

Carbon Fiber Trim Tab Installation Guide



Owner's Manual

By Aircraft Automation LLC

Revision History:

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Version 2: Extra warnings

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1.0 Purpose

This Installation Guide provides a general description, basic installation procedures, adjustments of our Carbon Fiber Trim Tab.

Note:

The 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 be also familiar with the instrument's 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.

Note:

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 IMMEDIATELY** BY RAISING THE NOSE AND REMOVING POWER.

Note:

FAILURE TO BALANCE YOUR MOVING SURFACES AND TRIM TABS MAY RESULT IN FLUTTER WHICH CAN CAUSE A CATASTROFIC STRUCTURAL FAILURE. IF YOU EVER ENCOUNTER FLUTTER, IMMEDIATELY REDUCE SPEED BY RAISING THE NOSE AND REMOVING POWER.

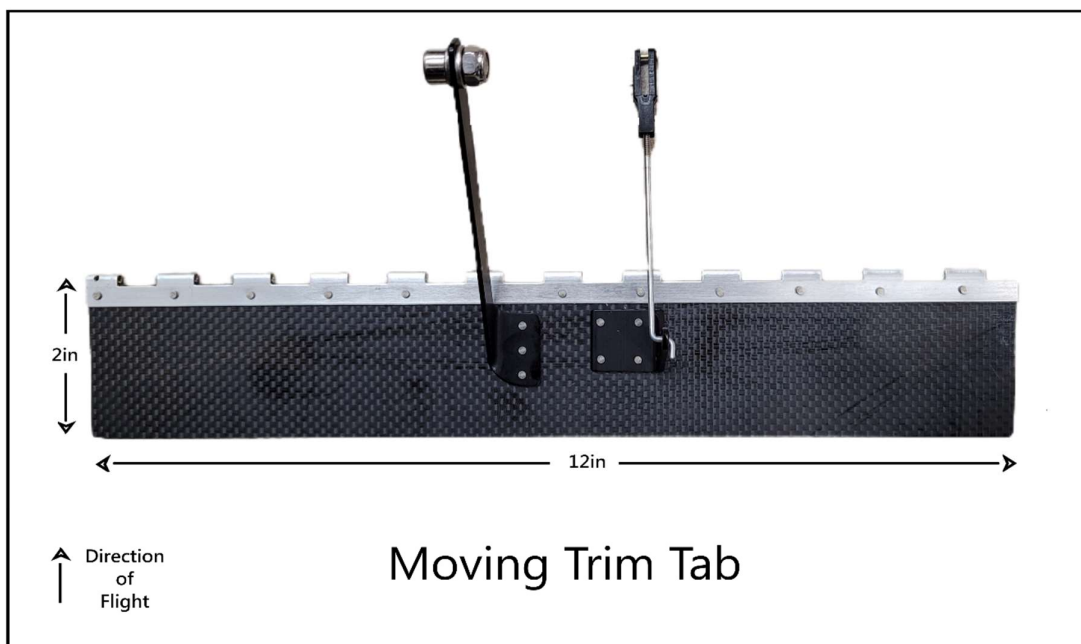
Note:

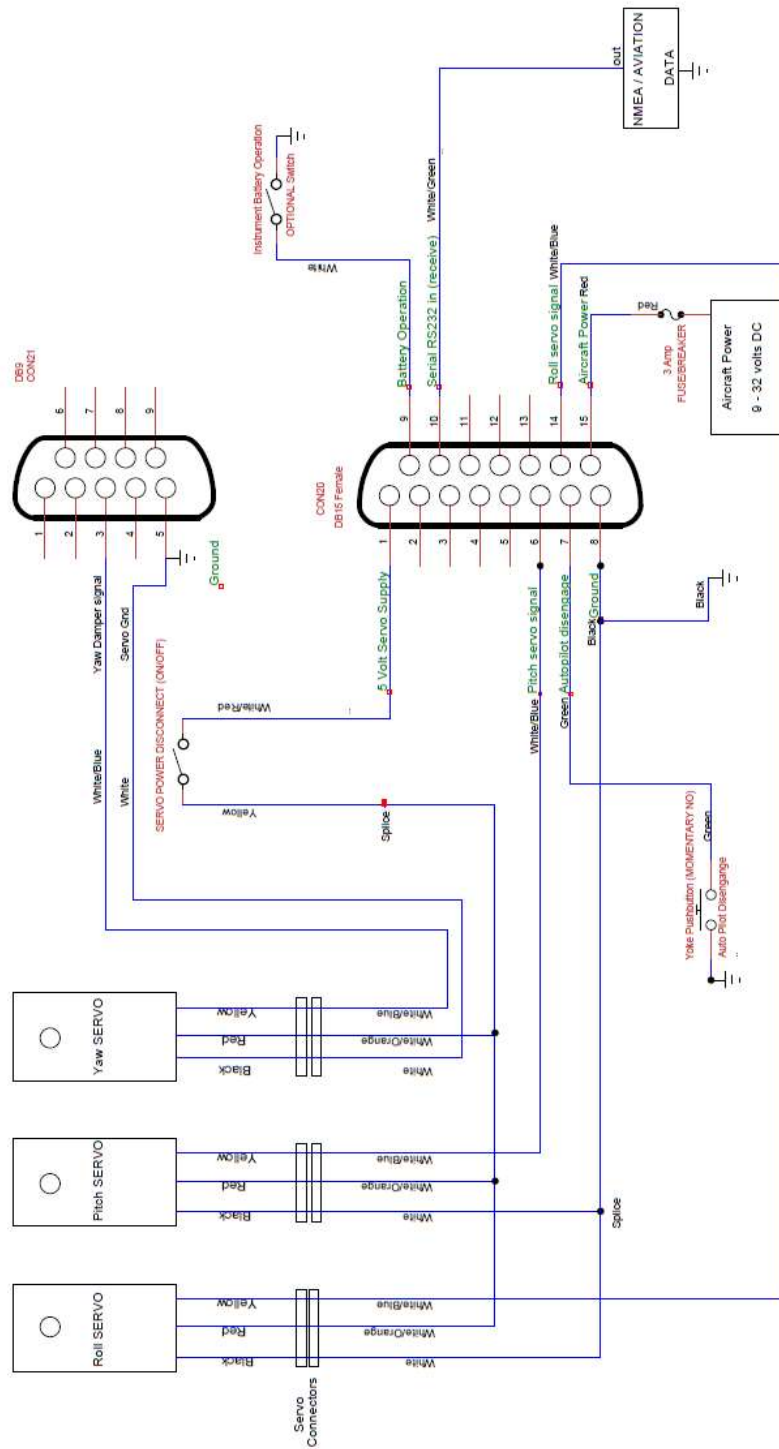
TRIM TABS HAVE A COUNTERWEIGHT TO AVOID FLUTTER. DO NOT REMOVE THIS COUNTERWEIGHT FOR ANY REASON.

