adjust Roll Trim.

PITCH TRIM: When the autopilot is disengaged then it can be used as a TRIM system. Rotate the knob to adjust Pitch Trim.

YAW TRIM: When the autopilot is disengaged then it can be used as a TRIM system. Rotate the knob to adjust Yaw Trim.

NOTE: Roll and Pitch Trim settings are automatically set to 0 (NEUTRAL) when the autopilot is turned on. Make sure your airplane flies approximately straight at this setting. If not, a mechanical push rod adjustment is necessary on each servo.

In-flight trim values should typically not exceed + or – 15 for proper autopilot operation.

When active, the autopilot will re-recadjust your Trims automatically.

Auto. Envelope Protect: (Automatic Envelope Protection). If this option is ON, when the Autopilot is disengaged, if the attitude of the airplane falls beyond a certain limit, then the Trim-Tabs will actuate bringing the airplane back to within its normal range.

1.3.3.2 Page 2: HOLD FUNCTION

HOLD: Define hold parameters and activate an Autopilot generated hold. This function is very useful for waiting for weather, traffic, or even to check your charts. It can also be used for aircraft tests without having to travel long distances away from the airport.

HOLD DIRECTION lets you to define the Holding Pattern for the autopilot HOLD mode. Select between NON STANDARD LEFT/STANDARD RIGHT.

HOLDING COURSE is equivalent to the holding pattern inbound leg heading to the Hold **FIX**. These settings along with the current aircraft heading are used by the autopilot to automatically select between **Direct, Parallel or Teardrop** hold entries.

ACTIVATE HOLD: At the exact moment that this is changed to ON, the autopilot will hold the present GPS position. This will mark the Holding **FIX**. From here the Autopilot will decide the entry type. Deactivate the HOLD by turning this function off.

1.3.3.3 Page 3: ARC FUNCTION

ARC: lets you define DME ARC settings for the autopilot ARC mode. Program your GOTO GPS waypoint to the desired station first. This waypoint will be used by the Autopilot ARC function to maintain a constant DME distance from it. It can be used to fly the shortest distance around military, airspace or restricted areas.

END COURSE: Select **NO ARC END** or **a pilot defined magnetic inbound course**. The magnetic course is defined by rotating the push-knob. If you select **NO ARC END,** the airplane will go around the station at the DME distance for an indefinite period. On the other hand, if you specify a course, then the Autopilot will go around the station until intersecting the inbound course, at this moment it will turn towards the station.

DME: Distance is a pilot defined arc radius in NM. The DME Distance is selected by rotating the push-knob.

ARC DIRECTION: Select how the Autopilot will fly the ARC. The arc can be flown clockwise or counterclockwise around the station.

ACTIVATE ARC: When turned on the Autopilot will continue flying the present heading towards or away from the station. The ARC flag will blink in the main screen until the arc is established. Deactivate the ARC by turning this function OFF.

1.3.3.4 Page 4: MISCELLANOUS FUNCTION

Adjust brightness: The SuperECO has automatic dimming. The Brightness level can be adjusted here, best done at night.

1.3.3.5 Page 5: NAV / APPROACH

CDI/GPS: This is the source of information for the CDI/OBS needle which appears in the center of the instrument. This also configures from which external device the GPS navigation information is coming from. The alternatives are:

- OFF: No CDI
- SERIAL GPS: CDI working with NMEA or AVIATION DATA
- NAV1 or NAV2 ARINC or SL-30 format for either device (NAV1 or NAV2).

GPS/VLOC: When with OPTIONAL ARINC mode (connected to a GPS system which includes approaches), then you can choose between GPS and VLOC

2 Pre-Flight procedures

2.1 Pre-flight checks

It is very important to include the following in your 360 pre-flight checks:

- Turn on the autopilot instrument and servos.
- Check each trim tab integrity and connection to servo.
- Check each trim tab servo is active by excising a small pressure on the trim tab. It should maintain its position.
- Trim tabs should now be in the neutral position.

2.2 Before your first Autopilot Flight

Make sure your SERVO KILL SWITCH is installed, connected, and tested. THIS SWITCH SHOULD ALWAYS BE ON. This switch is only used for emergency disconnect in case of servo runaway. TURN ON POWER TO THE SERVOS **WELL BEFORE** ACTIVATING YOUR AUTOPILOT.

Make sure your AUTOPILOT DISENGAGE momentary push-button is working. This button can be on the instrument panel or yoke. When pressed you will see a white spot on the top left-hand corner of the screen. When released, the spot disappears. **Make sure there is no spot when the button is released.**

Setup your autopilot basic parameters, section 4.1.1 SuperECO setup on the ground: (SERVICE MODE Password 1).

Setup your servo gains, Section 5.1.2 Autopilot Calibration in the air: (SERVICE MODE Password 2).

If Yaw equipped, read section 5.1.3 YAW calibration and make sure you adjust parameters in (SERVICE MODE 3)

Note: Do not hold the controls for prolonged periods when the AP is engaged. This will cause the autopilot to become unstable. Rather do short control inputs to avoid objects or to test autopilot's ability to return to level flight.

If in doubts cancel AP and re-start by pushing the cancel button for 3 consecutive seconds. This will re-start AP sequence.

2.3 Normal daily operation recommended sequence

This is an example of operation on a flight, from take-off to landing. It is a sample sequence that will help you understand AP operation:

DURING ENGINE WARMUP ON GROUND

1. Push knob ONCE
2. Turn knob to desired cruise Altitude – push knob ONCE
3. Turn knob to desired Climb Rate – push knob ONCE
4. Turn knob to desired Barometric Pressure

IN FLIGHT

1. TURN ON SERVO POWER KILL SWITCH
2. Fly manually to Desired Heading
3. Press push button on yoke/panel for 3 consecutive seconds – Auto Pilot will engage and hold Heading and Altitude
4. Can correct course by Heading Bug **OR** Can press "R" button – roll knob to GPS tab and Press knob – Auto Pilot will then fly GPS flight plan.
5. Press knob ONCE and change Altitude. Autopilot will climb or descend to selected altitude.

AT DESTINATION

1. Press knob ONCE
2. Turn knob to select Pattern Altitude – push knob
3. Turn knob to select Descent Rate – push knob
5. Turn knob to desired Barometric Pressure at destination

DISENGAGE AUTO PILOT

1. Push and Release push button on yoke/panel

LAND MANUALLY

Note: Do not hold the controls for prolonged periods when the AP is engaged. This will cause the autopilot to become unstable. Rather do short control inputs to avoid objects or to test autopilot's ability to return to level flight.

If in doubts cancel AP and re-start by pushing the cancel button for 3 consecutive seconds. This will re-start AP sequence.

3 Emergency procedures

Note:
The Autopilot SuperECO is a tool provided to assist pilots with cockpit workload. The ability of the autopilot to provide proper assistance is directly proportional to the pilot's knowledge of its operating procedures. It is highly recommended that the pilot develops a profound understanding of the autopilot its controls, its operation modes and operations procedures. Pilots should be also familiar with HSI operations.

Note:
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- DISENGAGE THE AUTOPILOT IF THERE EXISTS ANY DOUBTS ABOUT AIRCRAFT CONTROL.

- KILL SERVO POWER THROUGH THE SERVO DISCONNECT SWITCH IF YOU OBSERVE SERVO RUNAWAY OR OSCILLATING.

