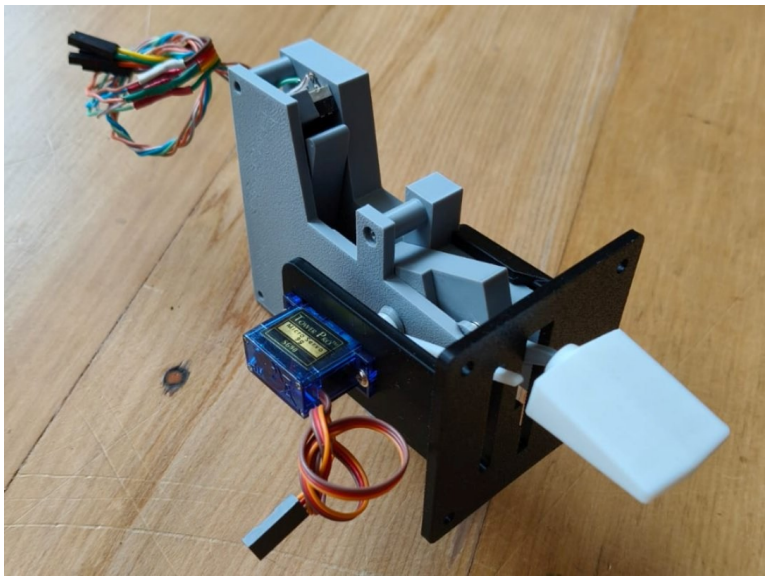
P A R K R O A D D E S I G N S

Cessna 172

Flaps Lever & Mechanism

Using microswitches for precise, reliable flap position detection



Completed assembly

Assembly Guide · Version 1.0 · November 2025

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1. Overview

Most Cessna 172 flaps lever designs found online use a potentiometer to set the flap position. While simple in principle, getting the calibration exactly right -- and keeping it there -- is surprisingly difficult. Tiny variations in lever position produce inconsistent results that require constant re-tuning.

Investigating how the real Cessna 172 works was the inspiration for this design. The real aircraft uses microswitches to detect the flap lever position with absolute precision. This model brings the same approach to the simulator.

Four microswitches correspond to the four Cessna 172 flap settings -- 0 degrees (up), 10 degrees, 20 degrees, and 30 degrees (full). When the lever is moved to a position, the mechanism trips exactly one microswitch. There is nothing to calibrate. Either a switch registers or it does not.

An SG90 micro servo drives a flap position indicator pointer behind the faceplate, moving in response to sim data -- just as the real aircraft instrument behaves.

Download the 3D files
https://makerworld.com/en/models/1929271-flaps-lever-for-cessna-172-using-microswitches

Parameter	Value
Faceplate size	63.5mm tall x 61.5mm wide
Panel cutout	~64mm x 62mm (slightly larger than faceplate)
Flap positions	4 positions -- 0, 10, 20 and 30 degrees
Position detection	4 x roller-lever microswitches
Position indicator	SG90 micro servo with printed pointer (optional)
Print material	PLA recommended (faceplate optionally ABS or PETG)
Controller options	PRD-GP-STM board or Arduino + MobiFlight

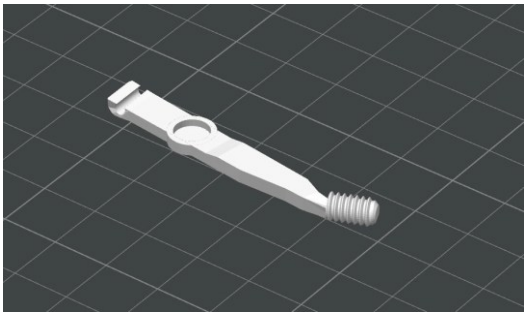
2. Printing the Parts

Download the .3MF file from MakerWorld and open in Bambu Studio or your preferred slicer. All parts are included in the file.

Materials: PLA works for all parts. The designer used white PLA for most parts and black ABS for the faceplate. PETG is a good alternative to ABS.

2.1 Part-specific settings

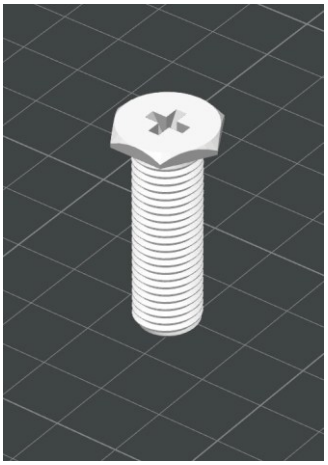
hinged-lever-A



hinged-lever-A slicer render

> **Layer height 0.08mm required**
> The lever arm has a printed thread at one end for the handle. Coarser layer heights produce a thread too rough to engage. Use 0.08mm layer height for this part.

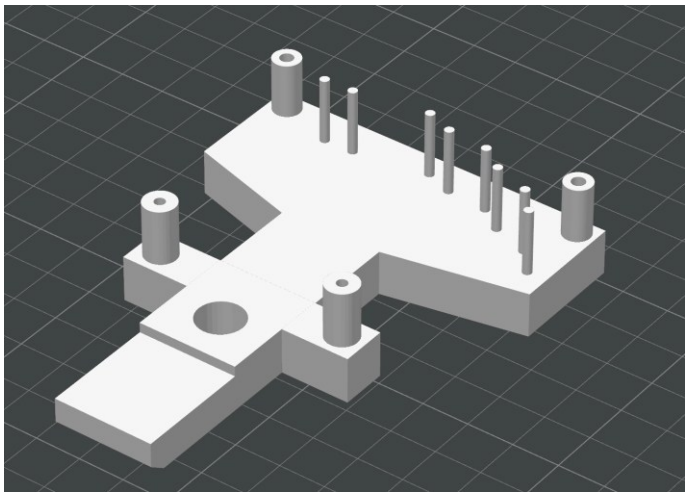
bolt



Bolt slicer render

Use brim ears to prevent tipping. Reducing layer height to 0.08mm for the last few layers gives a cleaner thread tip -- this is optional but improves the fit.