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.

General Description

Our standard Carbon Fiber Trim Tab consists of two hinged 1mm thick carbon fiber surfaces. The part that adheres to the aileron/elevator/rudder is called the fixed section. The moving section is the trim tab part that actuates on your flying surface.





Title	39010020A-Autopilot SuperECO Yaw
Author	www.aircraftautomation.com
File	3900188-Autopilot-SuperECO YAW diagram.dsn
Revision	Date
1.0	Sep. 20th, 2019
Sheets	1 of 1

3.2 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 from 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.

3.3 Connection to Servos:

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

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

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



SERVO CONNECTING EXAMPLES

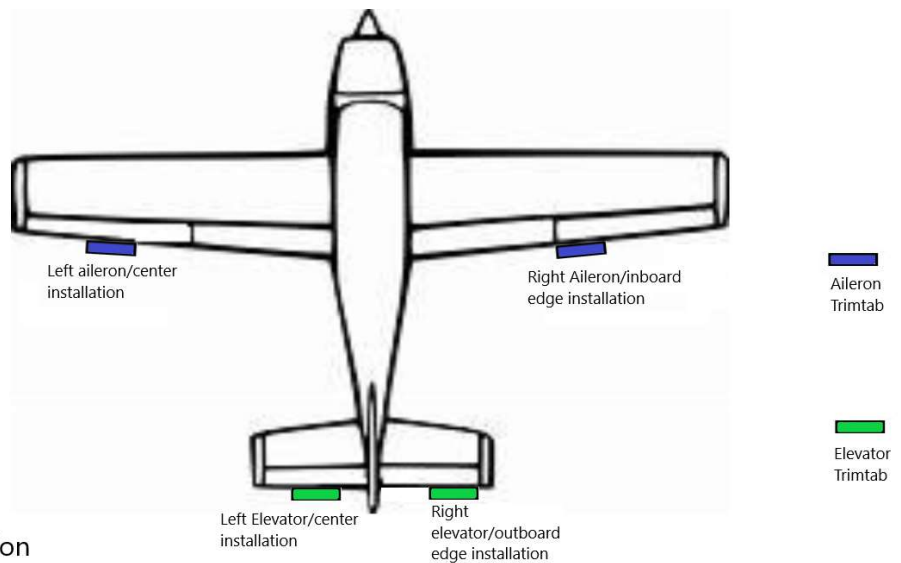
4.0 Installation.

There is no one correct way to install your trim tabs since moving surfaces vary in size, shape material and finish. The aircraft owner can have difference preferences to accommodate for size and esthetics. In this manual we will discuss various installation possibilities so that you can make your own decision.

4.1 Choosing the correct placement.

Trim tabs can be installed on either left or right aileron. On the aileron itself the center is the position where air is less turbulent, so the trim tab has better authority. Installing it in the center creates a challenge when routing the cable extension so if this is too complex for your airplane then you may install the tabs close to the aileron's outer edge or the inner edge. You can then configure the position of the trimtabs directly in the SuperECO (www.aircraftautomation.com) instrument or the iLevel AP (www.level.com) through the iOS app.

When choosing your trimtab position bear in mind that a cable extension will have to run through your airframe. Take this into consideration when deciding on the trim tab position.



Alternative installation locations for Trimtabs



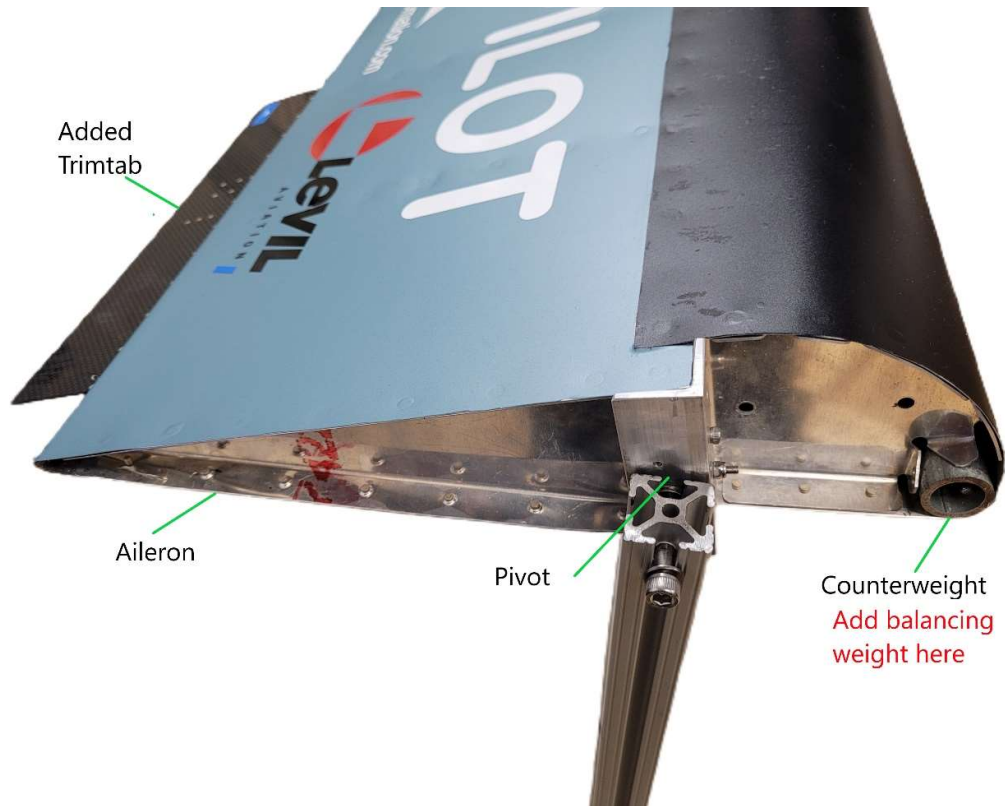
Note: Numerous trim tabs are shown so that you can choose the best alternative. Only install one trim tab for roll and one trim tab for pitch.