3.1 Autopilot Malfunction

An autopilot malfunction may be recognized as an un-commanded deviation in the airplane flight path. The primary concern in reacting to an autopilot malfunction, or to an un-commanded disengage of the autopilot, is in maintaining control of the airplane. Immediately grasp the flight stick or control wheel and momentarily press the A/P disengage button while you perform the recovery. Manipulate controls as required to safely maintain operation of the airplane within all its operating limitations.

Finally, if the unit does not respond to the Disengage button, then disconnect power to the servos by opening the 5v power disconnect switch installed.

3.2 Flutter

FLUTTER WARNING: BALANCE YOUR MOVING SURFACES AFTER INSTALLING TRIM TABS www.aircraftautomation.com

IF YOU OBSERVE ANY KIND OF CONTROL OSCILLATION, AIRCRAFT OSCILLATION OR SIMILAR EVENT, REDUCE **SPEED IMEDIATELY** BY RAISING THE NOSE AND REMOVING POWER.

3.3 Emergency Battery Operation

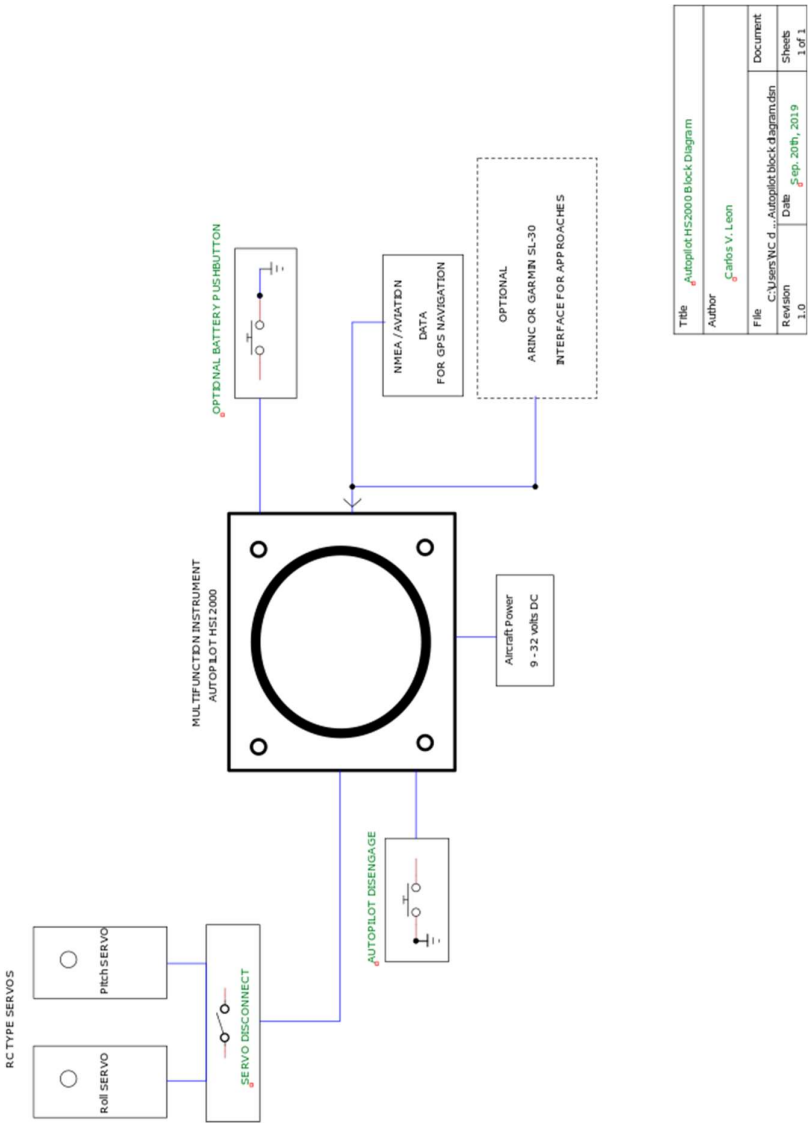
If there is a Bus power supply failure from the aircraft, the SuperECO will begin the battery transition. This consists of shutting down the autopilot and displaying a battery operation countdown. This countdown lasts one minute. After one minute the unit will automatically shut down.

DURING THIS COUNTDOWN PERIOD, THE PILOT SHOULD PRESS ANY KEY IN THE SUPERECO TO KEEP THE UNIT ON. NO AP FUNCTIONS WILL BE AVAILABLE SO IT IS ADVISABLE TO KILL POWER TO THE SERVOS USING THE EXTERNAL EMERGENCY SERVO POWER SWITCH. THIS WILL SAVE INSTRUMENT BATTERY POWER.

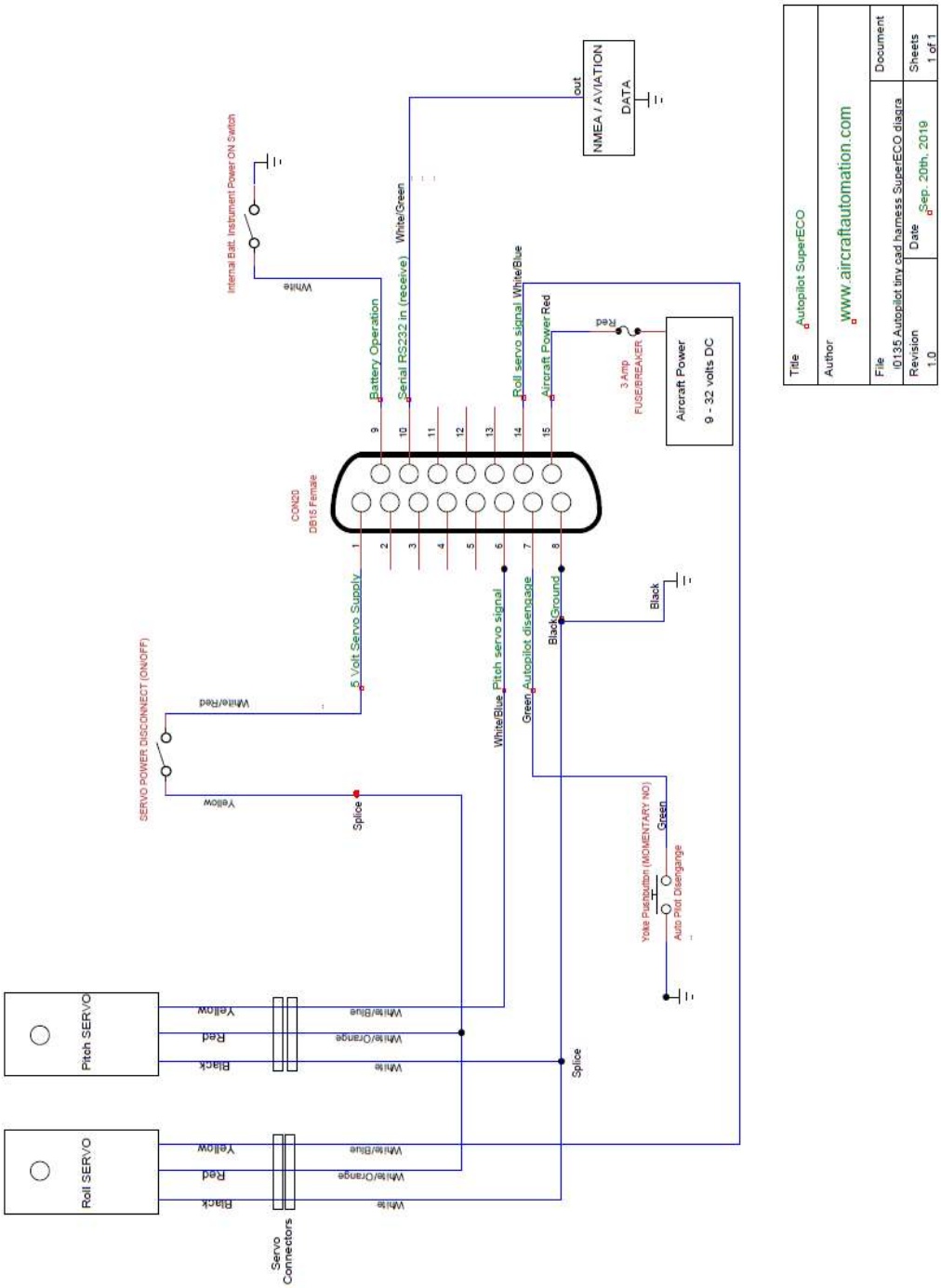
If the instrument has powered down, you can turn it back on using the optional external battery ON switch.

