Electronic devices pose a tricky threat to aeromodelling's future

by Sydney Lenssen

One obscure item on CIAM's agenda for its Plenary meeting in Lausanne, 10-12 April 2014, deals with what to do about electronic devices which help control models in international contests. Unless FAI gets to grips with this issue in all forms of model flying, some delegates see the latest gadgets, easily fitted into all types of model aircraft, as posing a threat to the future aeromodelling as we know it today.

The chances are that the meeting will debate a proposal put forward by the German national aero club - DAC e.V - and proposed by Gerhard Woebbeking, one of CIAM's vice-presidents. He wants to see rules which specifically prohibit any electronic device in a model aircraft which automatically stabilises the model or allows it to be flown automatically to a selected location.

The Sporting Code and official rules for F3B, F3J, F3F and the F5B/J classes limit themselves to stating that the model must be controlled by the competitor on the ground using radio control. Then they add, any technological device used to aid in supplying data of the air's condition or direct feedback of the model's flight status is prohibited during the flight. The single and only matter which is allowed by telemetry is the signal strength of the receiver and the state of the receiver battery, presumably on the grounds of safety. Not that many pilots take advantage of this permit.

So what is there to be worried about?

The wise men in Lausanne recognise that CIAM does not have full control of aeromodelling even though it does set the rules for competitions and records. They also recognise that times change. Not so long ago, the FAI used to insist that contestants must build their models for themselves and then fly them.That rule was abandoned when prefabricated and moulded models with superior performance and reliability could be bought off the shelf by competitors.

It used to be that if your freeflight model had to come down after a specified flight time, a dethermaliser was triggered by a slow burning wick or a clockwork device. These are still used today, but nowadays the pilot can actuate a radio device which dethermals the plane. All serious freeflight competition models are crammed full of technology and electronic devices such as tracker assistance. They too along with F3B/J/F/K models are candidates for autonomous electronic aids.

The big fear is that no matter what is said in the rules, more and more pilots are going to start playing with “enhanced electronic control systems” - EECS - because they find them enjoyable and challenging. This applies particularly to younger people, highly computer literate and eager to solve the many algorithms required and put them into practice.

In many classes of competition including F3B/J and F, nothing in the rules specifically forbids the use of automatic reacting electronic aids to control the model, and real advantages can be gained by exploiting this omission.

The halfway house to EECS which has been around for many years is the simple rate gyro. The technology of rate gyros, like the rest of the electronic world, has allowed a steady reduction in size and weight and the gyro can be easily switched off and on from the transmitter. Not so long ago in the early days of F3K, some pilots used them to help control yaw with the discuss throw. Uniquely for the Fclasses, words were put into the rules to ban them. Still to this day many RC helicopters have rate gyros to help with stability and control problems.

Future F3J contest scenario

Take a look at what the future might hold in an F3J contest.

Five seconds to the start buzzer, twiddle the sticks, check the launch switch, a bit more towline tension and off and away. The model swings gently to the left in the side wind and corrects itself, small dip and off with a zoom. Level off just before the top and swing left again across the side wind. Settles happily and switch into cruise - cruise with “EECS” to be correct. What is EECS? The computer transmitter and receiver’s enhanced electronic control systems, full bells and whistles.

Nine minutes thirty seconds later, glider is over the next field at a comfortable height in a gentle thermal which keeps it level. With fifteen seconds to go the model’s nose drops, it speeds up coming in with

barely a waver, slows a little to avoid the next door pilot, then into the spot. There's a tuft of grass standing proud in the rough field. The nose stops at 98 landing points. Dammit! Time - 9:55.

Walking down with the scores to the control tent, the pilot finds that everyone with EECS fitted has done better. Only two pilots are still flying without electronic aids and one of those has a better score, the other is a minute adrift. Two pilots have won the 1,000 points, both on 9:57 and 100 landing points.

What does EECS do?

The "latest" version of EECS has gyros to maintain stability in roll, pitch and yaw, an accurate timer, it has sensors which can identify other models and takes avoiding action if they threaten to collide, it has thermal recognition sensors which detect vertical air movements and the direction from which they come, then sending signals to ailerons, rudder and elevator to centre the thermal.

