

Clear Dope

JUNE 2013



Chichester and District Model Aero Club

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Derek Honeysett's BA Hawk takes to the air after a long gestation period.and Flies extremely well. Derek had experimented with a dolly but finally had to attach fixed U/C (To late in build for retracts)

"BLACK-WIRE" SURPRISE

I'm sure that most of us are aware of Black-Wire Corrosion, but it came as a surprise to have it creep-up on me from behind, as it were, and nothing at all to do with my Rx battery. It happened like this -

I've always had a high regard for the Futaba S-148 and S-3001 servos. They have been my first choice for models of moderate size, and they have given me very good service. But nothing in life is perfect. My little Colibrio suddenly reared-up from low altitude into a chandelle, without any input from me, the ground intervening to terminate proceedings. The subsequent post-mortem was to come-up with a surprise.

Returning the model to the pits, I found that the rudder and elevator servos were wildly over-swinging before coming to rest at their commanded positions. Normally when we see servo defects of this type we straight-away blame the servo pot, but I've experienced this behaviour before, so I knew where to start looking for the cause. The usual reason for this defect is excessive resistance in the black OV (ground) wire between the Rx and servo. The effect was repeated at home, but it suddenly disappeared after the moving the servo cables around. I feared this was going to be a classic case of the Intermittent Fault - the bane of every electronic engineer's life. I eventually managed to provoke it again on the rudder servo by flexing its cable at its entry to the servo case. Since the mechanism of this fault doesn't seem to be well known, it's worth taking a small diversion to explain what happens -

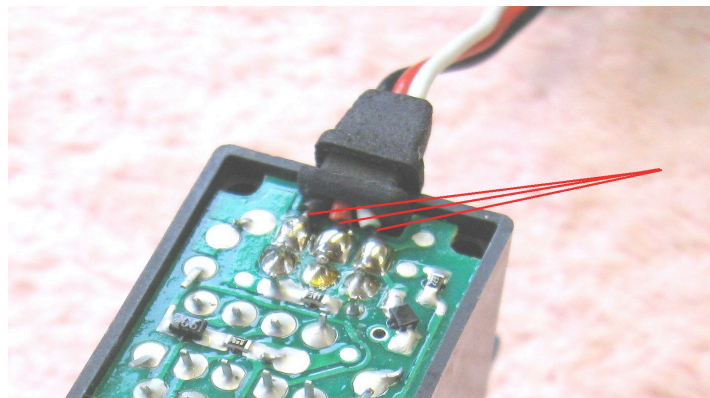
Any resistance existing in the OV wire to the servo will create a voltage-drop equalling its resistance times the current it's carrying. The servo motor current is returned along this wire to the battery via the Rx, and when the motor starts-up, the voltage drop from the heavy initial surge of current can be substantial. The IC chip used in modern servos requires the pulse signal from the Rx to operate between OV and a couple of volts positive. This volts-drop in the wire will cause the OV level of the servo ground to rise positive with respect to the OV level at the Rx, where the controlling pulse is generated. In effect then, the OV level of the pulse at the servo becomes negative with respect to the servo OV connection. This is where the modern servo amplifier chip shows an Achilles Heel, because this can cause it to malfunction. In ordinary circumstances this doesn't happen, but it will if the Rx to servo OV wiring or connections deteriorate, or if very long servo extension cables (Y-leads especially) are used. This is what I was seeing after the Colibrio prang.

To prove the effect, I made-up a patch lead which allowed me to insert low values of resistance into the servo OV wire. The rudder servo was behaving normally at this time, but when 0.5 ohms was inserted the over-swing returned. Increasing the resistor value to 1.5 ohms stopped the servo working altogether. I performed the same test on a brand new servo, but this time 1.5 ohms was required to cause over-swing. This is not a huge amount of resistance, and it points to less than totally elegant design. You can read more on the subject here - (<http://www.vantec.com/noisein.htm>).

But what was going-on behind the rubber grommet at the cable entry to the servo? First - to establish the condition of all 4 servos, a quick listen with an old Long Wave portable radio alongside them, just to hear if one has something drastically wrong with a motor. This is a useful check, since with a good servo, the rapid switching action of the motor commutator can be heard clearly as a slightly musical buzz. In the case of my rudder servo there was no buzz, just a loud "hash" indicating a lot of sparking taking place. I think we can say that it was well on the way to wear-out.

Opening the servo case, I found the solder joints looking normal, but pulling-back the insulation revealed a bad case of **Black Wire Corrosion** of the copper strands. So here was the erratic connection, as further movement proved.