4. Autopilot installation.

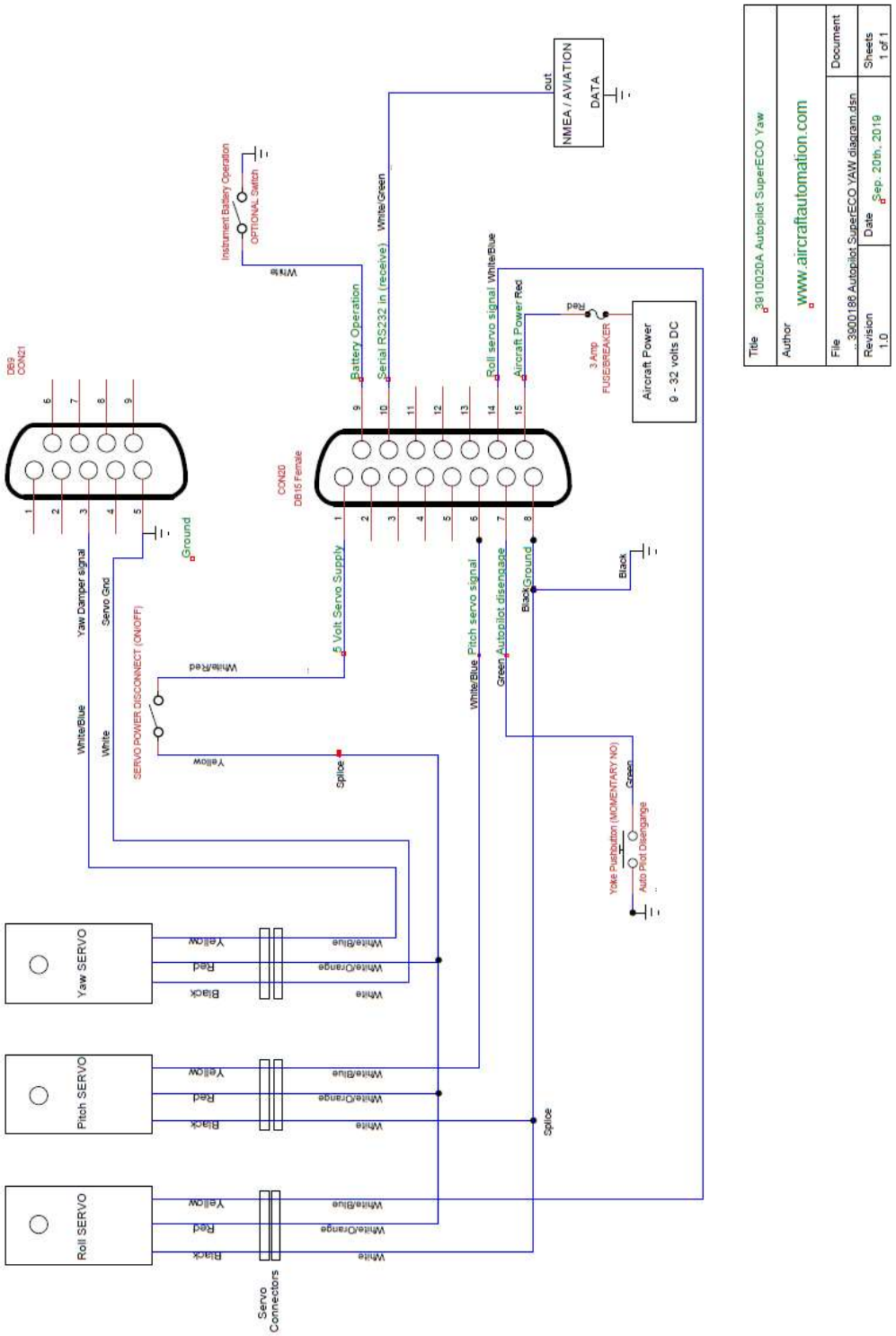
4.1 Block Diagram



5.2 Harness Diagram TWO AXIS



4.3 Harness Diagram THREE AXIS



Harness diagram made easy:

To easily understand the harness, we will explain all components and wire colors together with their function:

CON20. This DB15 connector is Female on the instrument and Male in the wiring Harness. The pin numbers are shown looking at the connector from the rear of the instrument:

Pin 1: This is 5-volt power supplied from the instrument to the model radio control servos. The current that can be drawn from the instrument is enough to drive both standard supplied servos. Should you install more powerful servos or more than one for each function (pitch or roll) then a separate power supply should be provided. This is done by disconnecting the White/Red cable form pin 1 and reconnecting it to the provided power supply.

The 5-volt supplied to the servos should have a safety disconnect switch so that power can be removed from the Yellow wire in case of a servo runaway. This is only for emergency disconnect. The Yellow wire splices to the White/Orange wire inside each servo connector where 5-volts is supplied. The splice is done inside the DB15 connector shell.

Pin 6: This is a Pulse Width Modulation (PWM) output provided by the instrument to drive the pitch servo. A White/Blue wire inside a coaxial mesh is connected to this pin. The other end of this wire ends up in the pitch servo connector.

Pin 7: This Green wire is connected to a push button that is normally mounted on the yoke for quick action. When momentarily shorted to ground both pitch and roll servo functions will disengage. The trim tabs will immediately go to a position that will keep the plane in trim ... level flight, climbing or descending.

Pin 8: This Black wire should be connected to ground. It is the zero-volt reference for the instrument power supply, servos and serial port signals. Each servo connector has one ground pin connected to this wire.

Pin 9: An optional momentary push button can be connected to pin 9. The wire is White. When the wire is momentarily shorted to ground the instrument will turn on using battery power. An example may be to turn on the instrument when aircraft power is missing, or master switch has not been turned on. When aircraft power is supplied to the instrument it will turn on automatically, therefore this push button is optional.

Pin 10: This pin will receive serial information coming from an external GPS with flight plan capabilities. The SuperECO will follow the route programmed in the external GPS. NMEA or AVIATION DATA can be input through this White/Green wire. Do not forget to set the BAUD rate on page 1 of SERVICE MODE 10 in the SuperECO instrument.

Pin 14: This is a Pulse Width Modulation (PWM) output provided by the instrument to drive the roll servo. A White/Blue wire inside a coaxial mesh is connected to this pin. The other end of this wire ends up in the roll servo connector.

Pin 15: Fused power should be connected to this Red wire. The instrument will run from 9 to 32 Volts DC and should be protected with a 3-amp fuse or breaker.

Connection to Servos:

Each servo (pitch and roll) is connected through a 3-pin standard Model Radio Control connector:

- Pin 1 (white wire/black shrink tube): ground
- Pin 2 (White/Orange wire): 5-vdc servo supply
- Pin 3 (Blue/White wire): Pulse Width Modulation (PWM) servo command.

