Review: Multiplex Royal Pro 12 M-PCM
Mike Shellim
14 March 2010

Based on the review first published in RCMW in 2009

Introduction

The last two years have been an exciting period in the history of R/C. The major story has of course been the phenomenal rise of 2.4 GHz, with virtually all of the established R/C manufacturers now producing products for the band. One manufacturer notable by its absence, however, is Multiplex, the German company normally noted for being at the cutting edge of technology. In the case of 2.4 GHz they decided to wait for clarification of the EU regulations before entering the fray.

Happily the wait is now over, as Multiplex have recently announced a raft of interesting new 2.4 GHz products including radio systems, receivers and rf modules. 35 MHz devotees have not been forgotten either, with a new 35 MHz PPM/PCM module, and a range of PCM receivers to match.

For this review, we'll look at the ROYAL Pro 12. This system sits at the top of the Multiplex range, and includes a 12-channel transmitter with 36 model memories. Sadly, the 2.4 GHz modules were not available at the time of writing, so the review set was provided with the new 35 MHz module and 12-channel M-PCM receiver. The 2.4 GHz modules should be available shortly however.

According to Multiplex, the Royal Pro 12 is targeted at jets, F3A and large power aircraft, sports flyers, helis and competition gliders. Let's take a closer look.

Evo Evolution

Despite the different name, the Royal Pro transmitter is in fact based on the well tried Royal Evo, the differences being restricted to a new case rear panel, a new motherboard, longer aerial and updated firmware. The latest firmware provides support for both 35 MHz and 2.4 GHz, as well as several functional improvements (mixer enhancements, flight phase dependent expo and combi adjustments, and other features). It's worth mentioning at this point that existing Royal Evo owners can obtain most of the benefits of the new firmware, including 2.4 GHz compatibility, via an upgrade.

The new 35 MHz rf module incorporates a software controlled synthesiser which supports not only the universal PPM standard, but also a brand new 12-bit PCM protocol dubbed 'M-PCM'. More on this later.

Purchasing options are unusally flexible; as well as the 12 channel/36 memory unit reviewed, the transmitter is also available in 7- and 9-channel versions, offering 15 and 20 memories respectively. As mentioned there is a choice (or will be soon) of 35 MHz or 2.4 GHz modules, and sets can be supplied with or without a receiver.

Transmitter

It's a credit to the designers of the original Evo that the transmitter still looks fresh and distinctive (although perhaps that's also a comment on the 'saminess' of most far eastern clones!). The box is comfortable to hold too, thanks to the slim profile and sculpted rear panel.

A 2.5 inch hinged LCD panel dominates the top of the case. It's refreshing to see an LCD panel located out of the way of the neck strap for a change, so top marks here. The LCD is particularly easy to read, both indoors and in sunlight.

The sticks are ball-raced units and have a smooth action. Three pairs of stalks are provided, one of which incorporates three micro switches for controlling auxiliary channels.

Below the stick units are the unusual cruciform style trims first seen on the Evo. These employ buttons instead of the more usual rocker switches, and although they work well enough, I found that their location does take a bit of getting used to.

Trims aside, the layout is good, with ample space between the various controls. Two levers on the front face can be used for flaps, throttle etc. All the switches are 3-position types except for the two nearest the LCD which are 2-position. A nice touch is the button and switch on each side of the case, which can be operated without taking your fingers off the sticks. The only thing I missed was side levers (like those provided on the Multiplex Cockpit SX) for camber adjustment.

A significant change from the Royal Evo is the inclusion of a longer and heaver aerial. Unfortunately the new aerial rather compromises the balance of the transmitter, especially with the aerial in the straight-ahead position. I also noted a bit of play in the knuckle joint on the review unit.

Access to the internal components is easy, just release a couple of catches and the rear panel lifts off to reveal a neat and tidy assembly. From there you can alter the stick tension, engage the throttle ratchet, remove the battery, and change the module.

Switching bands

Those with mixed 35 MHz/2.4 GHz fleets will no doubt wish to switch bands from time to time, and this is an area where the Royal Pro is something of a mixed bag as the rf modules are not externally accessible. Instead, to change bands, you will have to open the case, remove the old module, and plug in the new one. A little care is required as the rf modules do not have a protective case. The aerials will also need to be swapped.

