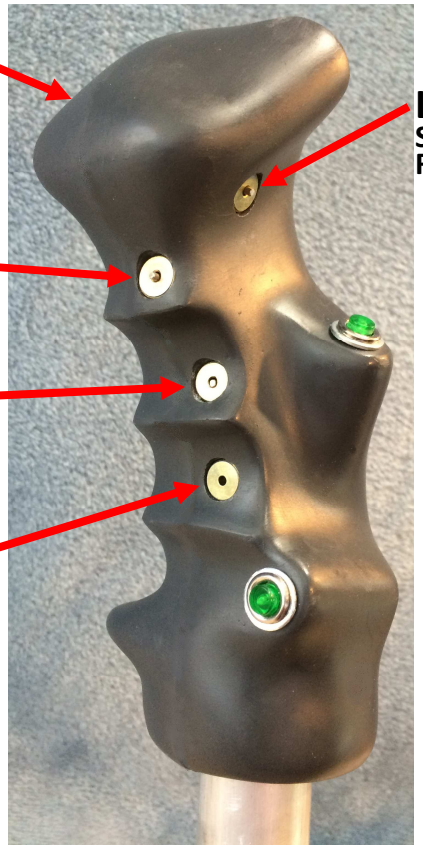
# INSTALLATION AND OPERATION MANUAL






## CONGRATULATIONS!

As an owner of the patented *FeelFlight Grip* you will learn how safe and easy it is to fly with our flight control grip. It is the only product of its kind for signaling the pilot, through haptic feedback, the angle of attack and inclination of your aircraft. In addition, there are also LED lamps in the control module mounted on the panel that duplicate AOA and INCLINATION information. This is called multiple modality. Each human sense is a modality, and signaling two or more simultaneously with the same signal greatly amplifies the sensory response. The *FeelFlight Grip* actually broadcasts three modalities. The third is an audio beep in the pilot's headphones that is the same pulse signal as the haptic and visual signals, and happens simultaneously. This is literally the maximum sensual feedback that can be provided. Of these three senses available to the pilot, numerous scientific studies have shown that haptic feedback is the most effective. It even reduces vertigo!

What you now have with your purchase of the *FeelFlight Grip* is the ultimate in pilot awareness of flying attitude. Most instructors stress the importance of feeling the attitude of your aircraft. They want to have the new student learn to "feel" a near stall or uncoordinated turn condition. This "seat of the pants" feel is possible but it is also limited. The buttocks area of a human actually has the lowest concentration of nerve endings. The fingers are more than ten times as sensitive as the buttocks. The human hand is considered the most sensitive in the animal kingdom. The human hand is amazing! Our research on haptic feedback unequivocally directed us to develop an aircraft attitude feedback system that utilizes the human hand and fingers. In addition, when human fingers are given a haptic feedback task, they adapt and improve at detecting the input. Just consider how humans learn to navigate a computer keyboard, piano, tools, braille print … or countless other devices. Part of the efficiency in haptic feedback is based on the fact that the sense of touch is directly connected to the brain. By contrast, hearing and sight are processed before reaching the brain.

It is important for you to know that the *FeelFlight Grip* is extremely easy to learn. In normal flight conditions you will not even be aware that there are haptic pulse pins in the control grip. However, if you are in an uncoordinated turn, the side pins immediately tell you which rudder to step on. This is identical to the "ball" signal. Flight testing has proven an immediate improvement in rudder skills. If you pull back on the elevator control you will pass through three angle of attack signals. The first is best rate of climb. More back pressure will slow your aircraft to best angle of climb. And if the pilot gets too slow, the top pin, which signals the most sensitive place on your body, the index finger, will begin pulsing to signal near stall attitude. Operation is highly intuitive. Pilots typically have it mastered on their first take off and climb out. Blue skies ahead!

# INSTALLATION

Installation is simple and easy. If you are the owner of an E-AB aircraft and have your repairman's certificate, you can do it yourself. If you are installing it in a certified aircraft, all that is required is to have an A & P sign off the installation. However, for GA it is also required by the FAA that you place the following placard on the control module:

**"NOT TO BE USED AS A PRIMARY INSTRUMENT OF FLIGHT"**

Note: *FeelFlight, Inc. i*s actively pursuing certification of the *FeelFlight Grip* system. Until certification is attained, that placard is required in GA aircraft.