Connect each servo or extension so that the black wire is aligned with white wire/black shrink tube. Reverse connection of these cables will prevent the servos from working normally but will not produce any permanent damage.

NOTE: for trim tab installation please refer to the separate Trim Tab installation manual or videos at:

https://aircraftautomation.com/support/

5 Settings

5.1 SERVICE MODES

The SuperECO autopilot head has different **SERVICE MODES** that can be accessed through the Main Menu (R) using different access passwords.

To access a **SERVICE MODE**:

1) Press **R** key
2) Rotate the Knob until **SERVICE MODE** is highlighted
3) **Click once on the Knob**
4) Rotate the Knob to select desired **PASSWORD** (mode)
5) **Click once on the Knob** to acknowledge
6) Press **L** key to enter the Mode Screen (or submenu)

Each **SERVICE MODE** has a different number of pages. To change page just rotate the Knob (the page number must be highlighted)

You can navigate through the items by clicking on the Knob. Rotate the Knob to change values, no need to acknowledge, just rotate the knob.

Pressing **L** key will toggle you in and out of the **SERVICE MODE** screen (or submenu)

DO NOT FORGET TO ALWAYS GO BACK TO SERVICE MODE, PASSWORD 0. This is the default MODE where you will find trim adjustments, etc.

5.1.1 SuperECO setup on the ground: (SERVICE MODE Password 1).

This is where all the initial unit configuration is done. It includes caging of the attitude indicator, configure correct servo direction, BAUD rate for your NMEA unit, etc. This section must be done on the ground.

5.1.1.1 Caging

- Level your airplane to the approximate cruise attitude. This is done to cage the Artificial Horizon

- Enter **SERVICE MODE 1** (see section 5.1 of this manual). The following screen will appear:

- Click once on the Knob to locate the cursor on **Cage Attitude:**
- Rotate the Knob until the word **CAGE** appears (white letters on yellow background)
- Click once on the Knob.
- The attitude indicator is now caged. It takes about 2 minutes to stabilize.
- Now you are in the main screen again. You can press **L** to re-enter the **SERVICE MODE** menu.

5.1.1.2 Roll Servo Direction

Make sure you are on **SERVICE MODE 1**

Depending on your installation the correct direction of the servo should be configured. Using the following procedure, you can make sure that right is right, and left is left…

Toggle the **L** key and change to PAGE 2 of the menu:

- Click once on the Knob to locate the cursor on **ROLL TRIM =**
- Rotate knob clockwise, to the **RIGHT**, and the trim tab will move. Note the direction:

- If the trim tab is installed on the left-wing aileron: Trim should be **moving UP**
- If the trim tab is installed on the right-wing aileron: Trim should be **moving DOWN**

If the above is inverted, then click on the Center Knob to lower the cursor to **Roll Servo Dir:** then rotate the Knob until the direction is changed.

5.1.1.3 Pitch Servo Direction

Make sure you are on **SERVICE MODE 1**

Select the correct pitch servo direction:

- Click once on the Center Knob to locate the cursor on **PITCH TRIM =**
- Rotate knob clockwise, for **UP**, and the trim tab will move. Note the direction:

- The Trim Tab should be **moving DOWN** (moving up in a CANARD airplane)

If the above is inverted, then click on the Knob to lower the cursor to **Pitch Servo Dir:**

then rotate the Knob until the direction is changed.

5.1.1.4 Yaw Servo Direction

Make sure you are on **SERVICE MODE 1**

Select the correct pitch servo direction:

Depending on your installation the correct direction of the servo should be configured. Using the following procedure, you can make sure that right is right, and left is left…

Toggle the L key and change to PAGE 4 of the menu:

- Click once on the Knob to locate the cursor on YAW TRIM =
- Rotate knob clockwise, to the RIGHT, and the trim tab will move. Note the direction:
- The Trim tab should be going to the left (to make the rudder go to the right)

If the above is inverted, then click on the Center Knob to lower the cursor to Yaw Servo Dir: then rotate the Knob until the direction is changed.

5.1.1.4 BAUD RATE

If an NMEA (or Aviation DATA) device is connected through the serial port input of the SuperECO, then you will need to set the communication speed, BAUD RATE.

Most GPS units use 9600 Baud (some 4800 Baud). Other Baud Rates are possible.

Refer to the GPS installation/pilot's manual for the correct Baud Rate.

NOTE: Exit this menu (Pressing **L**) and re-start the unit for the BAUD rate to take effect.

5.1.2 Autopilot Calibration in the air: (SERVICE MODE Password 2).

Once the servo direction is set and the unit is caged, proceed to fly the airplane. Factory set gains should work fine but you may want to optimize your settings. Follow the following procedures if you choose to do so:

Choose a calm day and altitude with little or no turbulence. This allows for accurate calibration since you will not confuse turbulence inputs with excessive autopilot inputs.

The **SuperECO** autopilot should fly the airplane as smoothly as possible. If the autopilot control is excessive, you may have the gains too high.

In the air select **SERVICE MODE 2** (see section 5.1)

The following (**PAGE 1**) will show on your screen:

Pages 1 (of **SERVICE MODE 2**) is an information screen.

Rotate knob to **Page 2**. The screen will instruct you to activate the AP. Press the AP cancel button for 3 continuous seconds and the Autopilot will start flying the airplane. Alternatively, you can activate level flight by pressing **R** button and choosing **LVL** from the main menu.

Note: Do not hold the controls for prolonged periods when the AP is engaged. This will cause the autopilot to become unstable. Rather do short control inputs to avoid objects or to test autopilot's ability to return to level flight.

If in doubts cancel AP and re-start by pushing the cancel button for 3 consecutive seconds. This will re-start AP sequence.

Rotate Knob to **Page 3**. On this page you can adjust the ability of the autopilot to level the wings.

NOTE: THE AUTOPILOT SHOULD NOW BE ACTIVE

Click on the Knob to locate the cursor on **Roll Servo Gain:**

With the Knob increase or decrease **Roll Servo Gain** until the autopilot has positive roll control**.** You can see the attitude indicator by toggling between this screen and the main screen. Press the **L** button to change screens.

If by any reason you feel uncomfortable with the autopilot, then you can cancel with the yoke's AP cancel Push Button rather than holding onto the controls. Start from **PAGE 1** again.

Feel free to do yoke inputs to roll (rock you wings), the autopilot should immediately level the wings, no overshoot.

- If the Autopilot reacts slow to changes in roll, INCREASE THE VALUE OF **Roll Servo Gain:**

- If the Autopilot oscillates trying to center the roll, then DECREASE THE VALUE OF **Roll Servo Gain**

It is normal for the aileron trim tab to be more responsive to one side from to the other. For example, it may be more difficult to roll to the right, rolling left will be fast.

Adjust **Roll Gain Balance** to offset this difference. After adjusting balance, you may increase **Roll Servo Gain** to improve rolling back from the slow side.

Adjust both gains back and forth because one depends on the other. The idea is to do a control input to either side and the **SuperECO** should immediately level the airplane.

Page 4. you will be able to adjust the following two constants:

GAIN when flying straight. When flying long straight legs, the AP should follow the heading smoothly without wandering to the sides. If you find that you can never reach the heading, then you can increase this constant. If it oscillates trying to find the heading, then decrease.

GAIN when turning. Using the heading bug you can invoke a turn, on any direction. Turning should be at a standard (2 min) rate. If less than standard, then increase this variable. If oscillates trying to find the standard turning gain, then decrease.

