

# Choosing RC equipment

Version 0.6

This advice is primarily intended for new members to the club wishing to buy radio control equipment for the first time. This is my opinion so please talk to others to get a balanced overview.

## Summary

The Radiomaster range of EdgeTX transmitters are currently the best value for money, giving a good combination of features and low cost. The 4-in-1 multi-protocol versions allow you to fly a wide range of off-the-shelf models. The ELRS protocol versions offer unsurpassed long-distance performance, low latency and are particularly suited for quadcopters and FPV planes with or without flight controllers.

Spektrum has been a market leader for many years. They offer solidly built radios, with excellent usability and features. They have long been popular with pilots flying planes. They sell at a premium price and are less suitable for quadcopters or use at long range for FPV but they are very easy to use with a simple user interface

## Terminology

Bind - link a transmitter to a receiver so that they communicate with each other.

Channels - individual control signals sent to the model. On a typical simple fixed wing plane each channel would operate a servo or set of servos. Examples: throttle, elevator, ailerons, rudder.

Fixed wing planes - models with wings to give lift rather than rotors.

FPV (first person view) - where the pilot wears goggles which display an image from a video camera at the front of the model.

Line of sight (LOS) flying - where the pilot directly watches the model when flying so must not fly behind trees or so far away as to not be able to see the orientation of the model.

Multirotors - models with more than two rotors to give lift, also called quadcopters, quads or drones. They usually have cameras and fly with FPV.

Protocol - the language that the transmitter and receiver understand. Only transmitters and receivers that use the same protocol will work with each other. Some protocols are proprietary to a specific company's products whereas others are shared by multiple companies.

RC - radio control.

Receiver - abbreviated to RX, the unit that is fitted in the model and receives the control signals.

Transmitter - abbreviated to TX (also called a radio), the handheld unit with sticks and switches you use to control the model. Transmits the control signals to the model.

## **Equipment included with fixed wing models**

### Ready to fly models (RTF)

These models are usually complete with all the equipment needed to fly including a battery and charger.

Transmitters which come with RTF models have basic functionality and are often of lower quality but are a relatively inexpensive way to find out if you like RC flying. You will probably want to buy a much better and more capable transmitter as you progress.

### Bind and fly (BNF)

These models come with a receiver but no transmitter. You will need to 'bind' your transmitter with the receiver. Your transmitter must be compatible with the receiver protocol for it to bind.

### Plug and play (PNP)

These models come without a transmitter or a receiver, but are fitted with servos, motor and ESC (electronic speed controller).

### Kits

Kits for planes made of foam (often called foamies) usually come with hardware but no motor, ESC, receiver or servos. This has an advantage when you are more experienced because you can choose what quality of equipment to install but it is not as good value for money as the other options. It can also be useful if you have a very damaged plane and want to replace the airframe.

Balsa models are rewarding to build but are not recommended for learning to fly. They break easily in a crash and are much harder to repair.

For advice on a suitable trainer model see the club website under Club Documents > 'Guide to suitable first RC trainer planes'

<https://ivcmac.bmfa.uk/wp-content/uploads/2021/03/Guide-to-suitable-first-RC-planes.pdf>

## **Important features**

6 channels is a sensible minimum for flying most small to medium sized planes. You may possibly want more channels if you fly larger or more complex models such as: helicopters, quadcopters, planes with flight controllers and FPV, larger gliders with 4 or 6 wing servos, or models with lots of auxiliary features like flaps, retractable undercarriage, lights, etc.

For fixed wing planes you need a transmitter with trim switches (to adjust the control surfaces to get the plane to fly "hands off" straight and level). Some smaller transmitters for quadcopters don't have these (they are not needed on a quad).

Most people in the club fly Mode 2 which is throttle and rudder on the left stick and ailerons and elevator on the right stick. We can help you more easily if you opt for a Mode 2

transmitter. Most transmitters on the UK market are Mode 2. Most transmitters can be changed between Mode 1 and Mode 2 with some minor disassembly.