There are three components involved in the installation of the *FeelFlight* system. These are:

1. The angle of attack sensor, AOA, which mounts under a wing.
2. The control module which mounts in a 3 1/8" panel hole.
3. The *FeelFlight* control grip.

## INSTALLING THE AOA SENSOR

The angle of attack sensor is a very light and small device. It utilizes a magnetic encoder which is accurate and most of all, very reliable. The electronics are completely "potted" at the bottom of the support tube. This insures that no water or other contaminants find their way in. The vane itself is very small and light … only 4" long by 2" wide. This is much smaller than other vane type AOA sensor vanes. The vane type was chosen over the differential pressure type of AOA sensors for the following reasons:

1. It is very reliable
2. Measures AOA directly (does not measure and interpret pitot pressure like many AOA systems.)
3. Very easy to calibrate
4. Can be pre-flight tested by one person.

The encoder/vane assembly is mounted at the bottom of a 7/16" aluminum tube that is 5" long. It easily fastens to an included 5" diameter inspection plate on the bottom of the wing.

*FeelFlight* uses a vane/encoder AOA sensor. This has the advantage of accuracy—1/20 of a degree. This precision is required for the discrete Vy and Vx feedback.



The sequence for installing the AOA sensor is as follows:

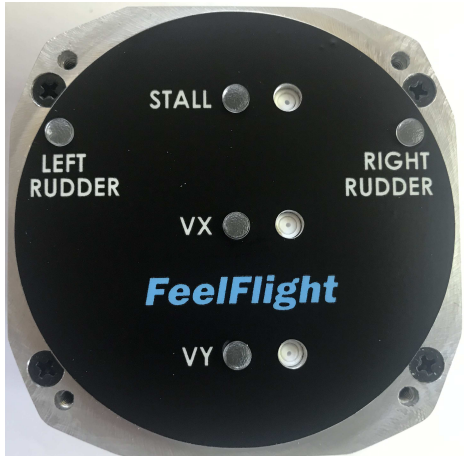
1. Locate the inspection cover on the bottom of the wing. Usually this is the one close to the pitot tube. Other inspection holes can be used, however, it is very important that the one selected is outside the slipstream of the propeller.
2. Remove the inspection plate.
3. Install the AOA cable (included) down the wing and exit the root of the wing. If it is a high wing aircraft you can generally run the cable behind the cover on the door/wing pillar. For low wing aircraft generally the cable can be run through the floor space. The cable should be routed to the back of the instrument panel to the 3 1/8" hole that will house the control module.
4. Insure that the cable is secured and supported at intervals that will not allow it to rub against the structure. This is easily done with self fusing silicon tape. Great stuff!
5. **IMPORTANT NOTE ON INSTALLING AOA CABLE—**Sensor cables can be susceptible to RFI and EMI. One problem we have seen was when the AOA cable was zip tied to the radio antenna output cable. Although the AOA cable is shielded, no shielding is 100% protective from RFI. Avionics professionals advise that sensor cables should be at least 5" from antenna output cables and power cables. We have successfully installed with closer distances than 5". However, please be aware of potential interference from radio or power noise. If you have an RFI problem your *FeelFlight* may display erroneous output when you talk to the tower. Ground testing while broadcasting on your radio is a good idea before flying.
6. Next, attach the AOA support tube to the included inspection plate. There is a large aluminum washer, a star lock washer and a 7/16" nut (included) to secure it through the center hole in the inspection plate. The aluminum washer helps to distribute a strong load that may impact the AOA sensor. This can happen from hangar rash, or someone's head may accidently impact it. The AOA sensor is quite robust and can endure a lot. The washers will help insure that the inspection plate will also survive an impact.
7. Back at the inspection hole, insert the cable into the jack at the top of the tube. Insure that it is pressed in all the way. For added protection, a piece of silicon tape can be wrapped around the cable/jack connection.
8. The AOA sensor should be aligned so that the vane is perpendicular to the airfoil. The streamlined trailing edge should face the rear of the airplane.

This completes the AOA sensor installation. The only thing left is to plug the signal cable into the back of the control module.

Note: The system is calibrated at the factory for the following values:
Vy—8 degrees, Vx - 13 degrees, Stall —16.5 degrees.
This will allow your system to be reasonably close on initial flight. It is recommended that you do not change these values before first flight. They will be set to your precise values during flight testing. See page 13.

# CONTROL MODULE INSTALLATION

The control module is the brains of the system. It reads the AOA sensor data and also the internal accelerometer chip and converts it to the signals required to pulse the thrust pins in the grip, blink the corresponding LED lamps on the face of the instrument and beep a corresponding pulsing tone in your headphones.