Page 5. Adjust Pitch gain:

Click on the Knob to locate the cursor on **Pitch Servo Gain:**

With the Knob increase or decrease **Pitch Servo Gain:** until the autopilot has positive pitch control. **Ignore the altimeter, we are only adjusting pitch in relation to the attitude indicator**. You can see the attitude indicator by toggling between this screen and the main screen. Press the **L** button to change screens.

If by any reason you feel uncomfortable with the autopilot, then you can cancel with the yoke's AP cancel Push Button. Go back to page 1 and start over.

Feel free to do yoke inputs to the attitude, the autopilot should immediately center in pitch, no overshoot.

- If the Autopilot reacts slow to changes in attitude INCREASE THE VALUE OF **Pitch Servo Gain:**

- If the Autopilot oscillates trying to center the attitude, then DECREASE THE VALUE OF **Pitch Servo Gain:**

It is normal for the elevator trim tab to be more responsive going up from down or vice-versa. For example, it may be more difficult to pitch down, pitch up will be fast.

Adjust **Pitch Gain Balance** to offset this difference. After adjusting balance, you may increase **Pitch Servo Gain** to improve leveling from the slow direction.

Adjust both gains back and forth because one depends on the other. The idea is to do a control input in either direction and the **SuperECO** should immediately level the airplane.

Page 6. Adjust Climb/Descend Gain:

The Autopilot should be able to hold an altitude without any adjustments but climbing and descending is more complicated.

A Constant for adjusting Climbs and Descends is provided on page 6. Adjust this constant until the Vertical speed is slowly attained. The autopilot should not try to hunt vertical speed quickly, it should take up to 30 seconds to reach the desired climb rate or descend rate.

Page 7:

Go to **R** button, select **IAS**

On the main screen, press knob and change the selected altitude to 3000 feet above your present altitude. (Top right hand corner of the main screen).

Press L button, you should be on page 6.

Adjust Air Speed Gain so that the AP follows your selected airspeed. Note that as the AP gets to the desired altitude it will ignore the IAS. That is why we need to have a different selected altitude to the present one. This will allow the AP to follow **IAS**.

Page 8.

Once satisfied with the autopilot calibration in Roll and Pitch, proceed to **SERVICE MODE 0** and operate your autopilot normally, section 1.3.2

IF STILL HAVING PROBLEMS WITH ROLL ADJUSTMENT PLEASE FOLLOW A MORE EXTENSIVE PROCEDURE on the following manual that can be downloaded from www.aircraftautomation.com/support

Manual: **SuperECO ROLL special calibration procedure**

5.1.3 YAW DAMPER TUNING in the air: (SERVICE MODE Password 3).

Select **SERVICE MODE page 3** for this adjustment.

Make sure ride is smooth, the ball is centered, and the airplane is trimmed for level flight.

Press the AP CANCEL BUTTON ** for 3 continuous seconds to activate the autopilot. LET THE AP FLY THE PLANE. If in doubt, disengage the AP by pressing the CANCEL BUTTON momentarily.

Page 3 "Yaw Servo Gain":

-Make **sure this setting is zero before you begin.** Work your way up from zero.

"Yaw Servo Gain" will allow the SuperECO to do quick rudder corrections in turbulent weather. It will attempt to keep the airplane flying as straight as possible.

Increase YAW Servo Gain for straight flight. Pedal inputs should result in quick YAW corrections **without oscillations**. In It is OK to leave it in zero at the first few flights.

Page 4 "BALL centering gain:"
This parameter will adjust the ability of the autopilot to slowly center the Ball Level for coordinated flight. To avoid unwanted oscillations the SuperECO does this slowly. Observe how the ball is centered when the airplane is turning. Adjust this parameter accordingly.

** The Yaw damper will not activate automatically with 3 seconds of the AP CANCEL BUTTON unless you activate this function:

- SERVICE MODE 10
- Push on L
- Go to page 4
- Change: "External PB YAW activation:" YES

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6 SERVICE MODE 10. SUPERECO FUNCTION PARAMETERS. Advanced users only

6.1 Access SERVICE MODE 10

In SERVICE MODE 10 you will find all available parameters that can be adjusted by the user. They are organized in groups for easy identification. There is usually no need to adjust any of these parameters. They are here for clarification purposes.

See Section 5 for normal Autopilot calibration procedures.

All parameters can be backed up by photographing each page of Service Mode 10.

For Default Parameters do a Factory Default, section 6.3

To access a **SERVICE MODE**:

1) Press **R** key
2) Rotate the Knob until **SERVICE MODE** is highlighted
3) Click once on the Knob
4) Rotate the Knob to the number 10
5) Click once on the Knob to acknowledge
6) Press **L** key to enter the Mode Screen (or submenu)

6.2 Description of parameters

Page1. General:

- **Baud Rate**: RS-232 transmission speed (usually 9600 or 4800).
- **Show Magnetic Heading:** if YES, a green arrow in the compass rose will point to the magnetic heading. Note: the SuperECO is provided with an internal magnetometer. The accuracy of magnetic heading will depend on the instrument installation and its surroundings.
- **GPS NAV:** Choose between NMEA or AVIATION data for the protocol of the flight plan that the SuperECO will follow.
- **Nav1 Source:** Select from ARINC, SL-30 or NONE for HSI external data of your navigation device 1.
- **Nav2 Source:** Select from ARINC, SL-30 or NONE for HSI external data of your navigation device 2.
- **HDG Source:** The SuperECO compass rose will be synced to one of these options: MAGNETIC HEADING, TRACK (MAGNETIC) from the internal GPS, TRACK (MAGNETIC) from the external NMEA/AVIATION DATA GPS. If you select magnetic, the unit uses an internal magnetometer, make sure the unit is installed away from magnetic fields and that it is calibrated according to "Magnetic Calibration" on Page 6 of this mode.

Page 2. Roll and Heading:

- **Roll Servo Gain:** Ability of servo to control roll.

- Roll Derivative: Very slow acting airplanes may require the trim tab to reverse direction as the wing rolls to center to avoid overshooting. Too much of this gain will also introduce fast oscillations.

- **Roll Gain Balance:** Balance the authority of the trim to make it different from one side to the other.

- Gain flying straight: Ability to follow a heading when the airplane if flying straight.

- Gain when turning: Ability of the autopilot to maintain a standard turn.

- HDG Integral: When following a heading, in a straight flight, the autopilot will correct for a heading bias such as an uncaged attitude indicator or a constant external force. This will be done slowly over a period.

- Roll Servo Backlash: Since trim tabs are thin, they might be shadowed by the aileron, making them inactive when they are approximately aligned. Backlash will move the trim tab an additional amount every time they reverse from one direction to the other.

Page 3. Pitch and Altitude:

- Pitch Servo Gain: Ability of servo to control pitch.

- Pitch Derivative: Very slow acting airplanes may require the trim tab to reverse direction as the pitch levels off to avoid overshooting. Too much of this gain will also introduce fast oscillations.

- **Pitch Gain Balance:** Balance the authority of the trim to make it different from one side to the other.

- Climb/Descend Gain: Ability of the autopilot to follow a climb rate.

- Alt Cal Time APR: When following a glide slope this is the time in tenth of seconds that the autopilot will sample between GS adjustment rate.

- Alt calc time climb: When climbing or descending the autopilot will not immediately make corrections but rather will supervise the rate at intervals. This is the interval in tens of seconds.

- Roll to ATT. Relation: When a turn is started the AP will pull the nose up (if number is positive) to offset for pitch change. On the roll out it will push the nose down.

