

# Spitfire MkIX – Kit A

## Bill of Materials

### Overview

This is a list of all the hardware and components you need to build the Spitfire MkIX flight stick as well as the Universal Hub to connect it to your PC as a fully functional flight control. All you need in addition to these items are the 3d printed parts.

### Sourcing Advice and Comments

A key design criteria for this flight control is that all parts should be low cost commodity items readily available from Amazon or eBay. The vast majority of items cost \$2 or less each. The key exceptions to this are the Leo Bodnar game controller board BU0836A and the springs. Although there are some slightly cheaper options to the BU0836A, it was chosen as it requires no programming to use; has proven very robust (to many miswiring errors during design!) and can be assembled with simple push fit connectors rather than requiring electronics skills.

The other items which are a little more tricky to source and can become pricey are the springs. Stock springs available from the internet were deliberately chosen rather than custom specifications even though this made the design of the flight stick a lot harder. In the UK, US and Europe they should be easy to obtain and although fundamentally cheap items, postage costs can push the total cost up to £15 or more. Unfortunately if you are in Australia/New Zealand we have found that springs are much more expensive again to source.

### Alternative Sourcing

A supplier has been found who is now making up kits containing all the items necessary for both the flight stick and hub. See their website listed below for more details.

Simulation Kit Supplies sells kits for this flight stick at [www.simkitsupplies.com](http://www.simkitsupplies.com)

## Full list of parts for the flight stick

Although there are quite a few items in this bill of materials the aim was to minimise the range of parts that are used across all AuthentiKit flight controls, so that you can become familiar with their type and assembly methods. The code system below applies to all flight controls, which is why some numbers are missing - they relate to items needed for the forthcoming trim wheel and throttle quadrant etc.

The price column is purely an estimate based on experience. You may be able to source parts cheaper or you may well find them to be more expensive. The price is for all the parts of that type required not the unit price.

Code	Component	Quantity	Price	Comment	Sourcing
001	M2 Self tapping screws	2	£1.00	These often come in PC repair packs	Get off ebay in the smallest pack you can
002	M3 x 6mm countersunk	4	£1.50	Machine screw - zinc is fine	Get off ebay in the smallest pack you can
003	M3 x 6mm flange/button head machine screw	6	£1.50		Get off ebay in the smallest pack you can
004	M4 x 6mm countersunk	9	£1.50	Machine screw - zinc is fine	Get off ebay in the smallest pack you can
005	M4 x 8mm countersunk	9	£1.50	Machine screw - zinc is fine	Get off ebay in the smallest pack you can
006	M4 x 10mm countersunk	13	£1.50	Machine screw - zinc is fine	Get off ebay in the smallest pack you can
008	M4 x 14mm countersunk	7	£1.50	Machine screw - zinc is fine	Get off ebay in the smallest pack you can
009	M4 x 20mm countersunk	10	£1.50	Machine screw - zinc is fine	Get off ebay in the smallest pack you can
010	M4 nut	4	£1.00	Machine screw - zinc is fine	Get off ebay in the smallest pack you can
015	M5 countersunk part threaded x 60mm	1	£1.60	Often with an allen key head. It is a part threaded bolt	<a href="https://www.ebay.co.uk/itm/M2-M2-5-M3-M4-M5-M6-SOCKET-COUNTERSUNK-S-CREWS-10-9-HT-CSK-HEX-ALLEN-KEY-BOLTS/284006064396">https://www.ebay.co.uk/itm/M2-M2-5-M3-M4-M5-M6-SOCKET-COUNTERSUNK-S-CREWS-10-9-HT-CSK-HEX-ALLEN-KEY-BOLTS/284006064396</a>
017	26 AWG White (cm)	1.8	£15	Use silicon wrapped stranded 26AWG wire. The outer silicon needs to be around 1.6mm diameter. You only need 1.8 metres of each	<a href="https://www.amazon.co.uk/TUOFENG-Electric-Different-Temperature-Resistance/dp/B07G732HNX">https://www.amazon.co.uk/TUOFENG-Electric-Different-Temperature-Resistance/dp/B07G732HNX</a>
018	26 AWG Red (mtrs)	1.8			