Trim tabs are normally installed on the bottom of the aileron/elevator but can also be put on the top. For this it is important to order the correct trim tab that will have the counterweigh and control arm inverted.

FLUTTER WARNING: NEVER INSTALL A STANDARD TRIM TAB WITH ITS COUNTERWEIGH FACING UP.

4.2 Balancing your surfaces:

A very important consideration we should have is weight on the flying surface. Most airplanes will have balanced ailerons and elevators. If your surface is balanced, then it is very important to counterweight the added trim tab. The appropriate amount of weight should be added forward of the hinge once you install your tabs:



If weight is an issue, then it is advisable to make the trim tab as light as possible. There are different things we can do to reconfigure the trim tab to eliminate weight. The servo and servo shell are the heaviest components of your trim tabs. To alleviate this weight, we can install the servo forward of the aileron/elevator hinge (or as far forward as practical). This will reduce the amount of counterweight needed, in fact it will contribute to it since we can fix the servo forward of the hinge.

4.3 Different ways to fix your Trim Tabs.

Once you decide the position of the trim tabs then we must choose a method to fix the tabs to the moving surfaces. There are many ways to do this, but most will depend on the type of material your airplane is built of.

Trim tabs are made of carbon fiber laminate with we very glossy finish. This makes them ideal for double sided sticky tape adhesion. All trim tabs come standard with enough area of 3M VHB double sided foam tape so that you can just adhere them to the elevator or aileron. The servo and servo shell can also be adhered to the fixed trim tab.

4.3.1 Attaching the servo to the fix trim tab:

You can either attach the servo shell to the fixed trim tab by using the provided 3M VHB tape. They can also be put together using rivets or screws but make sure you apply some silicon to make it waterproof.

The VHB tape provided comes oversize with a through hole to run the servo cable. Be careful with the orientation of the hole:

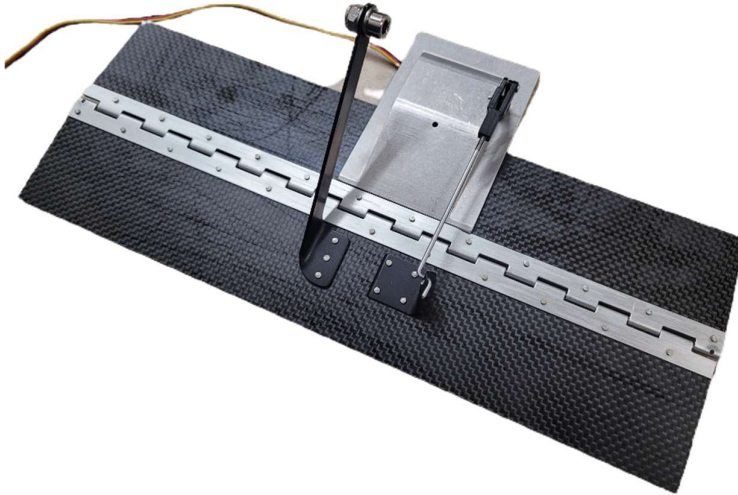


TOP VIEW



BOTTOM VIEW

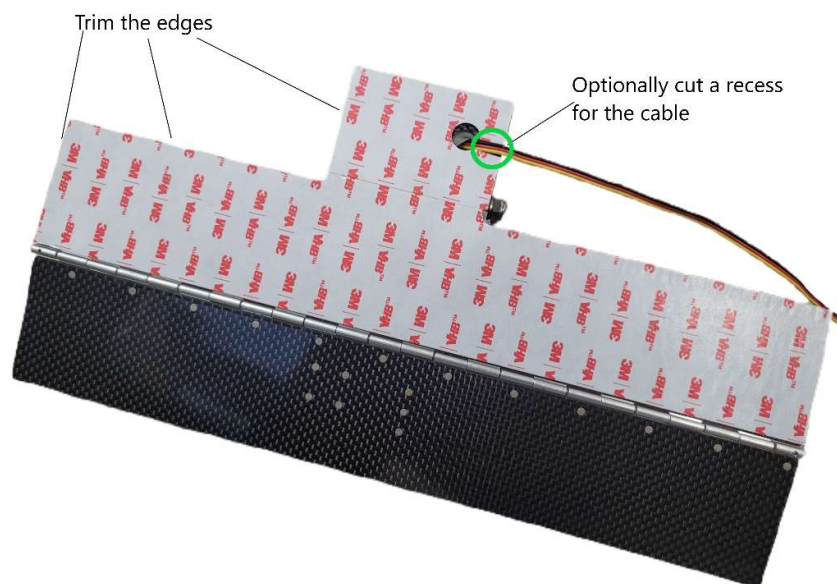
Once you adhere the tape to the servo case use an X-Acto knife to trim the overlapping tape (TOP VIEW) and then stick the servo to the fixed trim tab. Orientation is very important:



4.3.2 Adhering the 3M tape to the fixed trim tab:

Turn over the trim tab kit and adhere the provided tape to the other side of the fixed trim tab, pay attention to the orientation of the cable hole on the tape. Then trim the excess tape on the edges of the fixed trim tab.

There are two ways to run the servo cable. You can either run it on one side in which case you should cut a recess for the cable on the 3M sticker, or you can drill a 5/16" hole to run the cable through your aileron or elevator, this way it will be totally hidden:



4.3.3 Adhering trim tabs to your aileron or elevator.

Now your trim tab is ready for a quick install. Just take of the VHB liner and adhere the trim tab to your aileron or elevator:



TOP VIEW:

VIEW FROM UNDER THE WING:

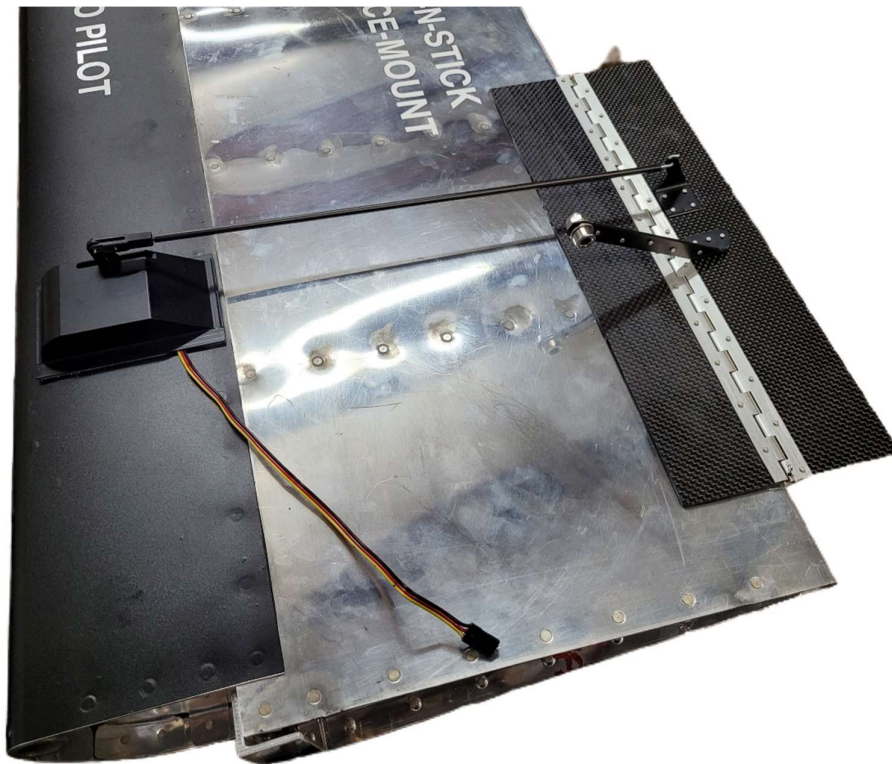


In this particular example the cable has been run through the aileron by previously drilling a 5/16" hole to pass the connector.

Note: Trim Tabs are shipped with very small corner radiuses. Feel free to make this radius bigger to suit your airplane. For this you can use 120 grit sandpaper on a block. Carbon fiber is very easy to sand.

4.3.4 Remote servo installation.

In order to install the servo away from the trim tab we will need a longer push rod and a pushrod carbon fiber reinforcement, we can supply you with both. The installation would look like this:



SERVO REMOTE INSTALLATION - AILERON BOTTOM VIEW

A good amount of weight has been taken from the trailing edge of the aileron/elevator towards the leading edge thus reducing the amount of weight that you need to balance the moving surface.

12" Carbon fiber reinforced 2-56 push rod kit, P/N 3900104A

4.3.5 Riveting the moving trim tab.

To further reduce weight, the moving trim tab can be riveted to the trailing edge of the aileron/elevator. To do this, order a bare hinge with or without predrilled 1/16" pilot holes. The maximum recommended rivet size for this hinge is 3/32". Higher diameter rivets will deform the hinge making it unusable.

Drilled half hinge MS20257P1 without pin, P/N 3900030

Undrilled half hinge MS20257P1 without pin, P/N 3900103

11 3/8" length Pin for PIANO HINGE MS20257P1, P/N 3900049

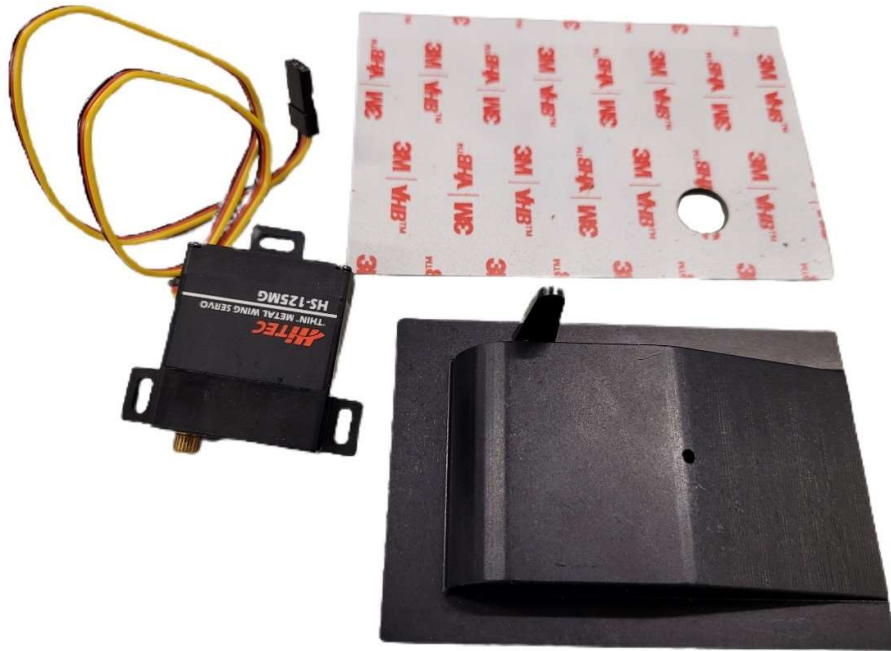


RIVETED INSTALLATION – AILERON BOTTOM VIEW. Trim tab counterweight omitted for clarity.

5.0 Alternate servo installations:

5.1 Standard servo.

Servos may be installed in many ways. In our standard trim tab, the servo is adhered to the fixed trim tab on a surface provided for this purpose. To do this we ship a standard servo, casing, and 3M VHB double double-sided tape. This standard servo can also be adhered, bolted, or riveted remotely on the aileron or elevator.



STANDARD SERVO KIT WITH CASE AND TAPE, P/N 2030007A

This servo was designed to be very slim and light, it is the lightest servo we provide, and it is very suitable for our standard trim tab where the servo is mounted on the trim tab itself. It is slim to reduce drag when it is installed on the surface of the aileron/elevator.

Our standard servo is splash proof but will not withstand heavy rain or a hose pointing directly on it. Normally it is installed under the aileron/elevator away from heavy rain. The drain hole in the case should be facing down. This servo **should not** be installed on top of the aileron/elevator.

Dimensions: 2 3/8" W x 3 1/2" L x 15/32" H (60mm W x 89mm L x 11.9mm H)

Weight: 1.8oz (51 grams.)

5.2 Waterproof servo.

Our waterproof IP-67 servo is slightly thicker than our standard servo. It is also a little heavier. We recommend this servo where weight and drag are not so important. For example, a slow flying airplane that does not have counterweights on its flying surfaces is suitable for this servo.