- Pitch Servo Backlash: Since trim tabs are thin, they might be shadowed by the elevator, making them inactive when they are approximately aligned. Backlash will move the trim tab an additional amount every time they reverse from one direction to the other.

Page 4: Airspeed climb and YAW control:

- Air Speed Gain: Ability of the autopilot to follow an airspeed when IAS climbing or descending.

- Air Speed Overshoot: When reaching the target air speed the AP will correct for the overshoot.

- YAW Servo Gain: The autopilot will correct for sudden unwanted YAW changes due to turbulence. Beware of YAW oscillations if this parameter is set too high.

- BALL centering gain: Ability of the AP to keep the airplane in coordinated flight (ball centered).

- Aileron/Rudder mix: Airplanes with high adverse yaw may need to actuate the rudder while the AP actuates roll. The amount of this mix is adjusted in this gain.

- Yaw Servo Backlash: Since trim tabs are thin, they might be shadowed by the rudder, making them inactive when they are approximately aligned. Backlash will move the trim tab an additional amount every time they reverse from one direction to the other.

- External PB YAW activation.

Manual: Activate YAW at page 1 (DEFAULT SERVICE MODE 0)

Push Button: YAW will be activated by pressing the Autopilot Disconnect Push Button for 3 consecutive seconds.

Always ON: YAW damper will be active permanently.

Page 5: Approach adjustments.

CDI Gain: Ability to follow the CDI needle when intersecting a radial from a GPS waypoint, a VOR or a Localizer in the ILS approach.

CDI Overshoot: Prevents heading overshoot when following the CDI needle.

GPS Hor. CMD. GAIN: Ability to follow the ARINC horizontal command.

GPS Glidepath GAIN: Ability to follow the glideslope when doing RNAV LP or AOV approaches.

ILS GS gain VLOC: Ability to follow the glideslope when doing ILS approaches.

Detour time: When in GPS or NAV mode the heading bug may be manually changed to avoid weather or traffic. This is the time in seconds that this detour lasts.

Page 6: Magnetic calibration, Caging and system units.

- Magnetic Calibration: The internal magnetometer will attempt to compensate for external magnetic sources around the instrument. These sources are usually steel parts and wires. This calibration is active during all flights but can be saved by selecting **"SAVE TO ROM"** at the end of a flight. You may want to reset the calibration by selecting: **"INITIALIZE"**

Cage Attitude Ind.: Select CAGE to center the attitude indicator in Pitch and Roll. UNCAGE will eliminate any caging previously made.

Baro Units: Select between **Inches of Mercury** or **Millibars**. You may select both if you travel different countries and want to show both units at the same time.

IAS Units: Indicated air speed will show in **KMH, MPH or KNOTS**.

ALTIMETER UNITS: Choose between **FEET** and **METERS**.

Pages 7 and 8: Pressure altimeter calibration:

The SuperECO altimeter comes calibrated from the factory. You can go to these pages if you want to re-calibrate the altimeter.

The SuperECO linearizes the altimeter by calibrating two altitudes, an altitude close to the ground and a higher altitude. You can choose the higher altitude according to your flights. Higher altitude should normally be 10,000 feet.

This adjustment should normally be made with a variable static source, but you can do it in flight if you have an accurate altitude reference like a calibrated altimeter.

Lower altitude:

- Go to **page 7.**
- Move the cursor to **Corrected Altitude**:
- Rotate the knob to the real altitude you want, say 150'
- Move the cursor to **Accept Changes**:
- Choose **YES.** The new altitude will be accepted as the correct lower altitude. If you choose **ERASE** the unit will go back to altitude factory default, only altitude will go to factory default.

Higher altitude:

- Go to **page 8**.
- Move the cursor to **Corrected Altitude**:
- Rotate the knob to the real altitude you want, say 10,000'
- Move the cursor to **Accept Changes**:
- Choose **YES.** The new altitude will be accepted as the correct higher altitude. If you choose **ERASE** the unit will go back to altitude factory default, only altitude will go to factory default.

Pages 9 and 10: Indicated Airspeed calibration:

The SuperECO Airspeed comes calibrated from the factory. You can go to these pages if you want to re-calibrate the Airspeed.

The SuperECO linearizes the Airspeed by calibrating two speeds, a low airspeed, maybe close to the stall speed and a higher airspeed. You can choose the higher airspeed according to your flights. Higher airspeed should normally be 120Kts.

This adjustment should normally be made with a variable dynamic source, but you can do it in flight if you have an accurate airspeed reference like a calibrated speedometer.

Lower altitude:

- Go to **page 9.**
- Move the cursor to **Corrected IAS**:
- Rotate the knob to the real airspeed you want, say 40 Knots.
- Move the cursor to **Accept Changes**:
- Choose **YES.** The new airspeed will be accepted as the correct lower airspeed. If you choose **ERASE** the unit will go back to airspeed factory default, only airspeed will go to factory default.

Higher airspeed:

- Go to **page 10**.
- Move the cursor to **Corrected IAS**:
- Rotate the knob to the real airspeed you want, say 120 knots
- Move the cursor to **Accept Changes**:
- Choose **YES.** The new airpeed will be accepted as the correct higher airspeed. If you choose **ERASE** the unit will go back to airspeed factory default, only airspeed will go to factory default.

Page 11: Serial Port Diagnosis.

If the **Baud Rate** is correct and the **GPS** is sending approved **NMEA or AVIATION** data, then these will be shown on the screen for diagnosis.

Page 12: Servo Direction.

Servo direction can be chosen for Roll, Pitch and Yaw. Can also be done on **SERVICE MODE 1**

Choose servo direction according to the direction of trim tab movement. If the direction is incorrect, then invert from **NORMAL** to **REVERSED** or vice versa.

Page 13: iLevil connection.

AHRS/AIR DATA Source: When the SuperECO is connected to an iLevil then you can choose which the data is shown on the SuperECO instrument. Parameters such as Airspeed, Altitude and Artificial horizon can be displayed on the SuperECO using data from its internal source or using external iLevil data.

There are four possibilities that can be chosen:

1- INTERNAL AHRS/AIR DATA: Displays the internal SuperECO sensors.
2- EXTERNAL AHRS/AIR DATA: Displays all data from the iLevil, ignoring the internal SuperECO. Useful if you want to show the same altitude and airspeed as your iLevil to avoid pilot confusion.
3- By priorities. If the data fails it will show the alternative:
   Priority 1: Internal Data
   Priority 2: External Data
4- By priorities. If the data fails it will show the alternative:
   Priority 1: External Data
   Priority 2: Internal Data

SuperECO/iLevil SYNC: Choose **YES** if you want to sync operation between the SuperECO and the iLevil. These will include, Barometric Adjust, Heading Bug, Altitude preselect, Trims, autopilot activation and deactivation, whether your servos are connected to the SuperECO or the iLevil.

Page 14: ARINC DIAGNOSIS. Check all incoming ARINC parameters if you connected an ARINC enabled NAV/GPS radio.

Page 15:

Speed Window: The instrument speed window can be configured to show GROUND SPEED under certain circumstances:

SHOW IAS: Always show IAS

SHOW GS: Always show GROUND SPEED

SHOW GS BELOW IAS: Below certain IAS the speed window will show GROUND SPEED. Useful for taxing.

Speed Threshold: At below which speed should the GROUND SPEED be shown on the speed window.

Page 16: SERVO STROKE LIMIT

You can limit the travel of each trim tab in the plus or minus directions. This is useful if there is an obstruction that prevents the trim tab from moving further, causing strain on the servo.

Page 17: Servo Dead Band

Always leave at zero.