019	26 AWG Blue (mtrs)	1.8		colour but i found it hard to source smaller lengths so this 6 colour pack costing £15 was what I used.	
020	26 AWG Green (mtrs)	1.8			
021	26 AWG Yellow (mtrs)	1.8			
022	26 AWG Black (mtrs)	1.8			
023	Ferrules	1.8	£1.29	These are 1mm diameter silver plated jewellery crimps. Try to get good quality ones as cheap ones are cut roughly and make it hard to push the wires through	<a href="https://www.ebay.co.uk/itm/300-or-600-Crimp-Tube-Beads-Silver-or-Gold-Plated-1mm-findings-jewellery-crafts/122432924071">https://www.ebay.co.uk/itm/300-or-600-Crimp-Tube-Beads-Silver-or-Gold-Plated-1mm-findings-jewellery-crafts/122432924071</a>
024	RJ45 jack	2	£5.00	After testing many different types one proved to be much more reliable and easy for a novice to reliably connect. The design is built around it. It's a tool-less keystone jack and this particular one is recommended.	<a href="https://www.amazon.com/dp/B07H926M2Y/ref=sspa_dk_detail_10">https://www.amazon.com/dp/B07H926M2Y/ref=sspa_dk_detail_10</a>
029	Tac switch	2	£3.20	OMRON 12x12x7.3mm PCB B3F-4055 Tactile Push Momentary Button Tact Switch. It needs to have the plastic lugs on the back	Amazon, ebay, RS Components <a href="https://uk.rs-online.com/web/p/tactile-switches/6866777/">https://uk.rs-online.com/web/p/tactile-switches/6866777/</a>
032	60032RS bearing	3	£6.00	35mm diameter x 17mm inner x 10mm thick	Amazon or ebay
033	5mm neodymium magnet	3	£3.50	Get them in blocks of several cubes each 5mmx5mmx5mm	Amazon or ebay
034	Hall sensor	3	£6.00	A1324LUA-T HALL EFFECT SENSOR	RS Components, CPC Farnell or others.  <a href="https://uk.farnell.com/allegro-microsystems/a1324lua-t/hall-effect-sensor-linear-sip/dp/2840983">https://uk.farnell.com/allegro-microsystems/a1324lua-t/hall-effect-sensor-linear-sip/dp/2840983</a>
036	3mm dowel pin	5	£1.70	Stainless steel pin 6mm long 3mm diameter	Amazon or ebay
040	6700ZZ Bearing	2	£4.00	Other types will fit. They need to be 15mm outer diameter 10mm inner and 4mm thick	Amazon or ebay
041	Raquet grip	1	£3.00	Ordinary tennis or squash racquet grip	Amazon or ebay

042	3mm Bungee cord (metres)	0.2	£3.00		Amazon or ebay
043	Dupont cable	10	£3.99	Female plug on one end, bare at the other. 20cm long. They often come in strips of 40 wires wide	<a href="https://www.amazon.co.uk/sourcingmap-Female-Jumper-Asphalt-Breadboard/dp/B07FM69291/ref=sr_1_21">https://www.amazon.co.uk/sourcingmap-Female-Jumper-Asphalt-Breadboard/dp/B07FM69291/ref=sr_1_21</a>
044	Red-Blue orientation magnet	1	£3.00	Any magnet with a clear north/south pole	Amazon
045	Simple wire stripper	1	£2.50	The cheap plastic ones seem to work best	<a href="https://www.amazon.co.uk/Convenient-stripper-Pliers-crimping-Stripping/dp/B077T9X6ZW/ref=sr_1_6">https://www.amazon.co.uk/Convenient-stripper-Pliers-crimping-Stripping/dp/B077T9X6ZW/ref=sr_1_6</a>
046	Neoprene strip 5mm thick (cm)	3	£1.00	You might manage glueing a bit of ordinary sponge/dense foam	Amazon
047	Spring - Roll	1	£9.50	Length 31.8, Diameter 9.5, Wire diam 1.42, Max Len 42.28, Initial Tension 10.5N, Tension 6.98N/MM	<a href="https://www.flexosprings.com/search-products?sku=am3310">https://www.flexosprings.com/search-products?sku=am3310</a>
048	Spring - Pitch	1	£7.00	Length 38.1, Diameter 9.5, Wire diam 1.6, Max Len 49.3, Initial Tension 36.68N, Tension 9.69N/MM	Ashfield item s48 <a href="https://www.ashfield-springs.com/shop/extension-springs-3-10mm">https://www.ashfield-springs.com/shop/extension-springs-3-10mm</a>
049	Copper wire 0.5mm (2cm)	1	£1.00	0.5 or 0.7 and squish it a bit with pliers	Amazon or try stripping the plastic off some normal thin wire - needs to be solid core
			£93.78		

## Universal Hub Parts

Although this is the most expensive item you only need one of these. With the AuthentiKit design it supports 10 flight controls simultaneously including flight stick, quadrant, trim wheel, flaps, gear, VOR and more.

091	USB Cable	1	£2.50	The printer cable type	<a href="https://www.amazon.co.uk/AmazonBasics-Male-B-Male-Cable-Feet/dp/B00BCWALHM/ref=sr_1_6">https://www.amazon.co.uk/AmazonBasics-Male-B-Male-Cable-Feet/dp/B00BCWALHM/ref=sr_1_6</a>
099	BU0836A USB board	1	£26.97		leobodnar.com BU0836A 12-Bit Joystick Controller
092	Ethernet cable 1.5m	1	£3.00	Just and ordinary one, around 1.5m or longer needed	Amazon
			£32.47		