THE WORLD'S BIGGEST & BEST MONTHLY HELI MAGAZINE

model Helicopter world

September 2006 • Price: £3.50 (UK)

EASTNOR MODEL & HOBBIES SPECTACULAR 2006
AUGUST
SATURDAY 19TH & SUNDAY 20TH

Mini Joker

Minicopter's fully acrobatic electric helicopter for 6-10 LiPo cells

Tuned Flight

Stephen Bell takes a look at the new MultiGov from Aerospire LLC

The 2006 XFC

Top pilots fighting it out to win the Extreme Flight Championship

9 770953 788041 09 TRAPLET

Hirobo 3-Blade Rotor Head

Adding the scale rotor head to the ec120

2006 International Circumgyration

Super scale models at the 6th Circumgyration

Futaba 14MZ and 12Z

Tuned Flight

Aerospire's new MultiGov

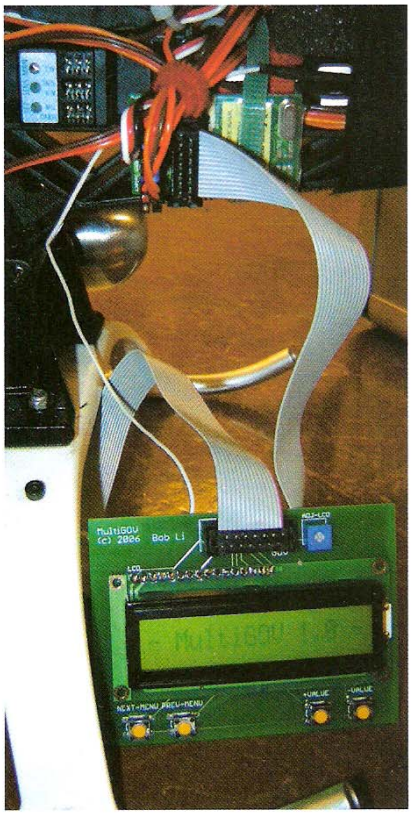
words: Stephen Bell, photos: Stephen Bell

I just happened to be skimming the Internet and came across a helicopter forum with mention to a new rpm management device. I followed the link to the manufacturer, Aerospire based in Honolulu USA (www.aerospire.com). A quick scan of the instructions sparked my interest since it seemed to take the best of all presently available governors and rpm limiters and then apply those to a very small and lightweight package. I spoke to the manufacturer by email and placed an order.

Upon receiving my MultiGov I carefully observed the quality of construction being very impressed with the surface mount layout and quality. All the accessories are included to easily adapt this equipment to most any I/C helicopter. The instructions leave no guesswork being clear, brief and to the point.

MultiGov has the unique ability to operate in governor and/or rpm limiter mode with the flick of the radio transmitter and can function with 3 speeds in any combination of modes. Speeds are squirreled away in the unit as a numerical value and not based upon ATV parameters, however selection of the stored values is. One also has the ability to disable the remote speed selection feature by way of a jumper and store one speed, thus freeing up a receiver channel should the need arise. The option is still available for governor or limiter mode!

The MultiGov contains everything needed to install the unit to most 30-90 helicopters



The programmer connects easily with access to all features having no requirement for a PC. This is convenient and inexpensive for set up support

Governor or Limiter?

The general difference between the limiter and the governor is that a governor both opens and closes the throttle while the limiter only backs off the throttle during over-speeding. The full governor design by nature requires a certain amount of dead-band or lag so its decisions for both under and over-speed correction will not confuse one another leading to hunting or torsional oscillations.

In the case of the limiter the relationship of the throttle curve signal to the collective position is etched in stone, the decision has already been made in real time so this removes process tasking. It is a real reference signal and not something calculated like the feed-forward parameter of the typical governor. This is based upon an accurate pitch/throttle curve relationship as it pertains to the target rpm.

What many people have found with the limiter is that additional performance can be gained by cranking up the throttle curve so that the limiter has a higher throttle servo position reference for speed correction. In other words it is forced into a more constant but well controlled clipping situation. Basically you have an over-speed governor with reduced complications associated with conventional governor over/under-speed management. What you the pilot feel is more available muscle directly coupled to powerful and rapid stick movements.

There have been a few misconceptions circulating with respect to running the throttle wide open in the aerobatic flight mode using a limiter. Some term this 'flat lining' the throttle curve based upon a pictorial or graphical illustration in the radio screen. Visions of a helicopter self-destructing in flight from a massive instantaneous rpm increase (should a magnet be thrown or the sensor fail) have been conjured up.

With a conventional non-governed aerobatic set up the throttle is full open at high and low stick simply because the rotor loads the engine. If a sensor failed and a wide open 'flat line' throttle curve was to be fed to the engine one would simply pull pitch and/or switch into conventional aerobatic flight mode. FAI types are known to run non-governed wide-open throttle flight modes and get by just fine. The pipe or tuned muffler in conjunction with the pitch needed to fly the helicopter plus blade mass will prevent instantaneous catastrophic rotor failure at lesser blade pitch angles.