While this may sound a little tedious, the Royal Pro approach does offer some advantages if you don't intend changing bands very often. With the module hidden

safely inside the case, the back of the case remains 'clean' and comfortable to hold. The 2.4 GHz aerial too will be located in the proper place at the top of the transmitter, rather than dangling out of the back.

Excellent battery management

One area where the Royal Pro excels is battery management, starting with the choice of the latest low self-discharge NiMH cells for the tx. These retain their charge much longer than regular cells, typically 75% capacity is retained after a year on the shelf.

The pack's capacity is a generous 2100 mAH, providing around eight hours operation on a full charge – so if you fancy a go at your club's duration record, this is the set to have!

The Royal Pro inherits the Evo's excellent battery monitor system which displays an estimate of remaining capacity and flying time. It's much more than just a fancy voltmeter too. It continually monitors the flow of current into and out of the battery, as well as estimating the energy lost through the self-discharge process.

It's worth pointing out that the forthcoming 2.4 GHz module features a voltage warning for the *airborne* pack, thanks to an integrated telemetry system – something that we could only have dreamed about just a year ago!

New M-PCM Protocol

The first thing that that strikes you about the RX-12 M-PCM receiver is that it's pretty big! At 64.0 x 48.0 x 25.5 mm, it's clearly designed for use in large models, a suspicion confirmed by the presence of a heavy duty Multiplex 'green' battery connector, in addition to two UNI-type battery sockets. The UNI sockets allow either two parallel harnesses to be used for a single battery, or for two separate batteries.

The wide operating voltage of 4 – 9V allows the use of a 2S LiPo pack, as well as 4-, 5-, or 6-cell NiMH/NiCd packs. The receiver also offers a glitch counter, and programmable fail safe.

The new M-PCM protocol is proprietory to Multiplex. It offers 12-bit resolution, as well as a 'diversity' mode whereby a second M-PCM receiver can be connected in order to optimise reception. To see how this worked in practice, I coupled the RX-12 to a smaller RX-7 M-PCM receiver. No problems were encountered on the bench, and it all apperas to be very well thought out.

All in all, M-PCM is PCM brought bang up to date. Nevertheless, despite all its advanced features, M-PCM is still at its heart a narrowband 35 MHz system, and the forthcoming 2.4 GHz receivers will undoubtedly offer a more secure solution.

Instructions

The Royal Pro comes with a comprehensive instruction manual which runs to 109 pages of A4. It is nicely bound, and contains a table of contents, a detailed introduction (with photos), and separate sections for fixed wing aircraft and helicopters. Lastly, a reference section explains the operation of each menu. To round

things off, a separate coloured crib sheet is provided in case you get stuck on the field.

All in all, an excellent manual which is streets ahead of those supplied with far eastern sets. If you fancy a bit of bedtime reading, you can download your very own copy from the Multiplex web site.

Programming Concepts

Like all Multiplex systems, the Royal Pro employs a logical programming method. While other high end sets try to hide the gory details (with varying degrees of success) the Royal Pro tells it like it is. The system makes a clear distinction between things which you push (‘controls’), what things do (‘functions’), and the actuating devices (‘servos’). And the user has very good control over how the various elements are hooked up.

Starting with the primary controls, there is a choice of four stick modes for assigning the three main aerodynamic controls: rudder, aileron and elevator functions. Other functions, including throttle and spoiler, are freely assignable to any switch or slider. Switches can perform multiple duties, e.g. the flight mode switch can trigger a timer.

Channel numbers are freely assignable too. For example you can emulate the channel assignment of your old transmitter. Or you can pack all your servo channels into the lowest numbers to enable use of receiver with limited channels.

The Royal Pro also provides up to four flight modes per model, for quick recall of various settings including diff, travel and expo.

Mixing

The mixing on the Royal Pro is very powerful (though not as powerful as the now obsolete 4000). Fourteen free mixers are available, each mixer having up to five control inputs. The response of each input can be made linear, symmetrical, asymmetrical, with/without deadband and so on. This provides the ability to tailor a mixer for almost any application.

Five of the mixers are already set up at the factory. These cover applications from elevons to crow brakes. The remaining nine mixers can be tailored for other applications, e.g. tailerons.

The aforementioned mixers are ‘global’ which means that the mixer definitions are shared across all model memories. So, for example, if you assign a switch to activate or deactivate a mixer, the switch will also apply to all models using that mixer, not just the active model, and it's up to the user to check for any unintended consequences. Whilst users who have several very similar models will like this feature, pilots who prefer to make ad-hoc changes to each model will not be so keen. I have to consider myself amongst the latter category - I would have preferred the mixer definitions to be private to each model memory.