**FRONT**

Notice in the back view that the system supports two grips. This allows the use of a secondary *FeelFlight* grip in the co-pilot seat.

Notice the power cable that exists the rear of the control module. The red wire connects to the 12 volt power supply. This wire also includes an in-line 3 amp fuse. The power wire can also be attached to an unused fuse in the panel. The black wire should be attached to ground. Some pilots choose to install an off/on switch. An additional SPST rocker switch can be installed in the panel. The black wire attaches to one pole of the switch. And the other pole should be connected to ground. Note: the *FeelFlight* only draws about 1/2 amp with two grips. It may be possible that you have a fused circuit that can handle what is already on that circuit and the *FeelFlight.*


**BACK**

After the cables are attached, the control module is then attached to the hole in the instrument panel. It fits into a standard 3 1/8" hole and is secured by (4) #6 screws (included.)

The control module can power two grips. If you use the jack labeled "GRIP 1", it may be necessary to trim some of the heavy plastic off of the grip cable end so as not to interfere with the audio cable.



## REAR PANEL CONNECTIONS

There are three brass mini BNC connectors. These are for connecting three of the switches on the grip. There are three male connectors in your kit. The wire from this male connector will attach to your switch signal wire. For example if you choose the large central switch at the top as your PTT (push to talk) switch, then brass socket labeled S1 (switch 1) will be the signal jack for PTT. When switch one is pressed your PTT wire is routed to ground. S2 is the small switch at the top of the grip to the left of S1. S3 is the switch on the left side of the grip for the thumb. Note: S4 is the switch at the bottom of the grip. There is a single wire exiting the bottom of the grip for this switch.


## FOUR WAY HAT SWITCH

If you choose the four way trim hat switch, this is the wiring procedure. The grip must be opened entirely. There are two #8 screws holding the grip halves together. Remove these two screws. Care must be taken as the top solenoid thrust pins can fall out. Keep track of these pins and their springs. Next, remove the large central switch. This switch is replaced with the four way hat switch. This switch has five wire connectors. The bottom, fifth connector solders to the common ground wire inside the grip. Next, solder 4 color coded wires to the remaining connectors on the hat switch. These 4 wires must be routed down the control stick and connect to your trim system. Often the trim system has relays ready to receive your switch signal wires.

## REASSEMBLING THE GRIP

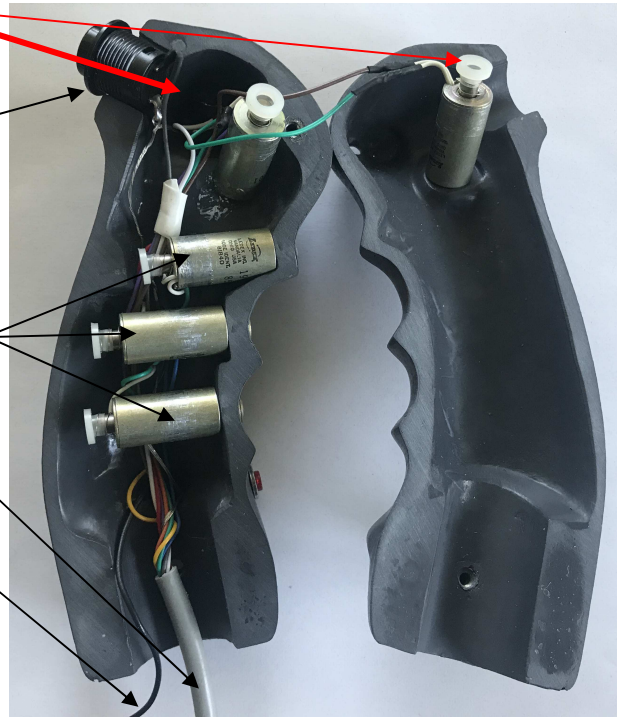
The primary consideration when reassembling the grip is to insure that none of the wires interfere with solenoid operation. This primarily affects the top two solenoids. Just insure that the wires are tucked below the three AOA solenoids. However, it is important that the number two switch wire and the four wires from the hat switch are routed down the grip to avoid interference with the top two solenoid thrust pins.

Note: If you ordered the grip with the hat switch then this wiring is completed by *FeelFlight*, Inc.