An onboard status light verifies an acceptable pre-start and post-start engine run condition. It can indicate a bad battery, questionable connections or a poor sensor signal. It also serves as an index reference for servo plug insertion

If you are an experienced pilot then don't be afraid to try this method with the limiter, top flyers have been doing so for years. It should go without saying that one should learn how to basically adjust the standard throttle/pitch relationship to a flyable state regardless of any governor use.

Setting Up

Setting up the parameters is by means of the included hand held programmer, which is removed after the required information, is entered. This keeps the flying weight low, the onboard unit size small, negating the need for a tach while still offering many user features. One needs only one hand held programmer for various governor-equipped helicopters, which makes economic sense. It comes with a cord to connect it to the MG. Since it does not fly with the helicopter the display is made sizeable and easy to view, the programming buttons are large enough that they require no special tools to input data. The programmer will easily fit into your tool or flight box, as it is reasonably sized.

The sensor is interchangeable with the Model Avionics product line of governors. The MultiGov like the Model Avionics sensor will not work with the Futaba GV-1 unless the sensor is modified with a resistor. Three carbon fibre sensor brackets are supplied for full glow engine application. Sensor performance or air gap positioning may be monitored using the hand held.

Looking closer into the set up features we have a gear ratio, which allows accurate and easy four place speed resolution meaning you do not need a tachometer or very good modeller experience to verify estimations. Throttle end points can be viewed numerically as they are aligned into the MG, plus they may also be verified with a test endpoint feature.

Furthermore, and this is the gravy for the goose, the lower governor over-speed servo travel limit may also be set relative to the desired carb opening thus maximizing engine and rotor speed tuning for the best performance. Many governors unfortunately rely on a general factory set parameter. Low throttle on/off position can be viewed in the display as the operation is verified with different throttle curves or flight modes. Super servo mode with a high update rate is available if desired and the benefit is prevalent in the full governor mode.

A selectable low voltage off can be engaged if desired to remove the MG function, and feed normal throttle signals from the receiver to the throttle servo. In the governor mode we also have a feed forward feature, which references the throttle signal from the receiver to prepare the governor better for incoming changes. Basically we have a prediction sent to reduce response lag.

The programmer has another menu with advanced features. Here you can set the base gain and gain aggressiveness, which will remove any hunting if it occurs. MG continually monitors the engine response to attempt to extract the best performance so generally the defaults work well. Peak performance might be aided with some tampering here.

The limiter mode has an adjustment for aggressiveness and controls the speed the servo will respond to at under-speed. Basically it tunes the throttle curve response time coming from the receiver and can trade off a slight over-speeding for better power extraction.

If for example, you run a flat line throttle curve or one where constant clipping occurs the throttle restore signal of the throttle curve (for under-speeding correction) may be too fast or too slow during various conditions. This keeps things from getting out of hand. Basically it offers a damped result to prevent surging (over-speed oscillation) and allow peak throttling response. The pilot or the helicopter won't feel a 50-75 rpm overshoot in a detrimental manner, however the typical lag restrictions felt with a full governor are removed in preference to a faster more direct-coupled throttle feel. If you get too greedy engine surging can occur. A hover parameter is supplied for trading off hover smoothness for 3-D grunt.

Finally, the start-up or engagement speed of the governor can be set to suite for a smooth and easy turn on or a more rapid selection depending on what the user personally prefers.

Once the programmer is unplugged there is still a status light indication at the onboard MG. This tells you if the unit is available ready to be engaged through a slow flashing before starting the engine. Once running the status light flash rate will increase informing you that rpm samples are indeed being captured.

The manual has helpful suggestions for fine tuning and explaining what each adjustment may do for performance and how incorrect adjustment could manifest in a negative manner. The default values for advanced features work well for most people and are designed for mass production and a general baseline application.

In Use

I initially plugged my MultiGov into a 50-sized Raptor helicopter with a sensor earlier configured for the Revmax and it functioned properly. Installation was very minor since it is the same sensor after all. I set the device to 1800 and 8.5:1 ratio for both governor and limiter modes plus 1700 for another governed normal flight mode. It worked very well with a notable but slight performance gain in limiter mode. At this time I encountered no over-speeding or hunting, leading me to consider more tampering could yield some benefit.

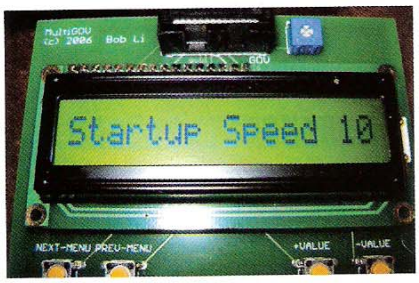
The rpm is very stable and right up there with the best units on the market. Engagement is very smooth and positive offering confidence in that the unit is governing. Switching modes and rpm selections demonstrated the same results. Bumping the rpm up to 1850 exhibited extremely stable performance however, when in the limiter mode the engine was much smoother during extended power let-off avoiding the lower throttle lean spot which many engines portray.

