The articles and views expressed by our members, are not necessarily the views of the editor or committee and therefore we reserve the right to modify and or refuse an article if it is considered in the best interest of the club.

Chichester and District Model Aero Club

Committee 2005

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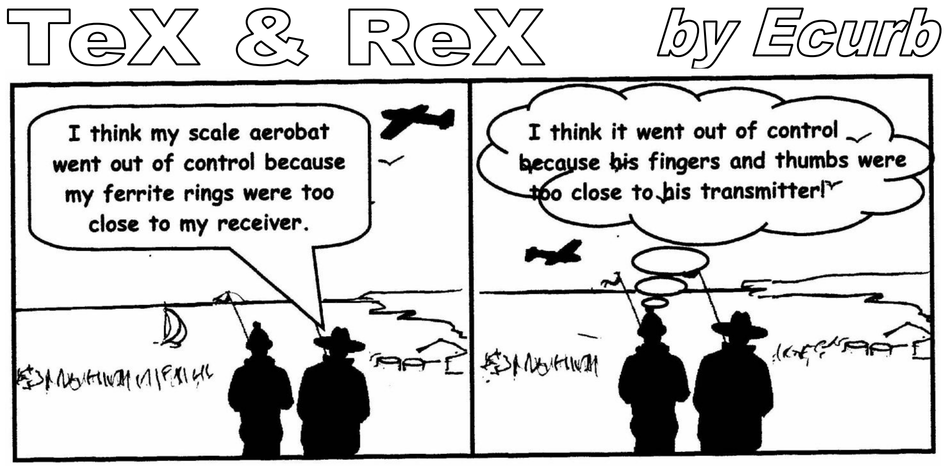
Cover photo:
Mick Blundell and Ray Beadle start Mick's 3D before an excited group of youngsters from the 'Little Green' Boys' School.

DIARY OF COMING EVENTS

30th July	Hastings Show	FULL	
06th Aug	12.30 Thermal Glider		Thorney Island
11th Aug	Flying Club night - Free flight, R/C Park Flyers and C/L		
13th Aug	12.30 Thermal Glider		Thorney Island
13th Aug	2.00-5.00 Indoor Flying		Seaford College
27-29 Aug	BMFA National - Barkstone Heath, Lincs		
8th Sept	DVD and Video Club night.		
17th Sept	Southern Model Air Show	5 places	
1st Oct	CADMAC Open Scale Symposium		Thorney Island
13th Oct	2nd Auction night.		
10th Nov	Talk by John Farley - Harrier Test Pilot		
8th Dec	Annual General Meeting.		



FLAPS, THEIR USE By Roy Vaillancourt

Flaps! What are they for? Very simply put they are used for three things: Take-offs, Landings, and Slow Flight.

As this Giant Scale movement gains momentum and more and more large, heavy WW II type models appear on the scene, the need to understand and use flaps is becoming of greater concern. In a nut shell and generally speaking... Flaps are used to lower the aircraft's stall-speed. That is, let it fly slower before it falls out of the sky and strikes terra-firma.

Flaps can also be used as an air brake if they are of the very large variety and are used in an extended at severe angles. When flaps are used in the extended mode of between 5 to 25 degrees they give the aircraft two aids for safe flight: 1) Increased lift at a slower airspeed without a significant increase in drag, and 2) They help induce a form of wash-out to the wing. This is seen in the centre or inboard portion of the wing now has a relatively higher angle of attack in comparison with the section of the wings where the ailerons are. This feature helps prevent snap rolls at slow airspeeds. The wash-out effect alone should be enough to help convince all P-51, P-40 and similar type aircraft owners to use partial flaps during critical flight phases such as landings and take-offs. Flaps should be constructed in a similar fashion as the ailerons. However, it must be taken into account that the flaps generally have a greater area than ailerons and they will be required to support a greater portion of the aircraft's weight. This factor should determine the size, number and placement of the flap hinges. Always use two or three more hinges on each flap than what you think is really needed... Better safe than sorry!

Flaps are generally actuated in a number of fashions similar to the ailerons. Torque tubes are very popular and compact. If this method is used, be sure to use a torque tube of sufficient size and support it at each end as well as through each rib with adequate bearing blocks. Some modellers prefer the bellcrank and linkage system This also works very well. Again, always be sure to support all the linkage through each rib, etc. Regardless of the type of actuation system employed, it will always be best to set it up so that all linkages, etc. are in tension when the flaps are down. Remember that while in flight, the airstream will attempt to blow the flaps back up. It is this ease that we must design for.