### **Popular transmitters at the club**

Most of us would recommend either a Spektrum or Radiomaster transmitter. Most RC fliers in the club use these and we can help with advice and support you in setting up your transmitter. You can also see these transmitters at the club and find out how they feel in your hands.

### **Firmware on the transmitter**

This determines the user interface and what functionality the transmitter offers.

Spektrum have their own firmware which has been developed with menus which are easy to learn and use. This has made them very popular particularly with fixed wing pilots. Talk to Alan Paul for more information about Spektrum transmitters.

Radiomaster and some other makes use open-source firmware called EdgeTX. This takes more effort to learn but is more flexible and capable, particularly for use with flight controllers and quads. EdgeTX continues to be developed and is very nice to use when you have learnt the main features. Some older transmitters use OpenTX, which is closely related to EdgeTX and very similar to use.

### **Guidance on transmitters with EdgeTX**

There are many good videos on YouTube which show how to set up and use these systems.

Model setup:

[https://www.youtube.com/watch?v=xQeeuaSyX6g&list=PLy3TC1ILJYTi\\_r8RrgLmpJ17WGEZ4lYo&index=46&t=714s](https://www.youtube.com/watch?v=xQeeuaSyX6g&list=PLy3TC1ILJYTi_r8RrgLmpJ17WGEZ4lYo&index=46&t=714s)

Transmitter setup to turn off annoying bleeps, add a volume control to the speaker, set up the buddy system, set the time, etc:

[https://www.youtube.com/watch?v=2Jh7\\_ZTRSpI&list=PLy3TC1ILJYTi\\_r8RrgLmpJ17WGEZ4lYo&index=2&t=2s](https://www.youtube.com/watch?v=2Jh7_ZTRSpI&list=PLy3TC1ILJYTi_r8RrgLmpJ17WGEZ4lYo&index=2&t=2s)

As well as setting up your model on the transmitter you can also do it on a PC using EdgeTX Companion. You can use this to try out EdgeTX before you buy to see if you like the interface:

[https://www.youtube.com/watch?v=VAEiwWaNEas&list=PLy3TC1ILJYTi\\_r8RrgLmpJ17WGEZ4lYo&index=52&t=4s](https://www.youtube.com/watch?v=VAEiwWaNEas&list=PLy3TC1ILJYTi_r8RrgLmpJ17WGEZ4lYo&index=52&t=4s)

RC Video Reviews and other channels have videos covering other more advanced features on EdgeTX.

Quad fliers almost exclusively use EdgeTX transmitters.

I started with a Spektrum DX6i, then had a DX6 which is a good transmitter, but I wanted more channels and features. The DX9 was very expensive. After trying OpenTX on Companion I was fascinated by the logic and flexibility of the firmware and bought my current Frsky Horus X10S which I flashed with OpenTX and later EdgeTX. Frsky make good transmitters but unfortunately their recent models have been made so you can no longer flash them with OpenTX or EdgeTX.

Advice on buying EdgeTX transmitters:

<https://oscarliang.com/radio-transmitter/>

### **Protocol for the radio signal**

Spektrum transmitters can only bind with receivers which use the DSMX protocol. These receivers are primarily made by Spektrum (the companies Orange and Lemon make DSMX compatible receivers at a lower price, but they are just as reliable). All new Spektrum transmitters only use DSMX. They do not support the old Spektrum DSM2 protocol.

EdgeTX transmitters, like Radiomaster, have several protocol options, the most important are:

#### **Multi-protocol (4-in-1)**

These can bind with most 2.4GHz receivers apart from those using Frsky ACCESS protocol or Flysky's protocol.

The most common protocols to use are Frsky EU-LBT ACCST V2 or DSMX. When buying a receiver check that it will bind with your transmitter.

The 4-in-1 transmitters also support the old Spektrum DSM2 protocol.

#### **Express LRS (ELRS)**

This is a new open-source protocol which is evolving fast and offers longer range, low latency, better telemetry, and lower priced receivers.

This is the protocol of choice for quads and FPV planes because the system is less affected by trees or if your body gets in the way of the signal. This is not important for line of sight flying.

Setting up ELRS is quite technical and involved:

<https://www.expresslrs.org/quick-start/getting-started/>

Talk to Daniel Kenyon-Jones for more information on ELRS.