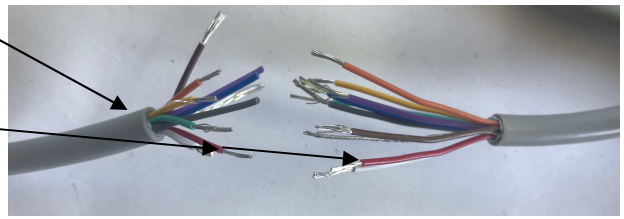
## WIRING DIAGRAMS

The *FeelFlight* comes with a long nine conductor cable exiting the bottom of the grip. This cable is intended to be routed down the control stick. If you drill a hole mid-span in the control stick for the exit of the control cable, this could weaken the stick. Please check with the manufacturer of your airplane before choosing this option. If this cable is routed through a hole you drill near the top of the stick, this should be a low stress option. However, the wire is not as well hidden. See diagram on page 9.

The other included nine conductor cable has the D-SUB connector for the back of the control module. It is intended to be soldered to the cable exiting the bottom of the stick. Simply match the colors, solder and protect with heat shrink. Note: The black wire of the grip cable connects to the white wire of the control module cable.




Note: If the top switch is replaced with the 4 way hat switch, then the gray wire attached to the top switch can now be attached to the bottom switch and the S1 BNC can now be used as the connector for the bottom switch function.



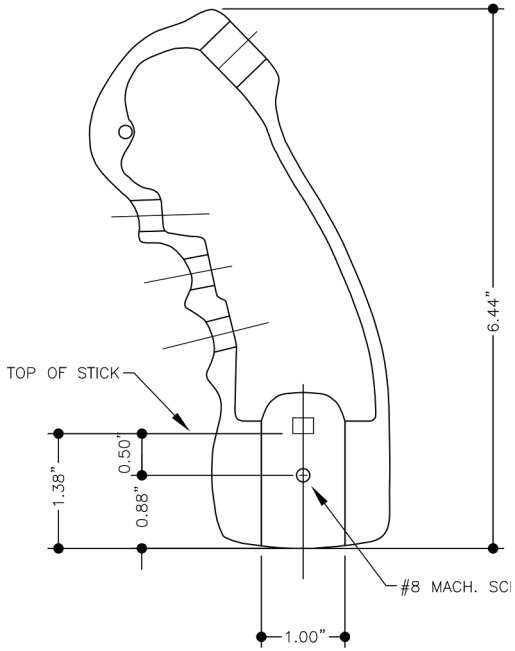



# GRIP INSTALLATION

The *FeelFlight Grip* is straight forward in the installation. It is designed for a one inch diameter control stick. However, sleeves are available if your stick diameter is 7/8", 3/4", 5/8" or 1/2" diameter. If you are installing in a certified aircraft then you will need the "Ram" mounting fixture. This bolts onto the yoke and is fully adjustable. Typically, it is mounted just to the outside of the existing yoke handle and is adjusted to the pilot's comfort preference. Note: *FeelFlight, Inc.* is actively pursuing the certification of a yoke that will replace the existing yoke. This yoke will have the option of installing with a left hand or right hand *FeelFlight* grip. A non-tactile grip is installed on the opposing handle. See page 16.

## STEPS FOR INSTALLING THE GRIP ON A STICK

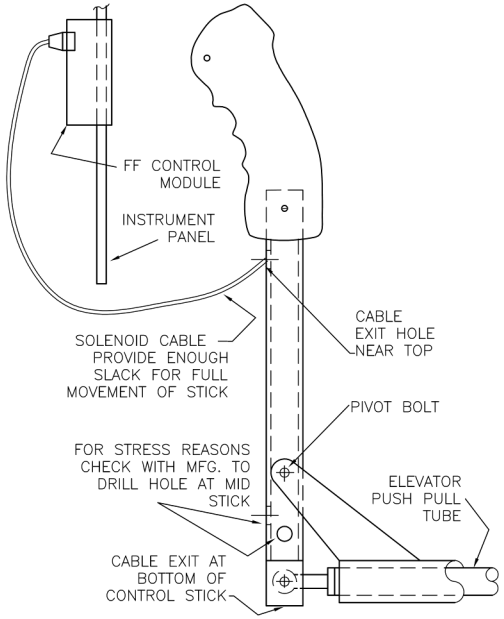
1. The first step is to drill a hole in your stick that matches the *FeelFlight* mounting hole. The hole is drilled 1/2" down from the top of the stick. Before cutting and drilling the stick, hold the grip against the stick and determine the height of the control stick. You may want to trim the stick. Note: the top of the stick is 1.38" above the bottom of the grip. If it is not easy to take the stick out and mount in a drill press, you can easily make a drill guide. Cut a short piece of 1" standard schedule 40 pipe. Drill your hole in the drill guide in a drill press. Slide your drill guide over the top of the stick and clamp tight. Drill a hole from one side and then from the other. This will insure they will align.
2. The grip has a nine conductor cable installed and it extends 40 inches out the bottom of the grip. This cable connects to a cable with a D-SUB connector. See page 7.