All airplanes that operate on water and those that the trim tab installation is done on top of the aileron/elevator should use this waterproof servo.

FLUTTER WARNING: NEVER INSTALL A STANDARD TRIM TAB WITH ITS COUNTERWEIGHT FACING UP.



IP-67 WATERPROOF SERVO WITH CASE, SPLASH GUARD AND TAPE, P/N 3900105A

This servo can be adhered to the trim tab itself or installed anywhere on the aileron/elevator. It can also be riveted or bolted down.

Dimensions: 2 3/8" W x 3 1/2" L x 15/32" H (60mm W x 89mm L x 11.9mm H)

Weight: 2.7 oz (77 grams.)

5.3 Special servo installations.

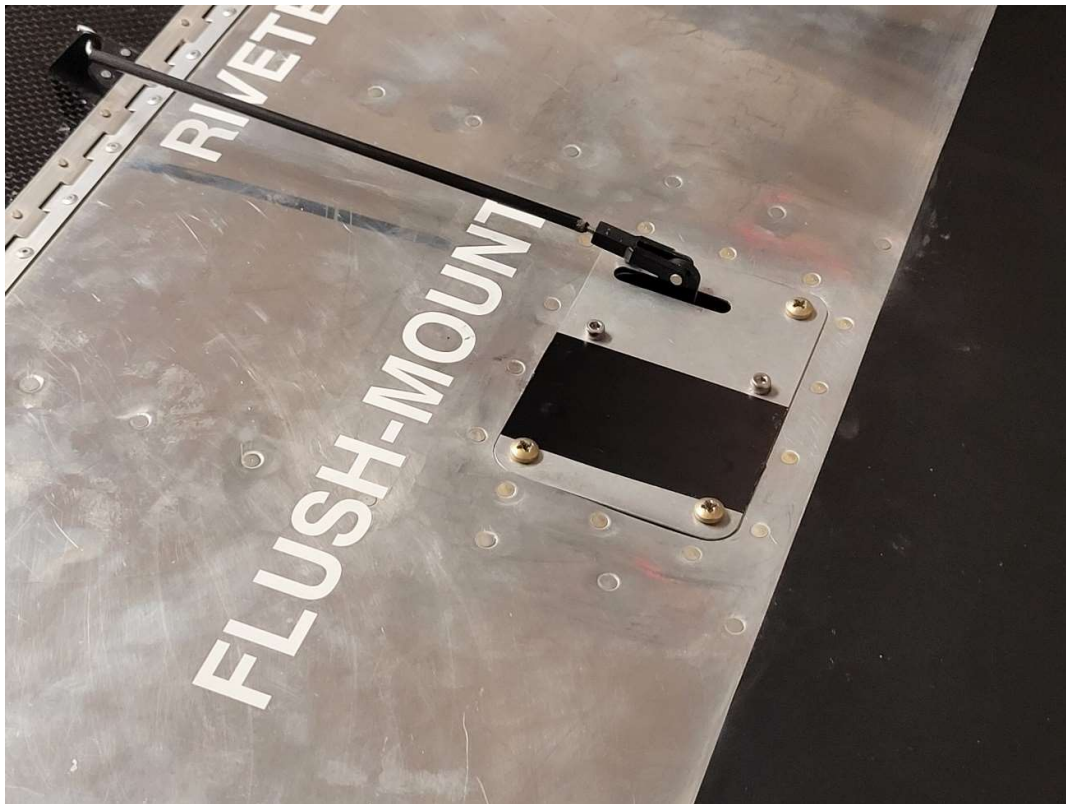
Special servo installations can be done by the user to suit his needs.

The most common self-installation is installing the servo flush with the surface of the aileron/elevator. Depending on each airplane the installation may be different. Any commercial analogue servo can be used. Digital servos are not compatible with neither SuperECO nor iLevel autopilots.

If you provide your own servos note that SuperECO or iLevel may not have enough power to drive different servos from the ones we have previously tested. Servos vary in voltage and wattage so you may have to provide your own power to the servos through the harness yellow wire and leave the white/red wire open.

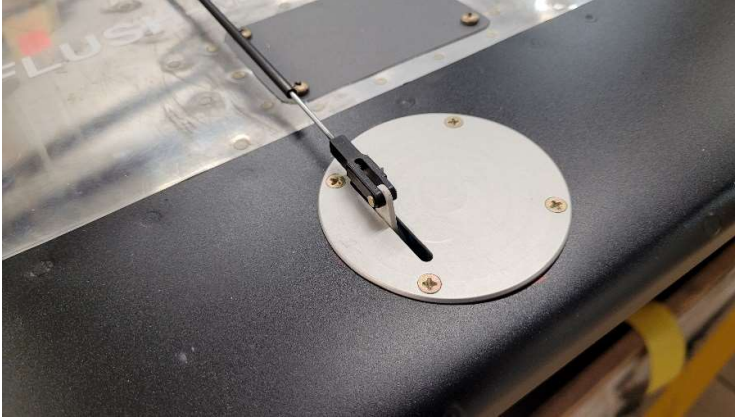
You may also install more than one servo or more than one trim tab for each axis. For this you will also have to provide your own power to the servos through the yellow wire.

This is an example of a flush installation:



5.3.1 Aircraft Automation Flush servo kit.

Our flush mount installation is available with part number 3900154A.



This flush mount kit has been designed for higher speed aircraft where drag may be an issue. Its nice looking and appealing. Makes a nice installation on aluminum and composite aircraft. Easy to install yet durable and reliable. All CNC machined 6061 clear anodized (paintable) aluminum makes it ideal for any aircraft.

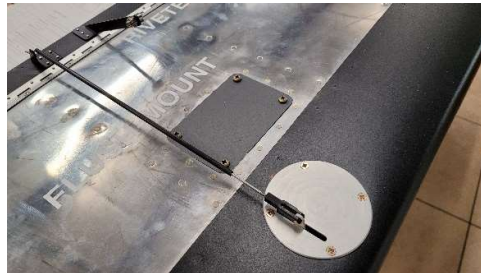
The kit contains:

- CNC machined clear or black anodized aluminum servo base/plate
- CNC machined half nut plates with K1000-06 anchor nuts and 6-32 x 3/8 in screws
- 3900058 Waterproof Hitec HS-5086WP servo with arm

To install just make a 2-1/4 in hole, drill 4 fixing screw holes, and adhere the nut plates (with included VHB tape). Then screw in the flush amount base. Can be done in ½ hour.