Fig 1 Black Wire Corrosion, in all its glory



Also of-note at this time -

- The +ve and pulse leads were similarly corroded.
- There was no black wire corrosion of any of the battery or DC wiring.
- The model has been stored indoors in dry conditions, and the battery has always been kept in a good state of charge.
- The corrosion extended back about 20mm only from the solder joints. Beyond that the cable was only moderately discoloured up its whole length.
- These particular servos have given a lot of service, over a 4-1/2 year period.

So why the corrosion? The servo is virtually hermetic, so the corrosion has clearly come from inside the servo itself, and presumably the NiCd and NiMH Rx batteries used have played no part in it. I later opened-up the remaining three servos, and all were showing the same corrosion, to a slightly lesser degree.

What can be the cause?

- An aggressive flux used in making the connections? It certainly gave-off an evil odour when re-soldering, nothing like the fluxes I've been used-to in my work.
- Sulphur dissociating from the rubber grommet?
- Ozone from the worn and electrically-noisy comm/brushes of the motor? Given the correlation between sparking and ultimate failure of this servo, this could be the case, because ozone is highly corrosive to copper, and it reinforces corrosion occurring from other effects. A case for ventilation?
- A penalty of the use of bare non-plated copper conductors?

Moving on to the elevator servo, I got no response from moving the cable at the servo entry, but found intermittency at its connector. Was it a poor contact with the Rx connector pins, or tired old crimped connections?. It was hard to separate the two under practical conditions, but the crimps and the connector side-grip contacts and plating material caused me unease. Opening several old discarded servos, I found that they too have the black wire corrosion. Not only that, but they all had degraded crimps, one showing a resistance of 2.4ohms, until exercised by repeated pulling of the wire.

I'd seen enough by now to be convinced that I needed to replace all of the Colibrio servos with new, and opening those I found the wires to be just lightly tarnished, with the usual 0.1ohms or so of crimp resistance at this time. I gave the internal wires a coat of clear polyurethane varnish to deter further corrosion, and changed the connectors to soldered gold types for peace of mind.

It becomes clear that we should pay attention to the condition of our servo wiring, and perhaps unplug and re-plug the Rx connections from time to time. My course now with these servos is always to open them when new, varnish the wire conductors and change the connectors. That should obviate the need for periodic inspection. Listening to the motor noise with a radio provides an early warning of the next problem to face us - impending motor wear-out.

But what about the prang? Were the servo defects the cause, or the result of it? I wish I could say for sure. I can't believe that two servos failed at the same instant. One definite servo failure, plus crash-damage to the other, seems the more likely to me.

Colin Stevens



New Storage boxes for Thorney, Derek Honeysett, Peter Doe and myself install two new storage boxes at Thorney



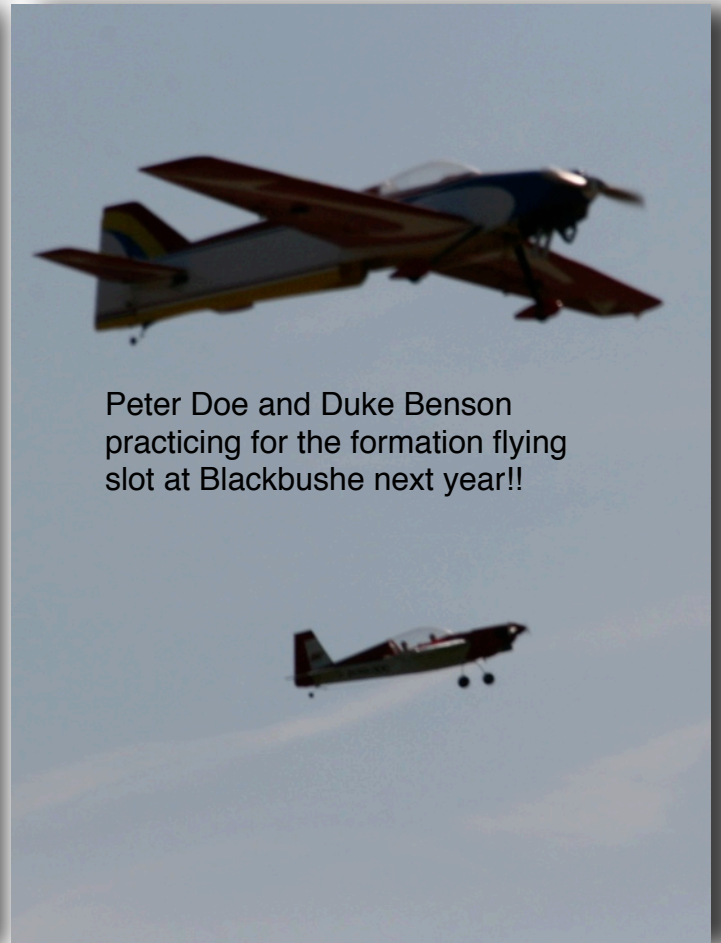
Oh Dear, this large scale Red Bull Extra goes in at Blackbushe after its four cylinder fuel injected engine failed



Looks as though the U/C has gone lets hope the plane will fly again



Thought about buying one of these in time for the electric glider event on Remembrance Sunday



Peter Doe and Duke Benson practicing for the formation flying slot at Blackbushe next year!!