Ideally you want to run the grip cable down the control stick and exit out the bottom. For many sticks this is workable. However, for smaller diameter sticks, you may find it difficult to pass the cable past the pivot bolt at the bottom. One option is to drill a hole near the top of the stick.

1. Drill a hole near the top of the stick just under the grip. Be sure to use a rubber grommet. The wires then pass from the stick to the back of the panel for mounting. The D-SUB cable (included) solders to the cable wires coming out of the grip. When trimming this cable insure that there is enough slack so you have full movement of the stick. The D-SUB connector plugs into the back of the *FeelFlight* control module. If you chose to install the 4 way hat switch, you will have to run four additional wires down the stick. Connecting to the standard grip switches is easy. The top three switches are connected through the main cable to the control module. There are 3 brass BNC jacks on the back of the control module. Three switches can easily be connected to these three jacks. There are three BNC plugs included. Simply solder the plug wire to your PTT switch wire and connect to the BNC jack. Repeat for two more switch functions. Note: the hole near the top of the stick typically does not affect the structural limit of the stick. The peak stress is at the pivot bolt.
2. The 2nd option is to run the wires down the stick and exit the bottom. This is good because it does not affect the strength of the control stick.
3. You can also drill a hole below the pivot bolt. However, stress considerations should be addressed. Check with your kit manufacturer if it is safe to add a hole in this area. If your elevator is connected by aircraft cables then also ensure not to weaken the stick. It may be permissible to add a hole near the cable connect.

THREE PLUGS WITH WIRE LEADS ARE INCLUDED. THESE ATTACH TO THE S1,S2 AND S3 JACKS. THIS CONNECTS YOUR DEVICES TO THE FeelFlight GRIP SWITCHES.




## INSTALLING THE GRIP ON A YOKE

It is legal to install the *FeelFlight* system in a certified aircraft. Several years ago the FAA streamlined the process for installing an angle of attack (AOA) system in certified GA aircraft. The *FeelFlight* is an AOA system. The primary difference is that it adds haptic feedback in addition to audio and visual AOA feedback to the pilot. Currently, the *FeelFlight* grip must be fastened to the existing yoke. However, *FeelFlight, Inc.* is pursuing a certified yoke with built in *FF* grips. (see page 16) To install in a certified aircraft, all that is required is for an A & P to sign off on the installation. Since the *FeelFlight* system does not affect the structure, aerodynamics or the flight controls, this is generally a non issue.

The yoke option consists of 3 parts:

1. U Bolt-clamp that bolts solidly to the yoke. This clamp has a 1" diameter ball coming out of the bottom.
1. An insert for the grip that consists of a 1" diameter tube with a 1" diameter ball coming out of the bottom.
2. And the connection fitting that connects the two ball joints.

That is all there is to it. The connection fitting has a large thumbscrew. This makes it very easy to adjust the grip to the exact position and feel for the pilot. It also makes it a simple process to remove the grip. The grip and connection fitting can be stowed in the glove compartment or by unplugging from the back of the control module—removed completely. Note: with the removal of the grip you still have the visual LED lights on the panel and audio in your headset for AOA information.

## AUDIO HOOKUP

The *FeelFlight* system also includes audio output. There is an audio output jack on the back of the control module (see page 6.)

Many intercom systems include an auxillary "IN" jack. The *FeelFlight* system includes a 36" audio patch cable. This cable connects from the "AUDIO" jack on the back of the *FeelFlight* control module to the AUX –IN jack on the intercom. The supplied audio cable also includes a volume control.

If your intercom does not have an AUX-IN jack, there is another option. The cable can be connected directly to the rear wire prongs of the headphone jack.
Note: the volume control can be helpful in silencing the FeelFlight audio signal when talking to ground control.
The *FeelFlight* pulsing tone starts at Vx and escalates in pitch when approaching stall.