Installing your flush mount:

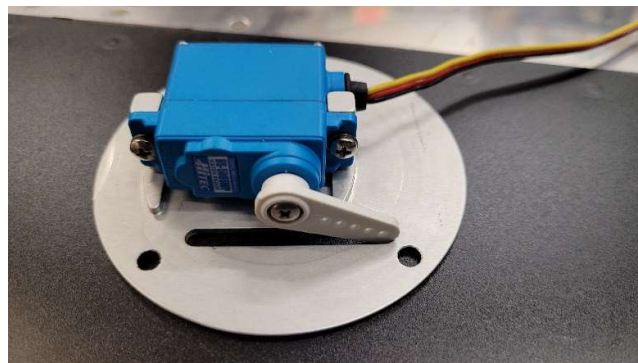
- 1) Mark the correct position of your flush servo in relation to the Trim Tab. The flush servo arm should be aligned to the trim tab control horn. This is very important. You may want to install the flush mount first and then align the trim tab to the servo arm. Choose a position between two aileron/elevator ribs:



- 2) You need to make a 2 ¼ in. internal diameter round opening. Practice first on a scrap sheet of aluminum:



- 3) Mark and drill four 9/64 in fixing screw holes:



4) 5.4 Installation on fabric aircraft.

Fabric aircraft pose a special challenge for the trim tab installations since most fabrics will not allow the double-sided 3M VHB tape. This tape will also be very difficult to remove from some fabrics and may damage them.

BEFORE YOU DRILL ANY HOLES IN YOUR AIRPLANE MAKE SURE YOU HAVE A COMPLETE PLAN FOR SERVO AND TRIM TAB INSTALLATION. FOR EXAMPLE, YOU MAY WANT TO CHOOSE WHERE TO RIVET THE SERVO AND THEN ALIGN THE TRIM TAB TO THAT POSITION OR DO VICE VERSA. ANALISE ALL THE SCENARIOS FIRST, INCLUDING THE RUNNING OF THE SERVO CABLE.

5.4.1 Trim tab installation.

The best solution is to rivet the trim tab hinge to the trailing tube so long as the rivets will not cause a structural fracture. For example, if you have a 1/4" tube it would be almost impossible to rivet. Tubes that are 3/8" in diameter or more may be suitable for riveting.

If riveting the hinge to the tube it is recommended to get the appropriate pre-formed hinge from Aircraft Automation. We have a pre-formed hinge that can be installed on a range of tubes:

Pre-formed half hinge for 3/8" to 5/8" tubes. P/N 3900108

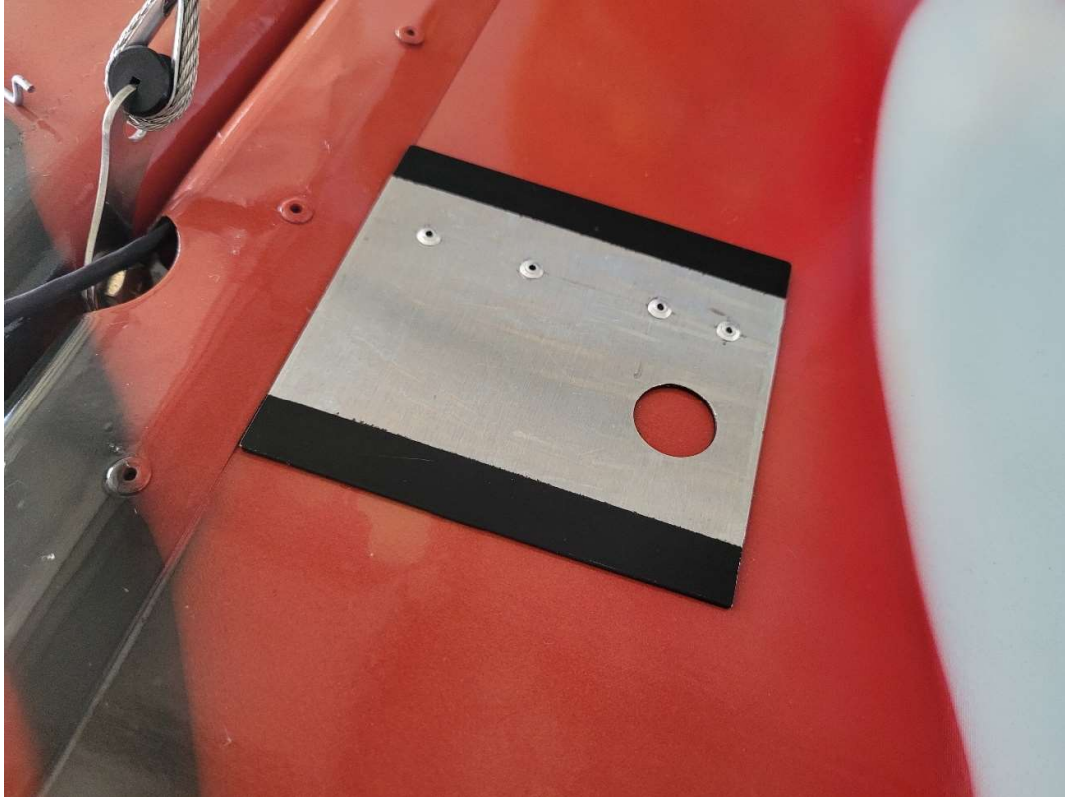
The following is a trimtab installation on a Searey. Notice that this waterproof servo is installed on the upper side of the aileron to avoid splashes from this amphibious airplane:



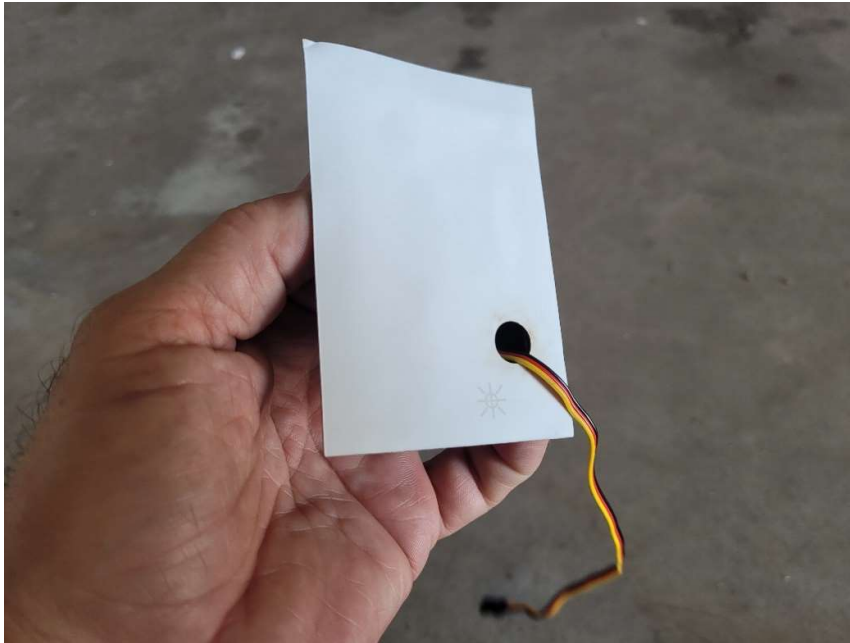
5.4.2 Servo installation.

We recommend using our waterproof servo which you can install on the upper or lower side of your aileron or elevator, P/N 3900105A.

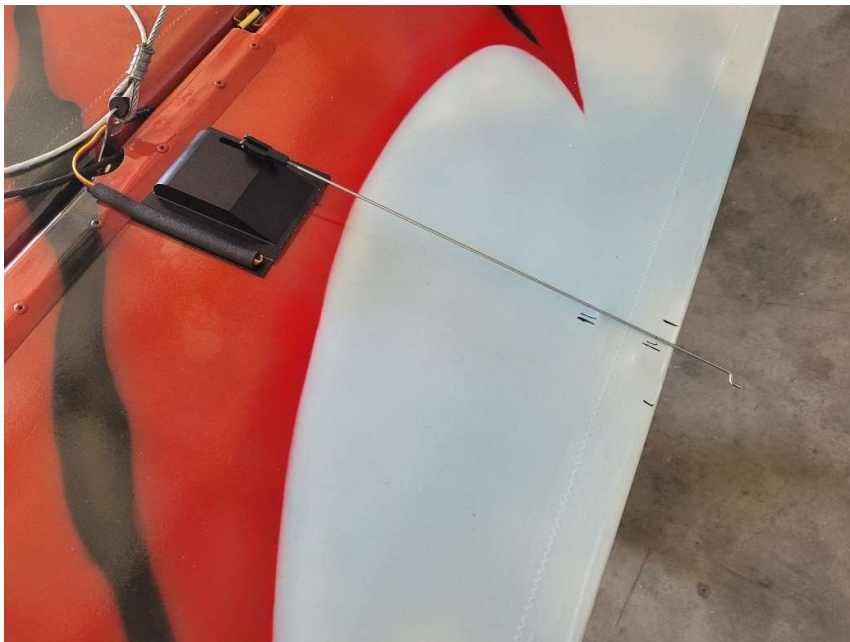
Use a rugged 3/32" thick 6061 aluminum to make an appropriate size plate to fix the servo. You can size this plate to suit your riveting needs then rivet the plate to the aileron ribs or the aileron front tube as applicable. The servo case can be adhered to this plate by 3M VHB tape, rivets or bolted using anchor nuts:



Notice that this example is riveted to a strong aileron rib. The position of the rivets are chosen so that they do not interfere with the servo



You may want to 3M VHB adhere the servo to your plate:

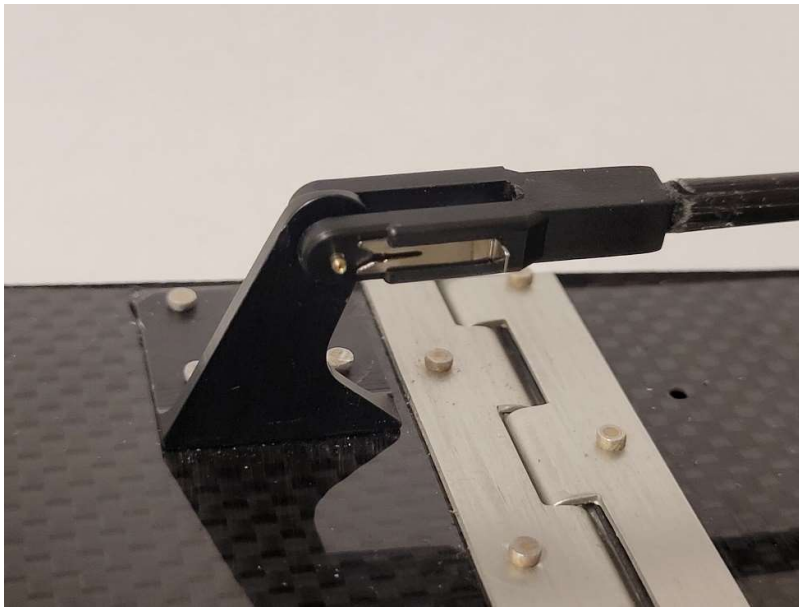


6.0 Rigging your trim tabs:

Now that your installation is complete you need to rig trim tabs for correct operation.

First test the correct movement of your trim tabs using your autopilot unit. Move in both directions until you get to the maximum and minimum travel. Check that all movements are smooth, and backlash is negligible, there should be hardly any backlash for the autopilot to work at its optimum

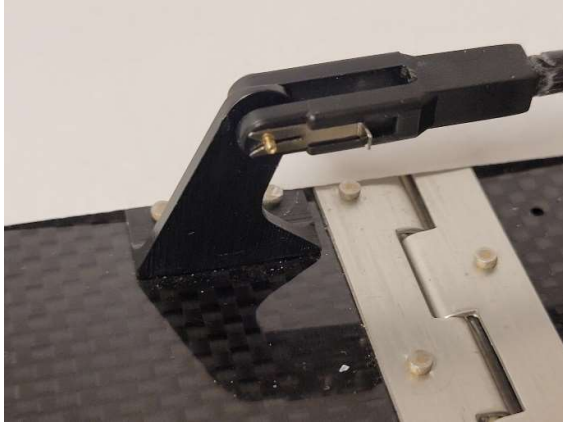
Use the pushrod Kwick Link to adjust the angle of incidence. You can turn it clockwise or counterclockwise to screw or unscrew the link.:



A good start is to eyeball the best neutral position for the trim tab in relation to the aileron. Turn on your autopilot and set all trims to neutral. With the autopilot on, adjust the Kwick Link until you obtain your desired neutral position. When doing this be careful not to lose the safety latch. If you do lose it there should be a couple spare supplied with our trim tab kit.