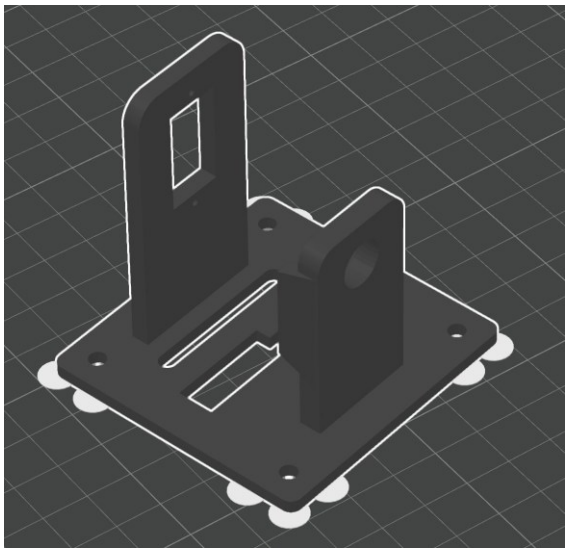
main-body



Main body slicer render

Enable ironing on top surfaces to reduce friction in the slider mechanism, giving a smoother lever action. Not strictly required but easy to enable.

faceplate-and-brackets



Faceplate and brackets slicer render

If printing in ABS, add brim ears to the corners to prevent corner lift. Not needed for PLA or PETG. Print in black for the best visual result.

Print TWO of each spacer block
The file contains spacer-block-A and spacer-block-B. You need 2 x spacer-block-A and 2 x spacer-block-B -- four spacer blocks in total. This is the most commonly missed step.

Five indicator pointers included
Print all five pointer variants and trial-fit each on your servo shaft to find the best fitting one. Servo shaft dimensions vary between batches. Do not glue the pointer until everything is tested.

3. Parts List

In addition to the printed parts you will need the following hardware and electronics.

4 x roller-lever microswitches

Roller-lever microswitch

Must be the roller-lever type -- without the roller the mechanism will not work. Available from AliExpress: aliexpress.com/item/32960278288.html

1 x compression spring

Compression spring

Approximately 5mm diameter x 15-20mm length. The original design used 5.5mm x 17.5mm. A local hardware store often sells singles for a few pence. AliExpress assortment: aliexpress.com/item/1005010113855122.html

2 x M2.5 x 12mm screws

M2.5 x 12mm screws

Used to secure the cover plate. A general M2.5 assortment set is a useful purchase. AliExpress: aliexpress.com/item/1005003061065206.html

1 x SG90 micro servo (180 degree)

SG90 micro servo

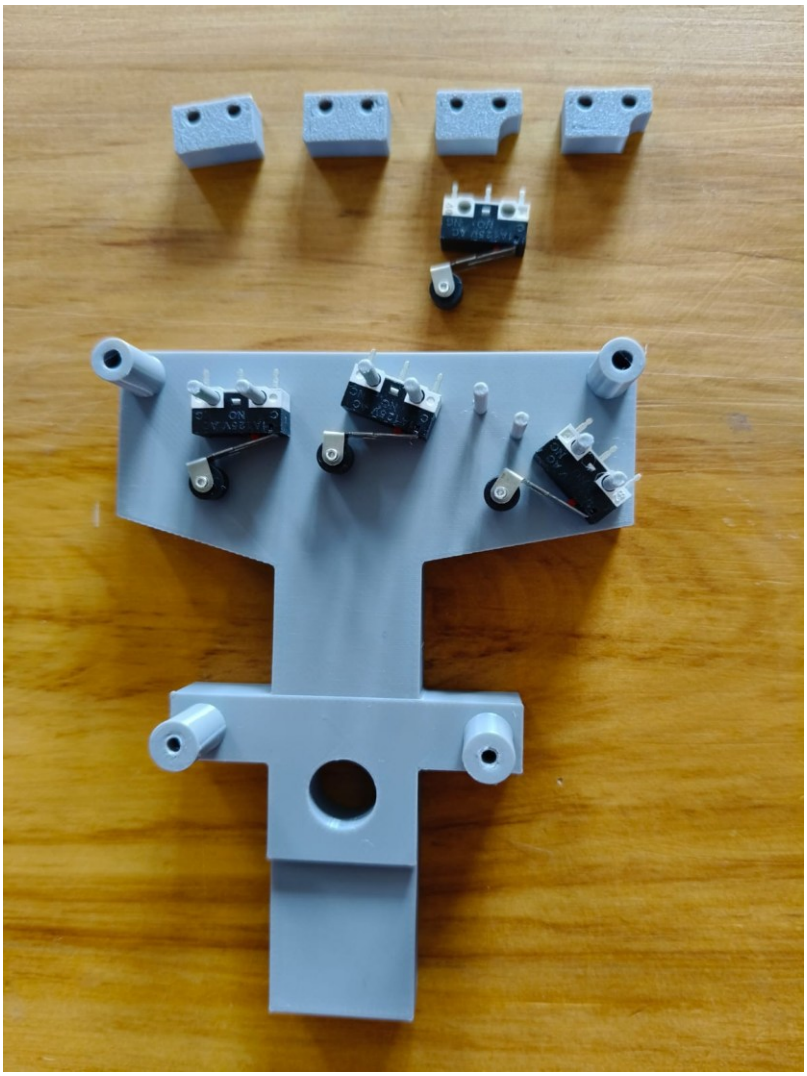
Drives the flap position indicator pointer. Comes with the small screws needed to mount it. Must be the 180 degree version -- 360 degree continuous rotation servos will not work correctly.