EVENTS CALENDAR 2013

4 th June	Committee meeting	
6 th June	Goodwood	Evening Flying at Goodwood Airfield no flying before 18.00
13 th June	Club Night	Light flight and Control Line Fishbourne Playing Field
3 rd July	Committee meeting	
11 th July	Club Night	Light flight and Control Line Fishbourne Playing Field
21 st July	Porthole Farm	Porthole BBQ & Fly-in Electric Only
6 th August	Committee Meeting	
8 th August	Club Night	Light flight and Control Line Fishbourne Playing Field
15 th August	Goodwood	Evening Flying at Goodwood Airfield no flying before 18.00
3 rd September	Committee Meeting	
12 th September	Club Night	Chairmans Chat
1 st October	Committee Meeting	
10 th October	Club Night	Balsa Brain Quiz & Chairmans Chat
6 th November	Committee Meeting	
14 th November	Club Night	AGM
3 rd December	Committee Meeting	
12 th December	Club Night	Subscriptions for 2014

*Competition Calendar &
Other Events 2013*



Date and Day	Time	Event	Venue
Saturday 22 nd June	11.30	Scramble i/c only	Thorney Island
Saturday 13 th July	11.30	Scale	Thorney Island
Sunday 21 st July	All day	BBQ, Electric only	Porthole Farm
Saturday 10 th August	11.30	Open Glider	Thorney Island
Saturday 17 th August	11.30	Open Glider	Thorney Island
Saturday 24 th August	11.30	Open Glider	Thorney Island
Saturday 21 st September	11.30	Loops, Rolls & Spins	Thorney Island
Sunday 10 th November	12.00	Open Glider fun day & Electric Duration Donation to Poppy Fund	Thorney Island



Nesting season at
Porthole

A Keith Watts Production

Please Try to leave
Porthole as tidy as
possible making
sure no fuel is left
on site

When
Driving
Around Thorney
be aware of young
children on bikes

New Medical Emergency Information Cards have been produced to allow members to record personal information that would be useful in the event of illness or injury on our flying sites.

They are not compulsory and will be issued to members by the Membership Secretary on request at club meetings.

A REMINDER OF FLYING TIMES AT THORNEY

Saturdays and Sundays Only

10.30 Electric only (No Ducted Fans), 11.30 for Electric and IC.

No flying after 18:00 hours

Thorney may be closed for access and flying from time to time as per notices posted Clear Dope and on the web site

www.cadmac.co.uk

Please also note that members can bring guests to Thorney and Porthole however if they fly they must fill in a guest flying form and they can only fly on three occasions in a year if they are not BMFA members. This is a condition of the BMFA insurance

New pass system for Thorney Island.

Due to a change in the organisation at Thorney Island, existing civilian car passes will cease to be valid as from 15th May 2013. The process for gaining access to the Island thereafter will be through the collection of a temporary car pass via the Main Entry Point gate post which must be returned on exiting the establishment. Temporary passes will be issued for a vehicle and its occupants provided that:

- All individuals are registered on the Club's membership list as held at the gate post.
- All vehicles are road legal and details (Make, Model, VRN) held on membership list.
- All vehicle occupants provide photo identification (driving licence or passport) to cross-reference with membership lists on entry.
- Users accept vehicle searches on entry and departure.
- The vehicle and occupants only use and park at the facility of which they are a member: other areas of the Island remain out of bounds, and military personnel will challenge breaches and are empowered to remove passes and escort non-compliant personnel off the Island.

Permanent vehicle passes will be withdrawn by military personnel from 14 May 13, and temporary passes issued from then on. Please note that all those requiring temporary access must pull into the lay-by prior to the barrier and enter the gate post to receive a vehicle pass.

In order for the Club to provide the necessary information to Thorney Administration, all members who wish to visit Thorney in the future MUST submit to Malcolm Farrington (mfarrington52@aol.com) and Tony Chant (t.chant11@btinternet.com) the Vehicle Make, Model and Registration Number before 30th April 2013, to allow the creation of the necessary list. (Please also send details of your second vehicle if applicable.)

Note that if a vehicle is changed, the same information for the new vehicle needs to go to Malcolm and Tony as soon