PLUG CABLE INTO INTERCOM INPUT

AUDIO PATCH CABLE WITH VOLUME CONTROL

## INCLUDED IN THE BASIC *FeelFlight* KIT

1. One—right hand *FeelFlight* grip (left hand grip option available)
2. One—AOA sensor w/nuts and fairings
3. One—5" diameter aluminum inspection hole cover
4. One—Panel mount electronic control module
5. One—Grip protective cover
6. One—12' cable for AOA sensor (various lengths available)
7. One—3' cable for audio hook up
8. One—40 inch D-SUB cable (grip to box) various lengths available
9. 4—#6 black machine screws—for mounting box to panel
10. 3 amp inline fuse

## AVAILABLE OPTIONS

Left hand haptic grip
Non tactile matching grip for right seat
Yoke attachment hardware
4 position trim switch (note: stock grip has SPST push switch)
Sleeves for smaller stick diameter: 7/8, 3/4, 5/8 are available.



# FLYING OPERATIONS

Flying with *FeelFlight* haptic feedback is very easy and super intuitive. It gives the pilot a level of sensory feedback of the air over his wings that approaches a bird's. There are five haptic signals. Three of these signal angle of attack—AOA. This feedback is very intuitive because is goes from green, yellow and red in a bottom to top sequence, just like every AOA system on market. The ring finger is green, the middle finger is yellow and the index finger is red—or stall! Coincidently, the index finger is the most sensitive touch location of the human body. There are more nerve endings in your index finger than anywhere else.

The other two haptic signals are for yaw, or more accurately, inclination. This function duplicates the "ball" instrument. The thrust pin on the left pulses against the thumb, and the thrust pin on the right side of the grip signals the lower index finger. If you are in an uncoordinated turn and need to apply left rudder then the left thrust pin pulses … and of course, right pin for right rudder. Again, super intuitive. All pilots who have flown with *FeelFlight* have reported an improvement in rudder skills on the first flight. Another bonus is that it sticks with you. Because you are now always flying coordinated turns, you begin to learn what a coordinated turn feels like. There is a natural "G" force with a coordinated turn. You soon unconsciously learn what the force should be for a coordinated turn.

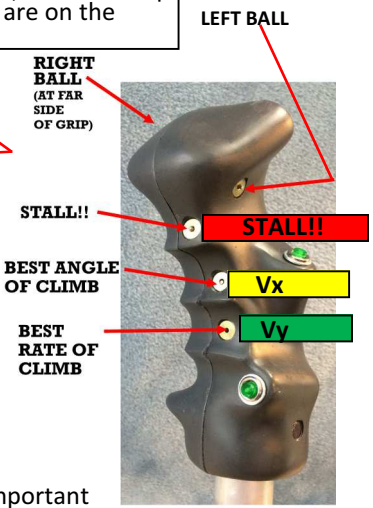
Another excellent feature that the *FeelFlight* incorporates is that the signals are discrete. That is to say when you are at Vy - best angle of climb, that is when the LED lamp on the control module flashes. Other AOA systems use a green, yellow, red chevron or a needle on a dial that points to the colored bands.

Thumb not on thrust pin.

When at cruise, you can relax your hand on the support. Three fingers will still be on the AOA pins.

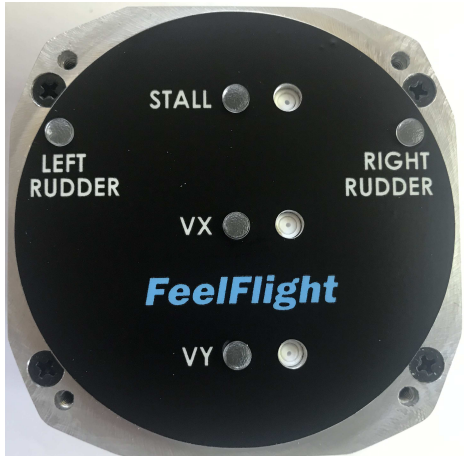
When entering the pattern, slide hand up so thumb and right finger are on the INCLINATION thrust pins.

When at slow flight, it is important to slide your hand up so the thumb and right finger are against the top knob. This will insure you are receiving the INCLINATION signal.




Important! A death grip is not required. A medium to light touch is all you need.