4. Assembly

Follow the steps in order. Allow approximately 30-60 minutes once all parts are printed.

Step 1 -- Install three microswitches into the main body

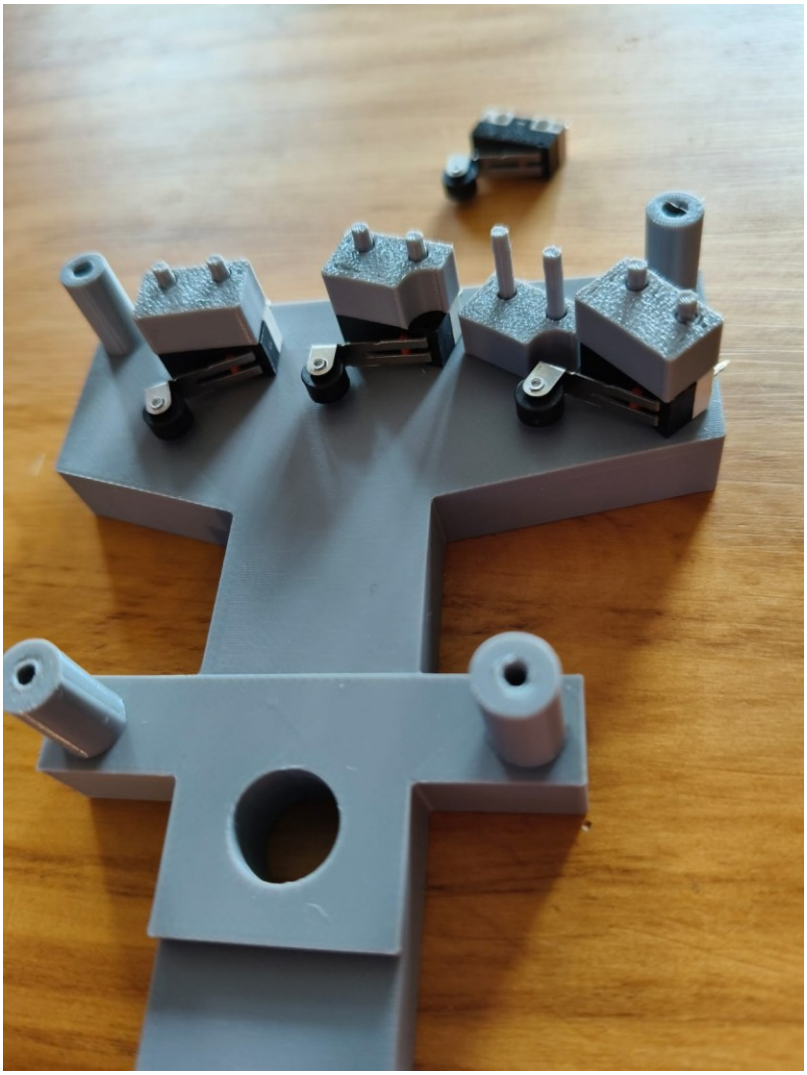
Press three of the four microswitches into the slots on the main body. The roller levers should all face inward toward the centre of the mechanism. The switches snap in and are held by the printed retention features -- no adhesive is needed.



Step 1 -- Three microswitches fitted into the main body, spacer blocks ready above

Step 2 -- Add the four spacer blocks

Press the four spacer blocks into position over the microswitches. There are two types -- spacer-block-A and spacer-block-B -- and they must go in the correct positions and correct orientation.