Page 18: Inhibit Servos.

Each servo can be inhibited if not used or installed. You can inhibit servos temporarily to make gain adjustments easier by just working on one axis.

Page 19: Additional parameters:

- Roll Limit: Maximum angle allowed on the roll axis, both for Autopilot control and for AEP (Automatic Envelope Protection)

- Pitch Limit: Maximum angle allowed on the pitch axis, both for Autopilot control and for AEP (Automatic Envelope Protection)

- **Ball Offset**: If the instrument is not installed perfectly straight then the ball (level) can be adjusted.

6.3 Factory Default

1) Turn off the SuperECO:
    a. Disconnect power to the SuperECO.
    b. Press R pushbutton
    c. Rotate the knob to select SHUTDOWN and press push-knob
    d. The instrument will shut down after 4 seconds.
2) Press and keep pressed the L and the R pushbuttons at the same time.
3) Apply power to the unit.
4) Wait until boot is complete.
5) The message “Release for Factory Default” will appear.
6) Release the L and R pushbuttons
7) A factory Default message will appear on the screen. After booting the Preselected altitude (top right hand corner) will show 5000.

7 MENU QUICK REFERENCE

7.1 MENU IN ALPHABETICAL ORDER

MENU Index	Description	SERVICE MODE	PB / PAGE
ACTIVATE ARC:	Maintain present heading until intersecting arc, then follow the arc.	0	L3
ACTIVATE HOLD:	Start Holding	0	L2
AHRS/AIR DATA Source	Data source when SuperECO connected to an iLevil	10	L13
Air speed Gain	Ability of the autopilot to follow an airspeed in IAS climb and descend	10	L4
Air speed Gain	Ability of the autopilot to follow an airspeed in IAS climb and descend	2	L7
Air Speed Overshoot	When reaching the target air speed the AP will correct for the overshoot.	10	L4
ALT	ALTITUDE HOLD, CLIMB, DESCEND	ANY	R1
Alt calc time APR:	Glide slope sampling time.	10	L3
Alt calc time climb	Sampling time for supervising climb/descend rate	10	L3
ALTIMETER UNITS:	Choose between FEET and METERS.	10	L6
APR	APPROACH	ANY	R1
Auto. Envelope Protect:	YES/NO In manual flying the autopilot will compensate for excessive roll or pitch	0	L1
BALL centering gain	Ability of the AP to keep the airplane in coordinated flight (ball centered).	10	L4
BALL centering gain	Ability of the AP to keep the airplane in coordinated flight (ball centered).	3	L4
Baro Units:	Select between Inches of Mercury or Millibars.	10	L6
Baud Rate	Select external GPS Baud Rate	10	L1
Baud Rate	Select external GPS Baud Rate	1	L5
BRIGHTNESS	Screen brightness. It will automatically dim at night according to this number	0	L4
Cage Attitude Ind.	Select CAGE to center the attitude indicator in Pitch and Roll. UNCAGE will eliminate any caging previously made.	10	L6
Cage Attitude Ind.	Select CAGE to center the attitude indicator in Pitch and Roll. UNCAGE will eliminate any caging previously made.	1	L1

CDI Gain	Ability to follow the CDI needle when intersecting a radial from a GPS waypoint, a VOR or a Localizer in the ILS approach.	10	L5
CDI Overshoot	Prevents heading overshoot when following the CDI needle.	10	L5
CDI:	Choose external GPS data source for navigation and approaches.	0	L5
Climb/Descend Gain:	Ability for the autopilot to follow climb or descend rate.	10	L3
Climb/Descend Gain:	Ability for the autopilot to follow climb or descend rate.	2	L6
Detour time s.	When in GPS or NAV mode the heading bug may be manually changed to avoid weather or traffic. This is the time in seconds that this detour lasts.	10	L5
DME DIST =	Arc distance from the station (GPS waypoint must be active)	0	L3
END COURSE =	Arc end course. Intersect and follow this course to the station(GPS waypoint must be active).	0	L3
External PB YAW activation	If YES, YAW will be activated by pressing the Autopilot Disconnect Push Button for 3 consecutive seconds	10	L4
Gain flying straight:	Ability for the autopilot to follow a heading when flying a straight line.	10	L2
Gain flying straight:	Ability for the autopilot to follow a heading when flying a straight line.	2	L4
Gain when turning:	Ability for the autopilot make a standard turn	10	L2
Gain when turning:	Ability for the autopilot make a standard turn	2	L4
GPS	FOLLOW EXTERNAL GPS	ANY	R1
GPS NAV	Type of external source such as NMEA or AVIATION data for external GPS navigation	10	L1
GS gain GPS	Ability to follow the glideslope when doing RNAV LP or AOV approaches.	10	L5
GS gain VLOC	Ability to follow the glideslope when doing ILS approaches.	10	L5
HDG / TRACK	HEADING OR TRACK	ANY	R1
HDG Integral	Slowly cancel any heading offset.	10	L2

HDG Source:	The compass rose gets the heading from different sources: Magnetic, Internal GPS, External GPS	10	L1
High altitude Cal.	Calibrate altimeter HIGH altitude	10	L8
High IAS Cal.	Calibrate Air Speed Indicator HIGH speed.	10	L10
HOLD DIRECTION:	Type of holding pattern, right turns or left turns	0	L2
HOLDING COURSE:	Course in degrees for the holding pattern	0	L2
IAS Units:	Indicated air speed will show in KMH, MPH or KNOTS.	10	L6
IAS Units:	AIRSPEED CLIMB/DESCEND MODE	ANY	R1
Low altitude Cal.	Calibrate altimeter LOW altitude	10	L7
Low IAS Cal.	Calibrate Air Speed Indicator LOW speed.	10	L9
LVL	LEVEL FLIGHT MODE	ANY	R1
Magnetic Calibration	The internal magnetometer will attempt to compensate for external magnetic sources around the instrument	10	L6
NAV	FOLLOW CDI NEEDLE	ANY	R1
NAV1 Source:	Type of source for Radio Navigator 1: ARINC / SERIAL PORT	10	L1
NAV2 Source:	Type of source for Radio Navigator 2: ARINC / SERIAL PORT	10	L1
OFF	DEACTIVATE HEADING, TRACK AND ALTITUDE HOLD	ANY	R1
Pitch Limit =	Maximum pitch angle allowed for Envelope protection.	10	L3
Pitch Servo Direction:	Select servo direction	10	L12
Pitch Servo Direction:	Select servo direction	1	L3
Pitch Servo Gain	Ability for the servo to control Pitch	10	L3
Pitch Servo Gain	Ability for the servo to control Pitch	2	L5
PITCH TRIM	Adjust pitch trim position	0	L1
Roll Limit:	Maximum roll angle allowed for Envelope protection.	10	L2
Roll Servo Direction:	Select servo direction	10	L12
Roll Servo Direction:	Select servo direction	1	L2
Roll Servo Gain:	Ability for the servo to control Roll	10	L2
Roll Servo Gain:	Ability for the servo to control Roll	2	L3
Roll to Att. Relation	On a turn bias the pitch control to prevent dropping of the nose.	10	L3
ROLL TRIM	Adjust roll trim position	0	L1