On smaller aircraft one servo was used to actuate the flaps. Everything worked fine and dandy. On larger, heavier aircraft (approx. 20 Ibs. plus) it should be common sense to use one servo on each flap. After all you are probably using one servo on each aileron!

The use of flaps during take-off will really surprise the new user. The aircraft will become airborne sooner, feel more stable and will climb out better. Almost all by itself! After climb-out "slowly" raise the flaps as airspeed increases. Generally half to one-quarter flap deflection is used on WW II ships during take-off. Landings will be (or should be) nice and gentle, the flaps should he lowered during the down wind to base leg portion of your landing approach. The amount of deflection will be determined by wind speed and experience. Never lower the flaps at 3/4 to full speed. You may see them part company from the aircraft.

As the aircraft descends the throttle should be used to control the decent more so than the elevator. A little practice and you'll he amazed how slow and soft that lead sled WW II ship can fly. TRY 'EM - YOU'LL LIKE 'EM... Happy Landings.

(***Submitted, from the Web, by Colin Steven***)

Editorial

Bit of a technical edition this month! What with an article on 'Flaps' and Mike Notter's very detailed investigations on 'Antenna.' No one can accuse CD of 'dumbing down!'

Seriously though, Mike's article will be beyond the majority of our membership, yours truly included, but it's worth battling through and concludes with very simple sound advice. I'm sure I'd have still had my 'fly-away' Giles if I'd read this six months ago.

R/C SCALE SYMPOSIUM

Sadly, Southern Area BMFA have had to pull the plug on our planned Scale Weekend 1/2 October. Ken Knox our SABMFA Rep reports that most of the 'Big Boys' couldn't be bothered to trundle down to little 'Chi,' certainly not without perks and expenses paid.

So your editor has stuck his head out of the trenches and volunteered to organise a scale event or (symposium if you want to be flash.)

Over the last couple of years I've noticed quite an increase in the appearance of scale models in the club. Not just war-birds although as you'd expect they are particularly popular, especially since so many good ones are now produced in ARTF form. As you've probably gathered I'm still hoping to enter my Brian Taylor Plan, P51D 'Twilight Tear' in the F4C Clubman event at the Nats this year as I'm personally very keen on scale - so I thought I'd run a flying only event where entrants had to conform to a little of the F4C discipline and so help enhance the quality of the scale flying within the club. Entrants will be expected to call and fly a schedule of ten manoeuvres (five compulsory and five selected from a list of options) mainly within a space frame of 100m at an elevation of 60^0. Each manoeuvre is scored out of 10 and has a varying 'K' factor.

I'd prefer it to be CADMAC members only but we'll probably have to open it to Southern Area to make the numbers viable.

All you need to enter is BMFA insurance and a scale model - from ARTF to scratch built. Contact me at your very earliest if you're interested and I'll let you have further details.

CONGRATULATIONS

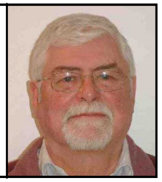
To **Ray Beadle** for gaining his BMFA 'B' Certificate. Ray (ex. Competition Secretary) took part in the Precision 'A' competition last month but elected to fly the 'B' schedule instead.

Also to **Trevor Burley** who is now a qualified 'B' Certificate Heli Flier. Obviously those £80 rotor blades did make a difference then Trev!

Bruce

Minutes of the CADMAC Committee Meeting - Tuesday 15th July 2005 8.00pm

from trevor bowry - hon. secretary



Apologies
J. Riall, T. Bowry

Matters Arising
None

Present
T. Chant (Chair), A Missellbrook, K. Knox, M. Campbell, A. Gibbs, M. Blundell, R. Hemblade, H. Walton, B. Smith (acting secretary)

Correspondence
The October Scale Forum has been cancelled.

Club/Membership Issues
Bank want to bring files up to date and further form filling is necessary to make chair a signatory. A new form was presented for Lloyds TSB Acc. and countersigned by K. Knox and B. Smith.

Just one new member had been vetted.

Monthly meetings/Social Events
All under control. John Farley confirmed for November meeting.

Competition Programme
Bomb drop competition cancelled on 24th June.
Precision 'A' to take place as planned

Training
Quiet period, mainly because of external shows and event currently in progress

Safety
TX frequency control checker worked well at Gala Day providing sufficient space between TX and checker.