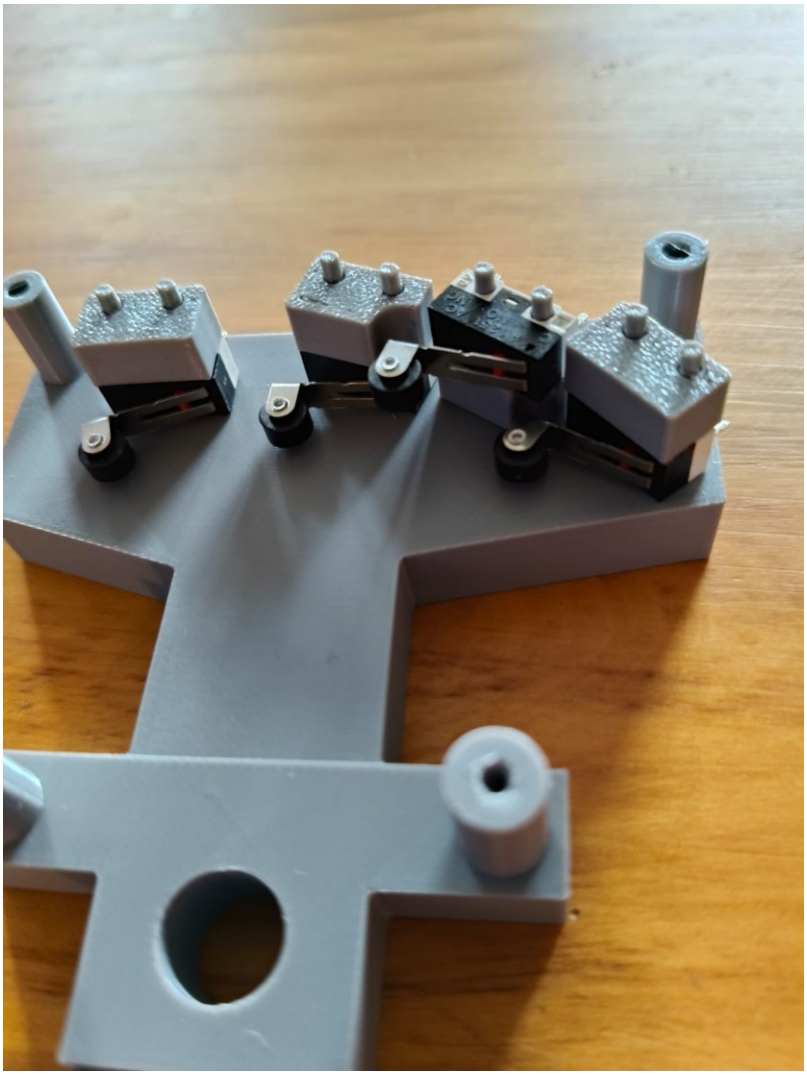


Step 2 -- All four spacer blocks fitted

Take care with the plastic pins
The spacer blocks have thin locating pins that will snap if the block is forced in the wrong orientation. If a block will not seat easily, check the orientation rather than applying more force.

Step 3 -- Install the fourth microswitch on top of the spacer block

The fourth microswitch sits elevated above the other three, mounted on top of one of the spacer blocks. This positions it at the correct height to detect the 30-degree (full flaps) lever position.



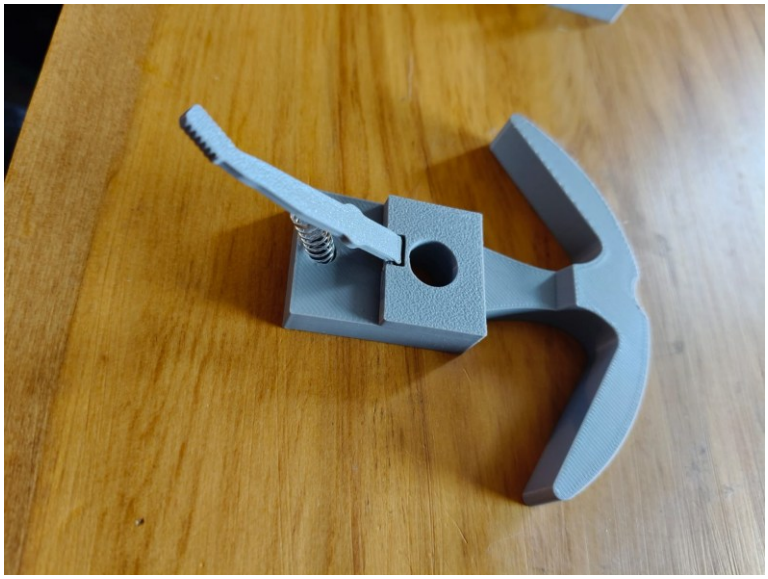
Step 3 -- Fourth microswitch fitted on top of spacer block

Step 4 -- Assemble the swing arm mechanism

Assemble the swing arm from its printed parts -- the curved rocker arm, the slider block, and the spring retainer. Place the compression spring loosely in position inside the assembly. Do not compress it yet.