## CALIBRATION OF THE FEEL FLIGHT




A significant feature of the *FeelFlight* system is the ease of calibration. It is as intuitive as knowing which thrust pins signal which fingers. To our knowledge there is not another AOA system on the market that has a calibration system as easy as the *FeelFlight.*

Looking at the face of the panel mounted control module you will see the Vy, Vx and STALL labels. To the right of these labels are the LED lamps. Again, these lamps are color coded green, yellow and red. The haptic signal is three pulses and a pause. This is a very common signaling pattern used in many industries, such as emergency vehicles, medical equipment, fire warning alarms, etc. This pulsing LED lamp signal is synchronized with the grip thrust pins and a synchronized audio signal in your headphones.

To the right of the Vy, Vx and STALL LED lamps are three white buttons. These are used to calibrate the angle of attack signal. These switches are recessed below the faceplate. This is to prevent the accidental pressing of a button. When you calibrate an AOA value, you can use any small pointer such as a toothpick or pencil. Our favorite is a retracted ball point pen. Here is the calibration procedure:

1. Pick a calm day preferably near a standard day (59 degrees and sea level.) It is best to be near gross weight. Typically, the POF lists best rate of climb and best angle of climb at these conditions. It is very surprising how much the airspeed values vary with density altitude, weight, wing bank and balance. By contrast, AOA is always constant!
2. As you climb at full power, trim the airplane for the POF published Vy airspeed. Once you are comfortable press the Vy recessed button. That is all there is to it! You do not need to hold the button down. One short press less than a second will work fine. You will see the corresponding LED lamp light up and hold for two seconds. This confirms that your calibration was recorded.
3. Repeat for Vx and STALL.



### STALL SETTING

The stall setting preference varies with the pilot's comfort level. Typically, you want to set it so it warns you a degree or two before you actually stall the airplane. It is important to remember that AOA is a constant and does not vary with weight and balance, density altitude and wing bank. By contrast, indicated airspeed does vary with these four factors.

### STALLING IN A BANK TURN

Interestingly, many pilots, including high time pilots, forget that stall speed varies with the bank angle of the airplane. This also applies to Vy and Vx. For example, say you have calibrated your Cessna 172 for best rate of climb (Vy) at 72 mph. You have climbed to a cruising altitude and throttled back for slow flight at this AOA. Straight and level you read 72 mph on your airspeed indicator. At the same time the ring finger pin is pulsing and the green light is flashing. Note: there is no audio warning at Vy as this is not a velocity that is dangerous and the signal is not a warning signal. Now that you are trimmed out and your airspeed and AOA are synchronized, turn into a 45 degree bank. You will now read on your airspeed indicator around 79 mph. This is not an error! Stall speed goes up with wing bank. Forgetting this fact has killed many pilots turning base to final! With the *FeelFlight* it does not matter if you forgot this very important aspect of flying. It will always tell you your correct AOA. And with three modalities—sight, sound and touch, there is a significantly lower chance that you will overlook your AOA.

### NORMAL FLIGHT

In normal flight modes you will not receive much feedback. If your turns are always coordinated, the left and right pins will not be pulsing. Most pilots like to climb to 500 feet at Vy and then trim for a faster climb airspeed. Your AOA will be below Vy, your airspeed faster than 72mph, and again, no signal is being generated. Ideally, you will only see, hear and feel the stall warning when your wheels are touching down on landing.

### OTHER VALUES FOR Vy and Vx

You do not have to set the Vy and Vx pins at those corresponding values. For example, we have had some pilots set the Vx pin at 1.3 times Vs. This is the recommended speed for landing approach. The Vy pin is generally set at the Vy value because it is critical for climb out and engine out situations. This is the aircraft's best L/D angle of attack. Being able to accurately glide at this AOA in an engine out situation may give you the glide distance necessary to make it to a field. Also, Vx is best angle of climb and may save your life clearing a tree. It is also where the aircraft enters the backside of the power curve.

### STALL WITH OR WITHOUT FLAPS

To have the stall warning vary with flap setting requires a significantly higher level of technology. We recommend you set your stall warning with the flaps retracted. This actually gives you a larger stall warning safety margin if you approach stall with flaps.

### CALIBRATION OF THE BALL

The left and right thrust pin settings are calibrated at the factory and no calibration is required by the pilot. However, it is important that the *FeelFlight* control module is mounted level with the wings. This is usually not an issue because the instrument panel is generally square with the airplane.