However, the updated firmware does at least offer a single 'private' mixer for each model. With a single input, and no curve options, this mixer is at first sight only

suited for simple trimming functions. However the output can be cascaded to a global mixer, which opens up some interesting possibilities for more adventurous tinkerers.

Programming

Programming on the Royal Pro is quick and logical, thanks to a combination of time saving templates, and well structured menus.

Entry to the programming screens is via the upper row of keys. These take you to the top-level menus entitled 'setup', 'controls', 'mixers', 'servos', 'timers' and 'memories'. Once inside a menu, you use the digi-adjusters for date entry and navigation. The digi-adjusters are very simple to use – just twist to select an option, and push to confirm.

Thanks to some clever software design, the process of creating a new model is ridiculously quick whether you're setting up a trainer or a full house model. Just four data items need to be entered in all cases. First, choose a template according to the type of model you wish to fly - choices include 'Basic', 'Acro', 'Hotliner', 'Delta', 'Glider', '4-Flaps', 'HeliMech', and 'HeliCcpm'. Next, choose a control layout from a choice of 'Power', 'Glider', 'Heli' (this determines the functions of all the switches and sliders). Next, select your channel numbering scheme from a choice of 'MPX/Hitec', 'Futaba' or 'JR'. Finally, select the stick mode.

And that's it - a brand new model, in about 30 seconds flat, with all the basic mixers set up, and the servo channel numbers matching your old radio! It's worth noting that templates don't restrict the adjustments you may wish to make later on. So at this stage you can define your own mixers, alter the servo assignments and so on.

With basic framework completed, final adjustments can be made. First stop will be the Servo Calibration menu. From here you can set servo curves, centre and end points. Curves may have 2, 3 or 5 points. If your model uses mixers, now is the time to tweak the movements in the Dynamic Mixer menu. Finally, you can fine tweak your diff, expo, etc. settings in the Controls menu.

In flight service

Multiplex have not forgotten that initial programming is only the start – a model also has to be trimmed, which invariably requires further adjustments to the programming.

Rather cleverly, the Royal Pro allows you to make adjustments to the programming during flight, in complete safety. It does this by allowing the user to 'lock' each digi-adjuster to a specific parameter. Furthermore, the system will prevent you from accidentally reversing the direction of the parameter.

Almost any numerical parameter can be adjusted in this way, including travel, exponential, differential etc. You can even adjust your mixer volumes – a great time saver when trimming 3D models and F3X gliders.

Conclusions

The Royal Pro is a cleverly designed system with lots of practical features. While it may not be as flexible as, say, the now obsolete Multiplex 4000, it offers a good

compromise between flexibility and ease of use, and should cater for the vast majority of sport and competition flyers' needs.

Plus points include good ergonomics (subject to reservations noted), logical programming, well designed menus, excellent documentation and the advanced battery management system. And of course, there's the wide ranging support for different protocols (PPM, PCM and 2.4 GHz).

On the downside, I was disappointed that the mixer definitions, as with the Royal Evo (but not the 4000 and 3030) are still 'global'. This makes ad hoc experimentation with mixers rather riskier than it should be (although though this will not be an issue if you intend to use the mixers as supplied).

As for the new M-PCM protocol, while it's technically interesting, it offers nothing over 2.4 GHz for the vast majority of applications. Most pilots will do better to purchase the transmitter on its own and use it with their existing PPM receivers, pending the arrival of the 2.4 GHz modules. Or else, to wait for complete 2.4 GHz bundles to appear. With the promise of a fully integrated telemetry facility, the 2.4 GHz systems should be very interesting.

Prices of the various Royal Pro bundles look competitive with comparable far eastern sets. If you're in the market for an advanced 2.4 GHz-ready radio, the Royal Pro is certainly worth placing on your shortlist.

SPECIFICATIONS

System tested	Multiplex Royal Pro 12 M-PCM/PPM (Vario set)
Channels	12
Memories	36
Flight Modes	4
RF Module	HFM M-PCM / PPM (2.4 GHz module available soon)
Current Drain	250 mA
Weight	900 g incl. Batteries
Price as tested	
Price Tx only	
Synthesised Receiver	RX-12-SYNTH DS M-PCM
Manufacturer	MULTIPLEX MODELLSPORT GmbH+Co.KG