Swing arm parts laid out

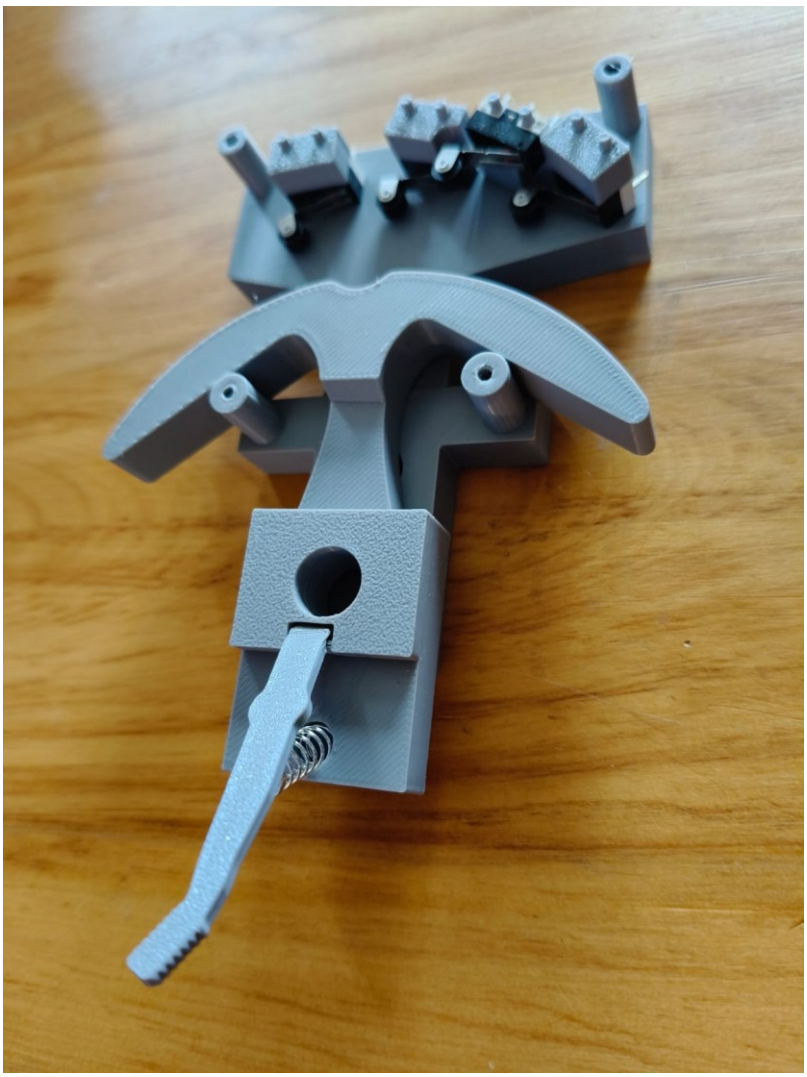
Swing arm assembled with spring



Swing arm assembled with spring loosely in place

Step 5 -- Place the swing arm onto the main body

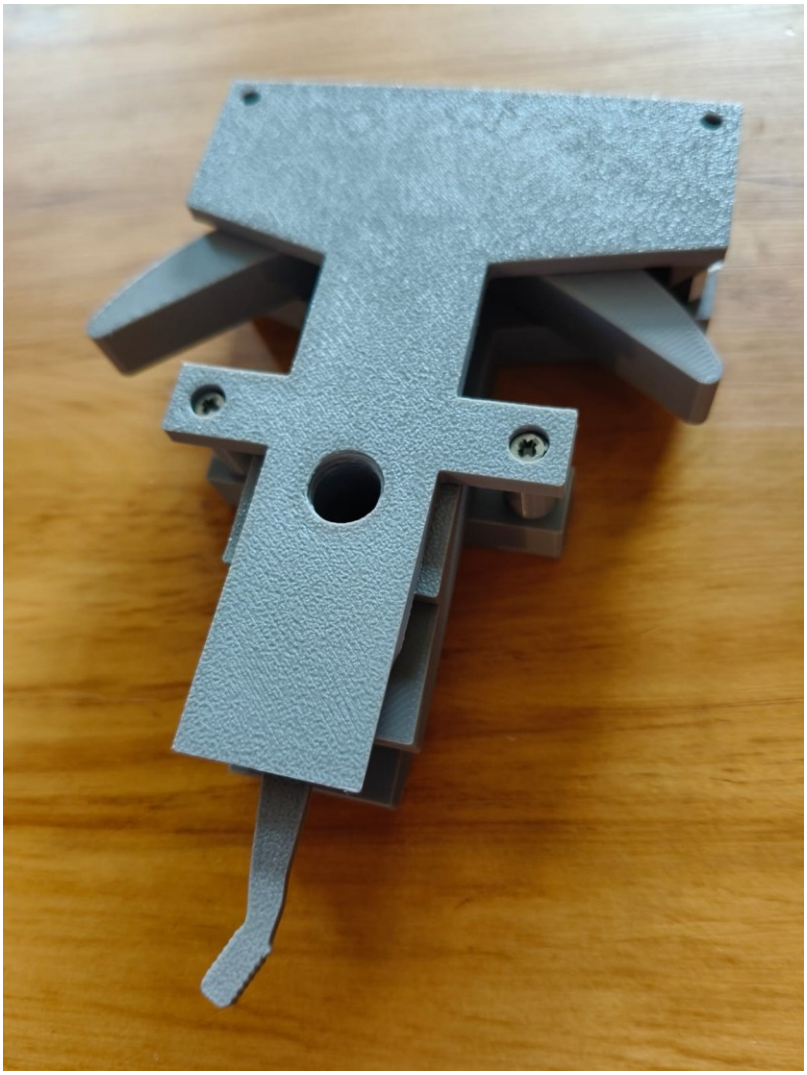
Slide the assembled swing arm mechanism onto the main body rails, positioning it all the way away from the microswitches for now. The spring should still be uncompressed at this point.