Note that on the lower priced receivers you must solder in the Dupont servo connector pins. This benefits from good soldering technique. There are however loads of new Radiomaster ELRS receivers available very cheaply that have servo pins already installed.

Please note that transmitters with only the CC2500 chip have a limited number of protocols and do not have DSMX. These should be avoided.

Many Radiomaster transmitters can be bought with either an internal 4-in-1 multi-protocol unit or an internal ELRS unit. Most of their transmitters also have a JR module bay in the back of the transmitter which allows either an ELRS or a 4-in-1 module to be fitted externally which can give you both options on one transmitter.

Horizon Hobby (who own Spektrum) produce some good indoor and outdoor RC planes which come fitted with a DSMX receiver, so multi-protocol capability is very useful if you don't have a Spektrum transmitter.

There are other small models which come with cheap transmitters. You can bind these models to a multi-protocol transmitter which means you can fly them with your own much better transmitter. This makes a big difference to the ease and quality of the control you have.

Quads have largely moved to ELRS, but you can still buy DSMX and Frsky versions of the popular models.

### **Stabilised receivers**

These can be useful for both beginner and intermediate pilots but are not necessary for learning, particularly if you have the assistance of an instructor using a buddy box.

They usually have three modes:

Manual mode with no stabilisation.

Wind rejection mode or Acro Mode which corrects any roll or pitch changes which are not input by the pilot. Spektrum call this Experienced Mode or AS3X. This is very useful as it makes it easier to fly models in turbulent conditions.

Self-levelling mode in which the model will transition to level flight if you let go of the sticks. Also called Angle Mode or Stabilised Mode. Spektrum call this Beginner Mode. However, this limits the turning capability of the model, so it is harder to avoid trees. It is best not to fly in this mode as it teaches bad habits – just use it as a temporary rescue mode (e.g., if you lose orientation of the model).

Spektrum's third mode is called 'Intermediate' (or 'Safe Select') and allows more control than Beginner Mode but prevents the model going inverted. This can also teach bad habits, so it is best to move on to Experienced Mode AS3X as soon as possible.

You can use an easily accessible switch on the transmitter to change between modes.

### **Other matters**

Servos have a standard plug which can be used with any PWM (pulse width modulated) receiver which is designed for use with servos. There are also receivers which have one data lead to plug into a flight controller, or separate stabiliser, and do not have servo outputs.

The standard connectors for lipos to power your model are XT60 and XT30 (for smaller models). If the plane you buy has a different connector it is better to buy an adaptor (or

solder on an XT60 or XT30 connector) rather than buy lipos with a connector to suit the model as lipos with XT60 type connectors are cheaper and more widely available.

You may find a neck strap makes it easier to hold the transmitter.

### **Radiomaster transmitters**

If you want to use EdgeTX then a good choice is the Radiomaster TX16S or Radiomaster Boxer. These are good quality very capable transmitters. If I were buying a transmitter now, I would get the Radiomaster TX16S.

### **Buddy box**

If you opt for an EdgeTX transmitter I would be happy to 'buddy' you with my EdgeTX transmitter connected by a lead so that I can take over control of your model when required. Using this 'buddy box' method is like dual controls in a car and is a very good way to learn, particularly at the Impington club site which is surrounded by trees. Normally with a buddy system the instructor holds the transmitter which is bound to the model and the student holds the slave transmitter. Unfortunately, I can only effectively operate a transmitter mounted on a tray and would not be able to operate your transmitter. However, EdgeTX allows the inputs from both transmitters to be added together so I can use my transmitter to take control of the model at any stage. This works very well.

### **Finally**

This document is not a club or committee consensus and is biased towards EdgeTX transmitters because that is what I like to use. Do ask around to get a range of views before buying. We are all happy to talk about our favourite equipment!

You are welcome to email us with a list of what you propose to buy, and we may be able to spot any incompatibilities or missing items.

Feedback is welcome.

If you decide not to join a club and plan to fly on your own, please consider joining the BMFA for the insurance cover it provides.

Happy flying!

John Clarke

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