The unit exhibits good midrange pop, allowing for more abrupt close encounters with the ground. A skilled pilot will appreciate the confidence instilled

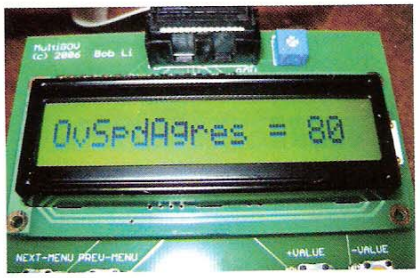
One of the 17 set up adjustments available for tweaking the unit to peak tune individual helicopters. This screen shows how the exact throttling response of the engine can be adapted in a manner to maximise power extraction and rotor rpm stability

This feature allows the low throttle over-speed point to be adjusted because sometimes the throttle may be reduced too far during an off load rotor condition resulting in a lean condition. This can be used for improving a less than ideal engine and/or exhaust installation

The helicopter gear ratio is set here so the rpm numerical values are indeed accurate removing the need for a tach

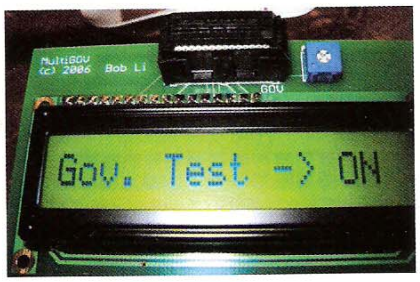


This feature allows the engagement speed to be customised to a faster, more harsh engagement all the way down to a slow and smooth mode. This comes in handy with various throttle curve styles and personal likes. While not mandatory I certainly made good use of it

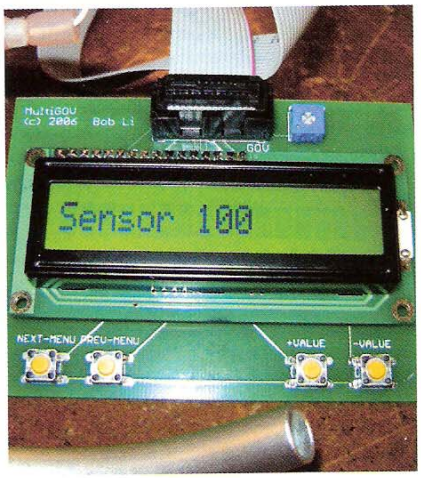


The 'OvSpdAgres' parameter works in limiter mode only with a higher value improving midrange punch-out. If over adjusted surging will occur during rpm limiting. This adjustment works great and is the first thing to tamper with in the limiter configuration

The basic gain can be used to increase response speed up to the point where hunting occurs allowing the modeller to remove hunting or better match up to the engine throttling response



After programming the throttle endpoints into the governor they can be verified as stored correctly using this test feature



An ideal sensor air gap may be set rather than guessing what is best using an on/off LED

My feeling at this point is the unit needs to be set up more aggressively in the limiter mode by moving away from the default set up values. Many people would not notice the difference unless they had another limiter for reference or the flying style and need. To this end we proceed with the aid of the hand held programmer.

So with the over-speed aggressiveness feature turned up to 80 another flight confirmed smooth operation and increased performance. At this point it works as well as any other limiter I have tried so far. Power is on tap instantly with excellent results by way of rpm stability. I attempted to crank this feature up an additional amount with early surging being evident. The hand held programmer is a pleasure to use for flight line set up. I see no reason at this time to adjust any other default parameters.

During this flight test I switched back and forth into two full governor modes, which verified the limiter does indeed extract better engine performance with less bogging and no lag. For sport flying and general aerobatics the governor modes do however work very well. What can I say other than I can have my cake and eat it too!

Because the MultiGov clearly earned its place with our Raptor 50 we decided to place the limiter into a competition 90-class helicopter. The 90 installation went as slick as the 50 since we already had the magnet installed in the fan and sensor attached. We never bother installing two magnets for balancing since the moment (mass x arm) change in the great scheme of things is minor. I've been doing so for years with absolutely no vibration issues.

The 90 performance is generally better compared to the 50 with regard to rotor rpm stability being a bigger more powerful machine with larger rotor inertia. Gains can be set slightly higher for this reason. The standard for this device ensures competition level use with the ability to peak tune rather than rely on a generic set up based upon non-adjustable firmware. We looked for shortfalls while pounding the helicopter in the air and found none. I do feel the default gains and aggressiveness values could be slightly higher but on the other hand this maintains a wider 'plug and play' application with acceptable generic results.

My advice to anyone using the unit for serious 3-D is to use the menu as intended, tweak the limiter aggressiveness and spend a few flights peak tuning the unit to your specific helicopter. The adjustments do work very well indeed.

I feel this product has an advantage over all other respective units I've had the pleasure to review, due to the combination of performance features along with dual mode operation all of which are cleverly tied into a logical and smart programming package. This is one of those rare hobby devices that has something for everyone, plus it does not require a brain surgeon to operate. What we have here is a much better 'mouse trap'! ■