Step 5 -- Swing arm placed on main body, slid away from microswitches

Step 6 -- Fit the cover plate and compress the spring

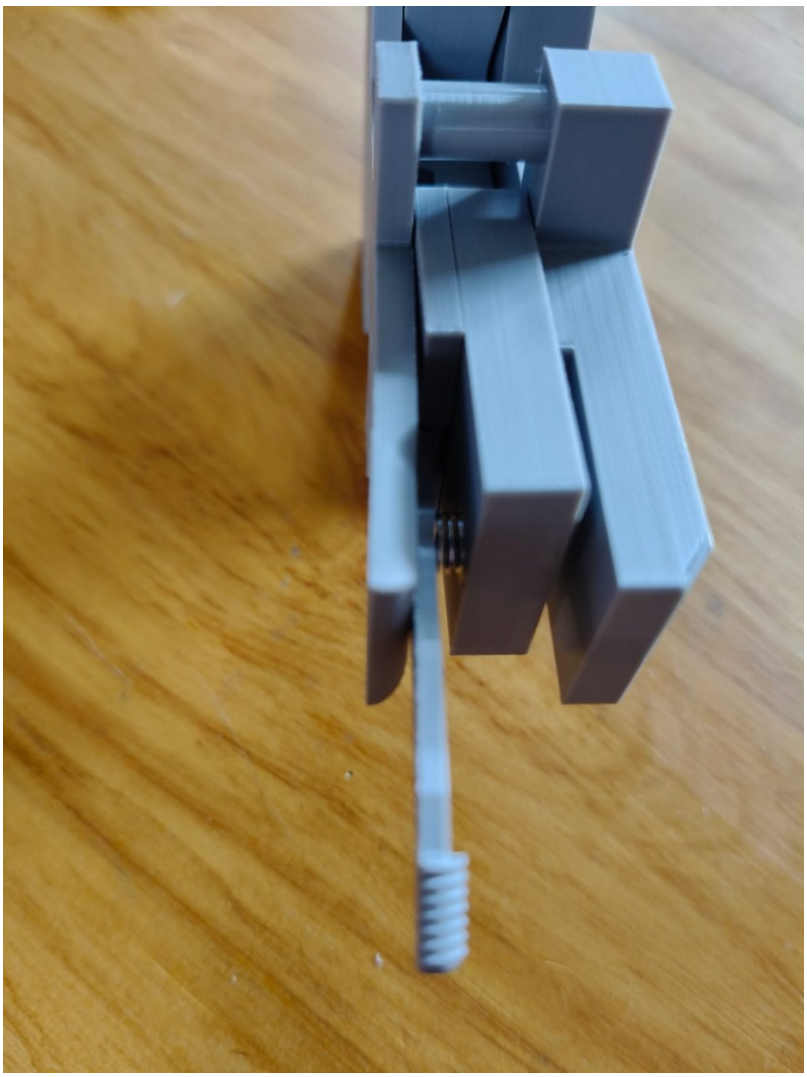
Place the cover plate on top and secure with the two M2.5 x 12mm screws. Tighten until snug -- do not overtighten. With the cover plate in place, compress the spring by sliding the swing arm forward toward the microswitches until the central hole aligns for the pivot bolt.



Step 6 -- Cover plate fitted with screws, spring compressed, bolt hole aligned

Step 7 -- Check the spring compression from the side

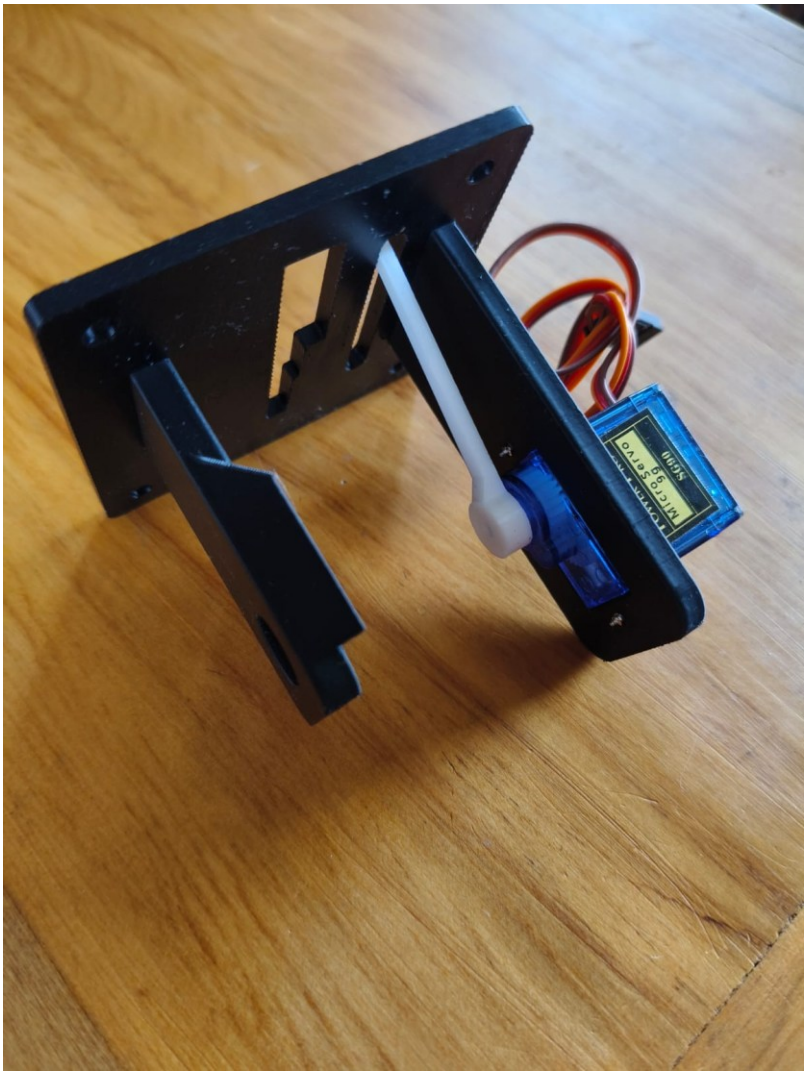
View the assembly from the side to confirm the spring is evenly compressed and the pivot bolt thread protrudes cleanly below the main body, ready to accept the handle bolt.