Communications
Printer has had new print head fitted and been serviced at a cost of £110. Now working well again.
Pilots' handbook discussion was shelved until next meeting. Bruce to print some June 2005 editions for Alan Misselbrook to distribute to new members.

under a gale force wind he gave a fine exhibition of control and gentle aerobatics accompanied by whoops and cries from the gathering. All this excitement makes one hungry, of course, and the staff broke out the provisions so the school could eat while they watched Mick and Ray demonstrate progressively wilder aerobatics first with the club trainer and then with Mick's 3D model. The kids were, quite naturally, just bursting to have a go so you can imagine their hype when Ray and Mick explained how they would take them up, one at a time, on the club's Buddy Box System, which they'd only configured for the first time that morning.

The system worked really well as Ray on 'Master' and Mick on 'Slave and tiny hands' repeatedly defied the element and adverse inputs to somehow keep the trainer airborne and in one piece.

One little angel poses with Frank's Super 60

Too soon it was time for the group to pack up and head back to school but not before they'd said a big 'Thank You' to the CADMAC members for all their efforts.

It really was an excellent morning and I'd like to add my appreciation for the staff and their control of the children in what was potentially a very dangerous situation.

Our guys, of course, did themselves, CADMAC and Aeromodelling in general a great service. They were determined not to disappoint the children and flew very safely in what would generally be considered to be far too windy conditions. Hopefully they'll have sparked off an Aeromodelling flame amongst some of the pupils along with a realisation of what you can achieve when you can keep your emotions and your behaviour under control.
I think the behaviour going home on the bus would be quite excellent anyway, as the staff went off with a large bundle of glossy RCM&Es as bribes!

Bruce

A DAY OUT FOR THE BOYS

School's boring!
But not for the pupils of 'Little Green' Boys' School. They'd been looking forward to their end of term outing for a long time and they certainly weren't disappointed.
The visit had been organised by CADMAC member Frank Lawton (2nd from right) when he approached the committee for permission to bring the boys along to a flying session. Mick Blundell had quickly agreed to host the event on our site at Porthole Farm and so ably assisted by Ray Beadle and of course Frank we awaited the arrival of the school minibus on the morning of Tuesday 19th July. (I was there wearing my JMPC hat to ensure that if any child abuse took, place it was done correctly!)
Just a little after the arranged time (trying to find the field) the convoy swung onto the flying site and parked up in the barn yard. The pupils and staff (in a ratio of 4:1) looked very excited and after an initial safety briefing and death threats to a couple of the pupils they all alighted from the transport and proceeded to a display of models set out on a trailer top in the yard. There were lots of interested questions: How fast do they fly? How high can they go? How much do they cost/ Can I take one home! Then Mick temporarily lost his audience when one of the boys spotted a rat making good his escape!
Next, on to the field and another safety briefing and a bit of a physical Geography lesson as the dangers of the site were explained. (All the safety signs had, of course, been put in place long before their arrival.) Then it was time for the greatest fun to begin. Frank gave a necessarily simple explanation of how his tranny controlled the aircraft then it was engine started and in a little

Thorney Island
No major problems.
Control-line day was a fiasco with military ops all afternoon.
T. Chant has produced new box signs for both areas. M. Blundell has produced new No Access signs for the C/L / Heli area.
In future a maximum of 4 only aircraft will be allowed in the air at any one time at the main i/c site and 5 glider/electrics on the far grass area. Heli and c/l will take turns where necessary.

Trundle
New signs in production/

Porthole Farm
On Tues 19 July a group of 12 special needs pupils will visit PF to experience model flying. Arriving 11.30 with Frank Lawton. Pupil/teacher ratio 4:1
M. Blundell and B. Smith (JMPC) to attend.

Indoor
Bosham Hall on 29th July. 7.00 pm till late.
Seaford College 13th August. 2.00 pm to 5.00 pm

BMFA
Scale flying day at Winchester had been excellent. Some top scale fliers were reluctant to travel down to Chichester for the proposed Scale Forum.
Our pilots were invited to the Southern Area glider meet.
Special mention of the CADMAC Gala Day was given in the SABMFA newsletter along with a glowing report.

AOB
B. Smith to organise a non-competitive but structured Scale Event in place of the cancelled Scale Forum and on the same date.