## THE FEEL FLIGHT EXPERIENCE

Once you have your *FeelFlight* haptic feedback control grip and system installed and working properly, it is time to really learn what it is like to enter the realm of flying with a strong, clear signal of what your aircraft attitude is. Birds have nerve endings in the base of their feathers and always have a sensitive feel of exactly what the wind is doing as it flows over their wings. With the *FeelFlight* grip, we have now given the pilot, through his fingers, a very sensitive feel of the wind over his wings. It is an idea, a system, an invention that is long overdue. Just imagine flying with a similar "feel" for your flight attitude that rivals that of a bird.

Take your airplane up to a safe altitude for practice and begin "feeling" this new experience. You will notice the clear signal of Vy in climb out. There is a feeling of confidence when you do. Now you can easily hold your true value for Vy at a precise AOA. Now you know with confidence that you really are climbing at "best rate of climb" and you know you now have the safety associated with that climb rate. You will get to a safe altitude sooner.

Once you get to your "testing" altitude, trim out for cruising at best L/D … lift over drag. This of course is the same AOA used for Vy. You will have to reduce the throttle so that you maintain a constant altitude. You will soon learn that it is easy to maintain best L/D because you have a constant indication on the finger tip of your ring finger. Next, do some turns. You will quickly learn that the *FeelFlight* inclination signal is telling you which rudder to step on. You touch that rudder and that signal goes away. Turn to the opposite direction, still maintaining the Vy signal … or best L/D angle of attack. No doubt your haptic grip will tell you again to step on the rudder. And herein lies the beauty of the system….you are maintaining best L/D and coordinated turns without ever having to look at the panel. At first you may have a tendency to want to cling to scanning the panel. This is normal, after all, this was drilled into us when we were learning to fly. However, within a few flights you will gain the confidence to control your aircraft with the haptic feedback you are receiving. It is a wonderful sensation to be enjoying the scenery without worrying about aircraft attitude. It becomes very natural to adapt to this new ability to simply "feel your wings." You can also scan for other aircraft or birds as you are pleasure flying without the constant anxiety of wondering how close to stall you may be or if your turns are coordinated.

It is a powerful instinct in humans to want to be looking at where they are going. Constantly pulling our heads in to look at the panel is a chore pilots need to force themselves to do. It is not natural. One thing you will discover when testing your *FeelFlight* is that you will look at the panel often on the first flights to confirm what the *FeelFlight* is telling you. However, after many confirmations you will begin to let go of the constant instrument scan. That is not a bad thing. The reason is that the airspeed indicator can typically broadcast a value that is far from what it should be. The airspeed indicator can easily display an error of 10 mph or more for Vy, Vx or stall. This again varies with density altitude, weight, balance and wing bank. By contrast our highly accurate AOA sensor is always broadcasting the exact correct angle for Vy, Vx or stall. Also, the standard inclination ball is very sluggish as it moves through the fluid it is suspended in. The *FeelFlight* inclination signal is immediate and precise.

Following turn testing at Vy, you will want to push your aircraft to stall to learn exactly what *FeelFlight* tells you. Return to straight and level and pull back on the elevator. When you get to the angle of attack for Vx you will feel it on your middle finger. You will also see the middle yellow LED blink, and very significantly you will



begin hearing an audible signal that is the same pulse pattern. Note: the LED lamps on our control module are very easy to see with your peripheral vision.

As you continue to apply more elevator back pressure, and slow more, you will notice the audible signal increasing in frequency. This is your audible modality being invoked to give you even more feedback on your angle of attack. As you pass through Vx ... the synchronized haptic, visual and audio signal definitely captures your attention. This is important, because when you pass through Vx you have now entered the back side of the power curve. You are now officially in "slow flight" and need to be more alert. The audible accelerating signal is very captivating as it lets you know that the stall warning is next. We typically set the "pre-stall" warning a few degrees before actual stall. When you slow enough to trigger the pre-stall warning, your haptic grip will now poke your index finger. In addition, the red LED is blinking and the audible is beeping - all in sync with your index finger signal. It is unmistakable!

Repeat this slowing to stall mode and get familiar with it. You will appreciate how definite the *FeelFlight* is signaling you. You cannot ignore or overlook it. And it may save your life someday when you are turning base to final.

**THANK YOU FOR YOUR PURCHASE OF FEEL FLIGHT**
**WE WISH YOU MANY YEARS OF SAFE FLYING**

The FAA is currently working with FeelFlight, Inc. to obtain STC's for the above yoke for many airplanes in the GA fleet. They like the idea of increasing aircraft safety.