Step 7 -- Side view showing spring compressed and bolt thread protruding

Step 8 -- Fit the servo motor and indicator pointer

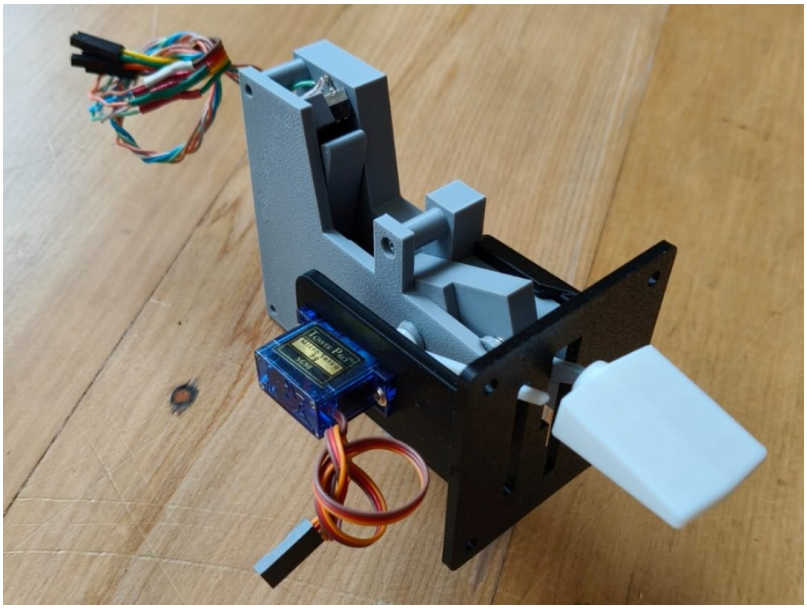
Mount the SG90 servo to the bracket using the two small screws provided with the servo. Orientation matters -- ensure the servo body is positioned as shown, with the output shaft toward the indicator window in the faceplate. Trial-fit the five printed indicator pointer variants on the servo shaft and choose the one that fits most snugly.



Step 8 -- Servo and indicator pointer fitted to faceplate bracket

Step 9 -- Final assembly

Insert the complete mechanism into the faceplate-and-brackets assembly. Thread the pivot bolt through the central hole and tighten until the mechanism pivots smoothly with no free play. Attach the handle to the threaded end of the lever arm.



Step 9 -- Completed assembly ready for panel installation and wiring

Do not glue the handle yet
You will almost certainly need to remove the handle during wiring and software setup. Only add a small drop of adhesive once everything is tested and working. Gluing makes disassembly impossible.

5. Wiring

5.1 How the switches work

Each microswitch is held closed by the mechanism in all lever positions except its own. When the lever reaches a position, the roller lever at that position is released and that switch opens. At any lever position, three switches are closed and exactly one is open -- the open switch identifies the current flap setting.

Lever position	Switch state
Flaps 0 degrees (up)	Switch 1 OPEN -- switches 2, 3, 4 closed
Flaps 10 degrees	Switch 2 OPEN -- switches 1, 3, 4 closed
Flaps 20 degrees	Switch 3 OPEN -- switches 1, 2, 4 closed
Flaps 30 degrees (full)	Switch 4 OPEN -- switches 1, 2, 3 closed

5.2 Switch wiring

Wire all four microswitches with a common ground. Connect all COM terminals together and run a single GND wire back to the controller. Each switch then needs one signal wire from its NO (normally open) terminal to a separate digital input pin.

> **Soldering tip**
> Solder short wire leads to each microswitch terminal before installing the switches in the printed body. Access becomes very difficult once assembled. Use heat-shrink sleeving on each joint.

5.3 Servo wiring

The SG90 servo has three wires: brown (GND), red (+5V), and orange (signal). Connect signal to a PWM-capable output pin. The servo requires a 50Hz PWM signal with pulse width between 1ms (0 degrees) and 2ms (180 degrees).

6. Connecting to the PRD-GP-STM Board

The PRD-GP-STM from Park Road Designs is the simplest way to connect the flaps lever to your simulator. The board connects to the PC as a standard USB HID joystick -- no Arduino, no MobiFlight, and no driver installation required.

Connection	Connector	Pin	GPIO	Configuration
Switch 1 (flaps 0 deg)	CON-B	6	PB4	GPIO Input Pull-Up
Switch 2 (flaps 10 deg)	CON-B	7	PB5	GPIO Input Pull-Up
Switch 3 (flaps 20 deg)	CON-B	8	PB6	GPIO Input Pull-Up
Switch 4 (flaps 30 deg)	CON-C	1	PB7	GPIO Input Pull-Up
Servo signal	CON-B	3	PA8	TIM1_CH1 PWM 50Hz
Servo +5V	CON-B	10	+5V	~4.7V supply
Common GND	CON-B	12	GND	All switch COM + servo GND

No MobiFlight needed
When using the PRD-GP-STM, the four switches appear as standard USB HID joystick buttons. Map them to flap commands in your simulator controls settings. The servo is driven directly by firmware responding to CAN bus data from the sim.

7. Connecting with MobiFlight + Arduino

If you are using an Arduino Mega running MobiFlight, the flaps lever integrates as follows.