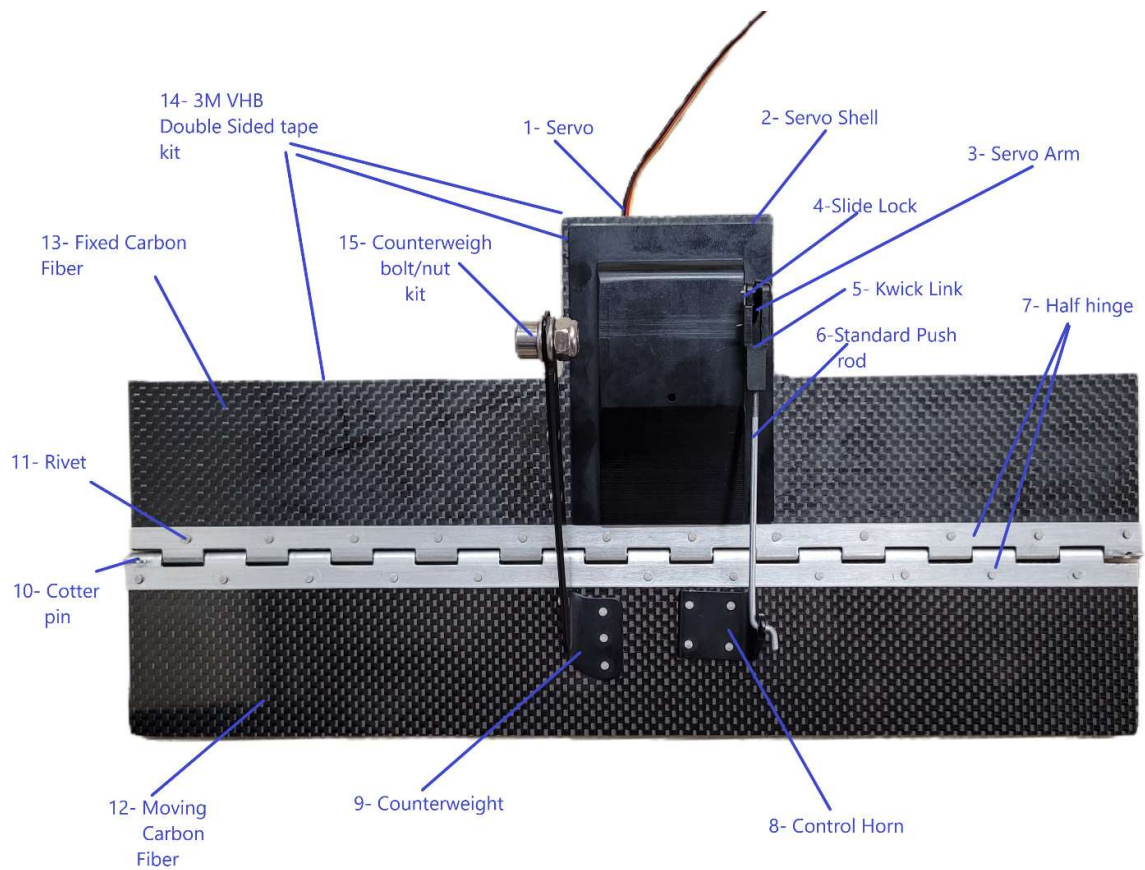
Don't forget to lock the safety latch after you adjust the trim tab.



After you fly, the trim tab can be readjusted to allow the airplane cruise approximately trimmed with the autopilot set at neutral. Make sure your other manual trims are not fighting your autopilot trim tabs. For example, both trims should be biasing your aircraft the same direction, you do not want one trim going one direction and the other to the opposite. This causes unwanted drag.



7.0 Spare parts list

All Trim Tabs, cables and harnesses as well as their parts are available at www.aircraftautomation.com



<p>1- Servo Hitec-125MG</p> <p>SKU: 3900025</p>  <p>A black Hitec HS-125MG servo motor with a white horn. The text on the servo includes "HITEC", "THIN METAL WING SERVO", "HS-125MG", and "HITEC servos.com".</p>	<p>2- Servo Shell for HS-125MG</p> <p>SKU: 3900002</p>  <p>A black plastic servo shell designed for the HS-125MG servo, shown from a top-down perspective.</p>
<p>3- Servo Arm for Hitec-125MG</p> <p>SKU: 3900088</p>  <p>A black plastic servo arm with a circular hole at one end and three smaller holes along its length.</p>	<p>4-Slide Lock</p> <p>SKU: 3900085</p>  <p>A thin, greenish metal slide lock with a gold-colored finish at the ends and a central slot.</p>
<p>5- Kwick Link</p> <p>SKU: 3900055</p>  <p>A black plastic Kwick Link servo linkage with a gold-colored metal insert and a small metal pin.</p>	<p>6- Standard Pushrod</p> <p>SKU: 3900089A</p>  <p>A long, thin metal pushrod with a hook-shaped end and a threaded section at the other end.</p>

<p>7- Half Hinge (qty 2) SKU: 3900030</p> 	<p>8- Control Horn SKU: 3900028</p> 
<p>9- Counterweight arm SKU: 3900047</p> 	<p>10- Cotter Pin (qty 2) SKU: 3900059</p> 
<p>11-Rivet (qty 19) SKU: 3900029</p> 	<p>12- Moving Carbon Fiber SKU: 3900050</p> 

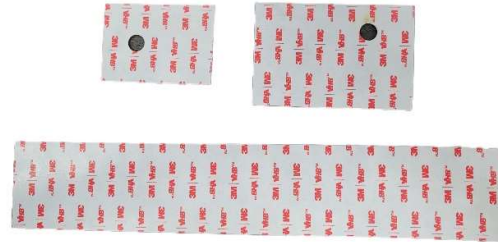
13- Fixed Carbon Fiber

SKU: 3900052



14- 3M VHB Double Sided Tape Kit

SKU: 3900086A



15- Counter weight Bolt/Nut kit

SKU: 3900087A