In our F3J contest, when the thermal is strong, then the flaps and ailerons with EECS will drop a degree or two into thermal mode; when it's too weak, then back to cruise or even distance mode with the flaps and ailerons up a little to search again for the core of lift.

At the appropriate time according to how far from the launch point the glider has travelled and the predicted wind speeds for the return flight, the model will leave its thermal, head for home, correcting its flight as it goes to arrive at the field with fifteen seconds to go.

You know the rest. It usually hits the landing spot unless it hits an unseen tuft of grass. The pilot, he has done nothing except launch his model and he can get help with that too. At no time, unless the pilot suspects that his EECS has gone wrong, does the pilot touch the transmitter controls or switches.

If his model is capable of flying for 10 minutes from a 200 metre height launch, the glider will always fly out the slot. If there is lift anywhere within a mile from launch, then the model will find it and fly out the slot. Exciting? What do you think?

One example of this type of technology in action was the recent flight, organised and televised starring James May and a helicopter launched

ugly glider, from Ilfracombe to Lundy Island. The glider carried the GPS coordinates of its landing site and it flew and landed autonomously to that site. Eye catching as it was, it was not in the same league as the FAI approved record by Joe Wurts of a 120 mile flight cross country pre-designated point to point flight.

By flying with EECS it is not too difficult to give Joe Wurts, Benedikt Feigl, Philip Kolb or Daryl Perkins - and others - a run for their money. But all those contestants who rely wholly and only on their piloting skills and ability to read and utilise air, as per the FAI's Sporting Code, will surely have dropped out from international contests by this stage. They don't see the point in competing with electronic gadgetry for that is not "sporting".

Or perhaps we shall see two categories of contest in all the present classes, one for fuddy duddy and traditional pilots following the Sporting Code and one for the EECS fanatics with no holds barred.

Is that the future for F3 contests and if so when? It could be at any time in the near future. The EECS equipment is all available today, you can buy it easily on the internet and most components are pretty cheap and likely to get cheaper. As far as I know, it hasn't all been put together yet, programmed and trimmed out, but I would not be surprised to hear someone claiming to have done it after this article.

F3F flyers have been debating the possible benefit of rate gyros which would certainly help in the landing approach when coming through severe roll over turbulence on some slopes. However the F3F contest group also recognise that gyros are the thin end of the wedge, and they definitely take an element of control out of the pilot's fingers. Regardless of the commercial viability and potential benefits, it can be seen that other forms of instrumentation and associated algorithms could remove more direct control from the pilot.

The attraction of competition to develop various forms of EECS is real and can be seen from various computer forum exchanges. Many computer savvy enthusiasts are happy to have a go!

So far we are describing mainly F3J, but the same imminent prospect applies to all forms of radio controlled model aircaft competitions, and some forms of free flight contests especially the F1A/B/C classes.

Of course, at this time, the principle for any FAI competition is that the pilot must control the model at all times during the whole flight, and that is embodied in the Sporting Code. It is worth repeating that in the FAI rules of many classes including F3B/J/F, nothing is stated which prevents pilots from using automatic electronic devices to help control the model.The reality is that competitors making use of such devices can gain significant advantages. The only allowable exceptions so far are devices which measure the height of launch and/or duration of motor run for certain electric motor powered competitions. F5J relies on the the motor/height to be controlled, measured and logged and is vital to make the competition work.

Is this future inevitable?

The big fear is that no matter what is said or might soon be written into the rules, more and more pilots are going to start playing with these EECS systems because they find it enjoyable and challenging. This applies particularly to younger people, highly computer literate and eager to solve the many algorithms required and put them into practice. It is impossible to “uninvent” things and as King Canute found, it’s impossible to hold back the tide.

When they get together to exchange ideas and experience, then surely they will organise contests. The very people who all countries are trying to encourage to join into existing classes to swell competition numbers are those most likely to be attracted to these newer challenges. Forget your iPad and computer games, model aeroplanes with EECS are really fun, and you get out into the fresh open air even when it is raining and windy!

The FAI/CIAM position today

Changes and new developments in aeromodelling will happen. That is a vital part of why most of us enjoy and are dedicated to the hobby/sport. Now is the time for CIAM to look long term and find the best way to embrace these changes without changing the ethos of our flying events.