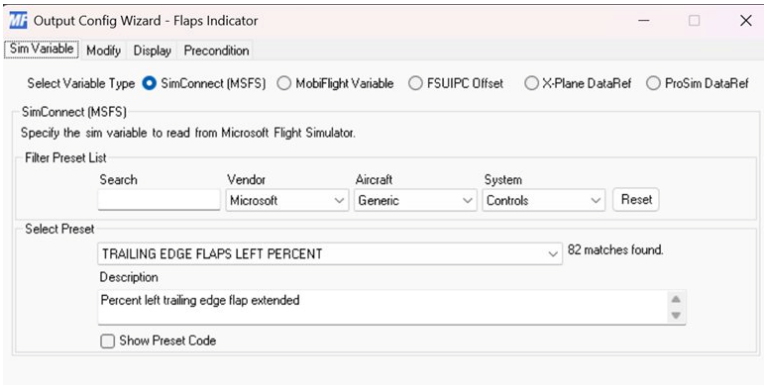
7.1 Switch (button input) configuration

Connect the four switch signal wires to digital input pins on the Arduino Mega. Wire all COM terminals to GND. In MobiFlight, configure each pin as a Button type input. Because the active position is the open (released) switch, FlapButton0 uses a RELEASE event and the others use PRESS:

MobiFlight button input configuration -- FlapButton0 on RELEASE, others on PRESS

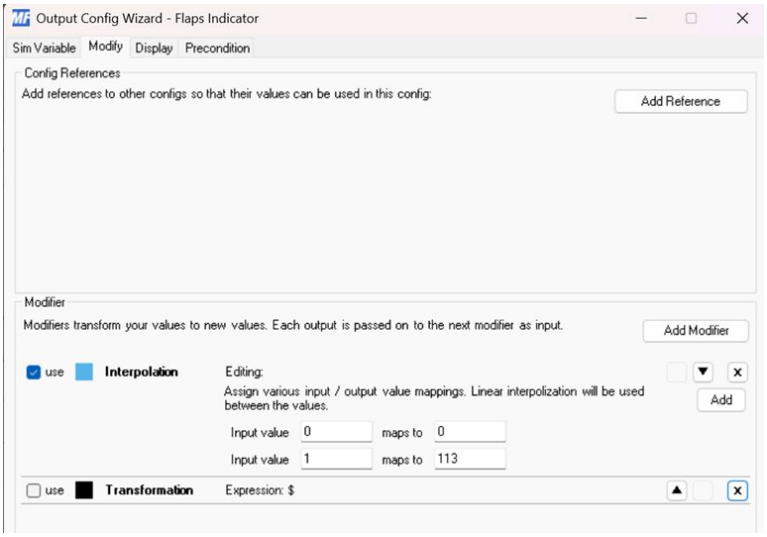
7.2 Servo indicator configuration

In MobiFlight, create a new Output Config for the flaps indicator. Set the sim variable on the Sim Variable tab:



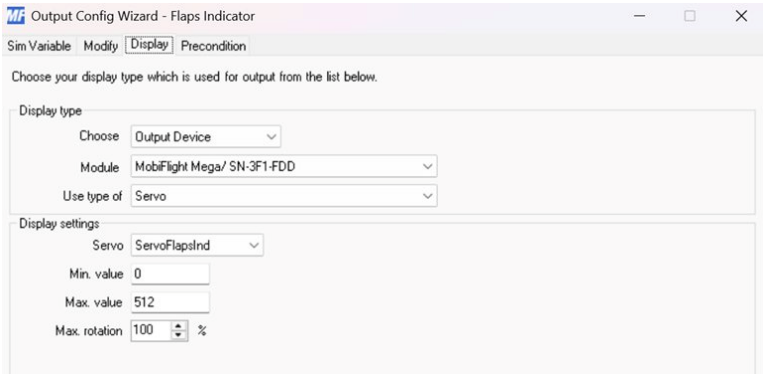
Sim Variable tab -- TRAILING EDGE FLAPS LEFT PERCENT

On the Modify tab, enable Interpolation and set input 0 maps to output 0, and input 1 maps to output 113. Adjust the output 113 value to match your indicator pointer travel:



Modify tab -- Interpolation mapping 0-1 input to 0-113 servo output

On the Display tab, select Output Device, choose your Arduino module, and set Use type of Servo. Set Min 0, Max 512, Max rotation 100%:



Display tab -- Servo output settings

Calibration note
The output value of 113 is a starting point. Adjust in small increments until the indicator pointer position matches the lever position across all four flap settings.

8. Troubleshooting

Symptom	Likely cause	Solution
Lever has no detent feel	Spring missing or not compressed	Check spring is correctly placed. Ensure cover plate screws are sufficiently tight.
Lever action is stiff	Friction on slider surfaces	Enable ironing on main-body and reprint, or apply a small amount of PTFE dry lubricant to the slider rails.
Handle thread will not engage	Layer height too coarse on hinged-lever-A	Reprint hinged-lever-A at 0.08mm layer height.
Spacer block will not seat	Wrong orientation or wrong block type	spacer-block-A and spacer-block-B are different. Check you have the correct type in each position.
Wrong flap position detected	Incorrect firmware or MobiFlight logic	The open (released) switch is the active position. GPIO reading high = switch open = active position.
Servo indicator jitters	Wrong servo type or PWM noise	Confirm 180-degree servo, not continuous rotation. Add 100nF cap from servo +5V to GND near connector.
Indicator pointer is loose	Wrong pointer variant fitted	Try the other four printed pointer variants. Select the snuggest fit without wobble.

9. Contact

Resource	Link
3D files	makerworld.com/en/models/1929271-flaps-lever-for-cessna-172-using-microswitches
Website	www.parkroaddesigns.com
Email	info@parkroaddesigns.com
PRD-GP-STM board	www.parkroaddesigns.com/product.html