SERVICE MODE	SERVICE MODE. SHOW EXTRA MENUS BY PRESSING "L" PUSHBUTTON	ANY	R1
Show Magnetic Heading:	A green arrow will point to magnetic heading at the compass rose.	10	L1
SHUT DOWN	TURN UNIT OFF AFTER 4 SECONDS	ANY	R1
SuperECO/iLevil SYNC	Whether iLevil will sync with SuperECO	10	L13
VS	CLIMB RATE MODE	ANY	R1
YAW CONTROL	Activate/Deactivate YAW autopilot	0	L1
Yaw Servo Direction:	Select servo direction	10	L12
Yaw Servo Direction:	Select servo direction	1	L4
YAW Servo Gain	The autopilot will correct for sudden unwanted YAW changes due to turbulence.	10	L4
YAW Servo Gain	The autopilot will correct for sudden unwanted YAW changes due to turbulence.	3	L3
YAW TRIM	Adjust yaw trim position	0	L1

7.2 MENU IN SERVICE MODE ORDER

MENU Index	Description	SERVICE MODE	PB / PAGE
ACTIVATE ARC:	Maintain present heading until intersecting arc, then follow the arc.	0	L3
ACTIVATE HOLD:	Start Holding	0	L2
Auto. Envelope Protect:	YES/NO In manual flying the autopilot will compensate for excessive roll or pitch	0	L1
BRIGHTNESS	Screen brightness. It will automatically dim at night according to this number	0	L4
CDI:	Choose external GPS data source for navigation and approaches.	0	L5
DME DIST =	Arc distance from the station (GPS waypoint must be active)	0	L3
END COURSE =	Arc end course. Intersect and follow this course to the station(GPS waypoint must be active).	0	L3
HOLD DIRECTION:	Type of holding pattern, right turns or left turns	0	L2
HOLDING COURSE:	Course in degrees for the holding pattern	0	L2
PITCH TRIM	Adjust pitch trim position	0	L1
ROLL TRIM	Adjust roll trim position	0	L1
YAW CONTROL	Activate/Deactivate YAW autopilot	0	L1
YAW TRIM	Adjust yaw trim position	0	L1
Baud Rate	Select external GPS Baud Rate	1	L5
Cage Attitude Ind.	Select CAGE to center the attitude indicator in Pitch and Roll. UNCAGE will eliminate any caging previously made.	1	L1
Pitch Servo Direction:	Select servo direction	1	L3
Roll Servo Direction:	Select servo direction	1	L2
Yaw Servo Direction:	Select servo direction	1	L4
Air speed Gain	Ability of the autopilot to follow an airspeed in IAS climb and descend	2	L7
Climb/Descend Gain:	Ability for the autopilot to follow climb or descend rate.	2	L6
Gain flying straight:	Ability for the autopilot to follow a heading when flying a straight line.	2	L4

Gain when turning:	Ability for the autopilot make a standard turn	2	L4
Pitch Servo Gain	Ability for the servo to control Pitch	2	L5
Roll Servo Gain:	Ability for the servo to control Roll	2	L3
BALL centering gain	Ability of the AP to keep the airplane in coordinated flight (ball centered).	3	L4
YAW Servo Gain	The autopilot will correct for sudden unwanted YAW changes due to turbulence.	3	L3
AHRS/AIR DATA Source	Data source when SuperECO connected to an iLevil	10	L13
Air speed Gain	Ability of the autopilot to follow an airspeed in IAS climb and descend	10	L4
Air Speed Overshoot	When reaching the target air speed the AP will correct for the overshoot.	10	L4
Alt calc time APR:	Glide slope sampling time.	10	L3
Alt calc time climb	Sampling time for supervising climb/descend rate	10	L3
ALTIMETER UNITS:	Choose between FEET and METERS.	10	L6
BALL centering gain	Ability of the AP to keep the airplane in coordinated flight (ball centered).	10	L4
Baro Units:	Select between Inches of Mercury or Millibars.	10	L6
Baud Rate	Select external GPS Baud Rate	10	L1
Cage Attitude Ind.	Select CAGE to center the attitude indicator in Pitch and Roll. UNCAGE will eliminate any caging previously made.	10	L6
CDI Gain	Ability to follow the CDI needle when intersecting a radial from a GPS waypoint, a VOR or a Localizer in the ILS approach.	10	L5
CDI Overshoot	Prevents heading overshoot when following the CDI needle.	10	L5
Climb/Descend Gain:	Ability for the autopilot to follow climb or descend rate.	10	L3
Detour time s.	When in GPS or NAV mode the heading bug may be manually changed to avoid weather or traffic. This is the time in seconds that this detour lasts.	10	L5
External PB YAW activation	If YES, YAW will be activated by pressing the Autopilot Disconnect Push Button for 3 consecutive seconds	10	L4

Gain flying straight:	Ability for the autopilot to follow a heading when flying a straight line.	10	L2
Gain when turning:	Ability for the autopilot make a standard turn	10	L2
GPS NAV	Type of external source such as NMEA or AVIATION data for external GPS navigation	10	L1
GS gain GPS	Ability to follow the glideslope when doing RNAV LP or AOV approaches.	10	L5
GS gain VLOC	Ability to follow the glideslope when doing ILS approaches.	10	L5
HDG Integral	Slowly cancel any heading offset.	10	L2
HDG Source:	The compass rose gets the heading from different sources: Magnetic, Internal GPS, External GPS	10	L1
High altitude Cal.	Calibrate altimeter HIGH altitude	10	L8
High IAS Cal.	Calibrate Air Speed Indicator HIGH speed.	10	L10
IAS Units:	Indicated air speed will show in KMH, MPH or KNOTS.	10	L6
Low altitude Cal.	Calibrate altimeter LOW altitude	10	L7
Low IAS Cal.	Calibrate Air Speed Indicator LOW speed.	10	L9
Magnetic Calibration	The internal magnetometer will attempt to compensate for external magnetic sources around the instrument	10	L6
NAV1 Source:	Type of source for Radio Navigator 1: ARINC / SERIAL PORT	10	L1
NAV2 Source:	Type of source for Radio Navigator 2: ARINC / SERIAL PORT	10	L1
Pitch Limit =	Maximum pitch angle allowed for Envelope protection.	10	L3
Pitch Servo Direction:	Select servo direction	10	L12
Pitch Servo Gain	Ability for the servo to control Pitch	10	L3
Roll Limit:	Maximum roll angle allowed for Envelope protection.	10	L2
Roll Servo Direction:	Select servo direction	10	L12
Roll Servo Gain:	Ability for the servo to control Roll	10	L2
Roll to Att. Relation	On a turn bias the pitch control to prevent dropping of the nose.	10	L3
Show Magnetic Heading:	A green arrow will point to magnetic heading at the compass rose.	10	L1

SuperECO/iLevil SYNC	Whether iLevil will sync with SuperECO	10	L13
Yaw Servo Direction:	Select servo direction	10	L12
YAW Servo Gain	The autopilot will correct for sudden unwanted YAW changes due to turbulence.	10	L4
ALT	ALTITUDE HOLD, CLIMB, DESCEND	ANY	R1
APR	APPROACH	ANY	R1
GPS	FOLLOW EXTERNAL GPS	ANY	R1
HDG / TRACK	HEADING OR TRACK	ANY	R1
IAS Units:	AIRSPEED CLIMB/DESCEND MODE	ANY	R1
LVL	LEVEL FLIGHT MODE	ANY	R1
NAV	FOLLOW CDI NEEDLE	ANY	R1
OFF	DEACTIVATE HEADING, TRACK AND ALTITUDE HOLD	ANY	R1
SERVICE MODE	SERVICE MODE. SHOW EXTRA MENUS BY PRESSING "L" PUSHBUTTON	ANY	R1
SHUT DOWN	TURN UNIT OFF AFTER 4 SECONDS	ANY	R1
VS	CLIMB RATE MODE	ANY	R1