A few of the National Aero Clubs around the world have discussed the situation with their aeromodelling bodies and for the most part, as in Britain, the national aero clubs have delegated responsibility to recognised aeromodelling bodies, BMFA in the UK.

For FPV - ‘first person view” - there is one basic rule: the model of limited size and weight should be kept in visual line of sight with bare eyes. In the UK this means that a model being flown by a pilot using headset goggles or screen should be kept in sight by a helper close by. Relations between CAA and BMFA are harmonius, and in March this year, the mass of fixed wing and rotary craft will be increased to 3.5 kg and the height limit permitted from 400ft to 1,000ft.

Early days so far, and what sort of control is there on who does what? Indeed at the same time as these legal limits are about to be raised, the potential technology of FPV together with higher transmission power than is currently legal will allow flights well beyond the line of sight. The temptation to push the boundaries ever further will be a welcome challenge to many FPV flyers and others. How many pilots are there today flying by themselves far beyond the line of sight, and the very nature of FPV is the thrill of this ability.

The Times this weekend reported that Nans Thomas, aged 18, has been charged by the French police in Nancy for flying a drone plus camera without authorisation to video his city. On YouTube “Nancy vu du Ciel” went viral with 400,000 views in two weeks, and it is artistic and breathtaking. The police say there was a danger of a crash and the flights showed no respect for people’s private lives. The potential penalty is 12 months in prison and a 15,000 Euro fine. M. Thomas bought his drone on the internet and says he had no idea that he needed any permit.

So far CIAM has defined three categories: **FPV**, “first person view” where the model is carrying a video camera transmitting to a headset goggle worn by the pilot or to a screen close to his transmitter. These systems are already in widespread use in gliders, powered and pure, and far more commonly helicopters and quadricopters.

Autopilot systems where the controlling pilot activates or deactivates programmable automatic systems to stabilise the model aircraft or to initiate a programmed flight path. The system are capable of returning the aircraft to a selected location when the radio link is lost.

The third is **small Unmanned Aeronautical Systems**, sUAS, which are small models with programmable autonomous controls which are mission orientated or to be flown beyond visual line of sight and computer controlled for nearly the entire flight. These aeroplanes of all sizes are commonly known as “drones” at this time, and some are

capable of flying around the world, to my mind often on highly questionable missions.

Substantial funds are being spent by countries, also around the world, developing sUAS, and these will lead to more robust data and video links than the simplex systems with their potential for single point failures currently available for FPV type flying. Miniturisation of electronic devices and the creation of tiny sensor packages for this type of sUAV will progress rapidly and the boundaries between sUAVs and model aircraft used solely for recreational sport will blur.

More and more frequently the benefits of these technologies can be seen by all of us in all sorts of harmless and and cost beneficial applications. A friend of mine in Canada surveyed a piece of land in an almost inaccessible location with a laptop controlled drone taking photographs every second, a one day job which would have taken months, perhaps forever, if the forest jungle had to be accessed on foot. One small and peaceful example.

The major risk is that the “pilot controlled” aeromodelling activities are likely to be affected. Irresponsible sUAV or FPV flying, and how can anyone police or prevent this from happening, could trigger massive public pressure to restrict model flying.

The National Aero Clubs in most of the countries contacted in an FAI questionnaire in 2013 replied that they would like CIAM to take these sUAV activities under its aeromodelling responsibilities, and that CIAM should make and require all countries to follow rules.

CIAM has been aware of electronic device problems for some time. In 2008 a working group deliberated and decided that UAVs and autonomous flight have no place in model aircraft flying within CIAM. This was unanimously approved. Last year, CIAM looked at what is essentially the same as this year’s proposal but could not come to any decision because most of the delegates did not see or understand what or where the problem was or is.

This year’s Plenary Meeting in Lausanne is unlikely to recognise or solve all the problems raised by EECS for the future. It is not a simple matter of rules. The situation calls for strong Statesmen with vision.

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Writing this article I have consulted several friends for suggestions and some have provided additional information previously unknown to me. Grateful thanks to them. Responsibility for what is written is mine.

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