DONM
Tuesday 2nd August

The meeting closed at 9.30 pm

Trevor.

Probably More Than You Wanted To Know About Model Aeroplane Antennas

Mike Notter July 2005

There has recently been some concern that certain model antenna installations may have been responsible for crashes due to signal failure. This is obviously an important issue, so I've put together the following article, which might throw some light on the concepts involved. I've assumed knowledge of Ohm's Law and some familiarity with the properties of basic electronic circuits.

Firstly, the wavelength (l) at 35 MHz is 8.57m. This means a typical model antenna of 1m is just 0.12l long, to which must be added the effective length of all the other leads (servos + batteries) which are connected to the receiver ground – giving, say, 0.15l in all. It is not often appreciated, by the way, that these 'other leads' are an important part of the antenna system, forming, in effect, the return RF current path.

One of the problems of short antennas (much less than 0.5l) is that you need a lot of RF electric current flowing on them to radiate even a small amount of power. The same thing applies in reverse[Y], i.e. you need a lot of induced current on the antenna to extract useful RF power and operate the receiver. If we assume that power radiated is equivalent to passing the current flowing into the antenna through a resistor ('radiation resistance'), then you can see that a short antenna will have a low ohmic value, according to the familiar relationship, Power = I^2R.

Now, a zero-loss wire Rx antenna of any length up to about l/2, will deliver approximately the same power to a load <u>provided</u> that load is matched to the antenna. This assumes, of course, that the frequency and receptions conditions don't vary. In Figure 1, I have shown a somewhat idealised model aeroplane antenna and some computer simulation results for the case where the incident transmitted signal arrives from the 'best' reception direction and the polarisation is aligned to that of the antenna. Notice that the radiation pattern is similar to that of a typical dipole, with nulls approximately aligned with the axis of the antenna. The equivalent circuit of the antenna consists of a voltage generator in series with the same impedance as that seen at the input terminals if it is used to transmit rather than receive. For our somewhat undersized antenna, this amounts to a small resistance (equal to the radiation resistance) and a large capacitive reactance. The latter is effectively removed from the circuit by incorporating an equivalent sized inductive reactance in the matched load, as shown in Figure 1. This means that the load current is simply Va/2R amps and the load power is: R x $(Va/2R)^2$ watts.

[Y] *Going a bit deeper, the principal of 'reciprocity' states that if we transmit through the Rx antenna and receive through the Tx antenna, then the reception is unaffected. Also, the transmit radiation pattern of an antenna is the same as when it is used to receive signals*

Computer analysis of the antenna in Figure 1 gives a received matched load power of 0.021W with 1V/m incident wave amplitude. Since R=2.25W, the value of Va is therefore just 0.43 volts. We now have all the antenna equivalent circuit parameters

The 'A' Test Schedule (Fixed Wing) Competition

It was a balmy, hot, cloudless day with a light wind changing directions every few minutes. It seemed that Tony and I were Judges/Examiners. Tony said, "You're entering if I do," laying a gauntlet at my feet. "Damn it!" I only brought my skittish little Mini Jazz. - Handicapping myself was appropriate.
Nine members entered with a wide mixture of models and all contestants, bar one, had at least an 'A' Cert. This was going to be interesting - as was the air activity, quite turbulent with two whirlwinds passing through as well. All contestants did well on the safety front apart from one who applied his starter to a backward running engine - naughty!
Most down-marking was due to poor rectangular circuits, a couple of thrupenny figure eights, three mishaps and one kamikaze attempt at landing within 30m which tore off the landing gear. One trainer went in after take-off. An AcroWot did the same due to a flat/faulty Rx battery but overall most did not let themselves down while holders of the 'A' Certificate.
The results show points out of a possible 90. No one was that perfect, even me! Morris Campbell came out the winner with his Dago Red Mustang which was unfortunately written off after the competition due to a broken plug socket connection and not interference as was first thought. Quite a carnage day in all, but a good flying day and competition. At the end of the day Ray Beadle went for his 'B' Test for real and passed with flying colours, so congratulations Ray. I averaged his scores and then divided by the nine sections of the comp to give him a score for the competition.

Morris Campbell with another of his much favoured Mustangs.

Final Positions

1st	Morris	75
2nd	Stuart	70
3rd	John	65
4th	Ray	64
5th	Harry W	60
6th	Bill	54
7th	Mick	27
8th	Tony	9
9th	Harry H	7

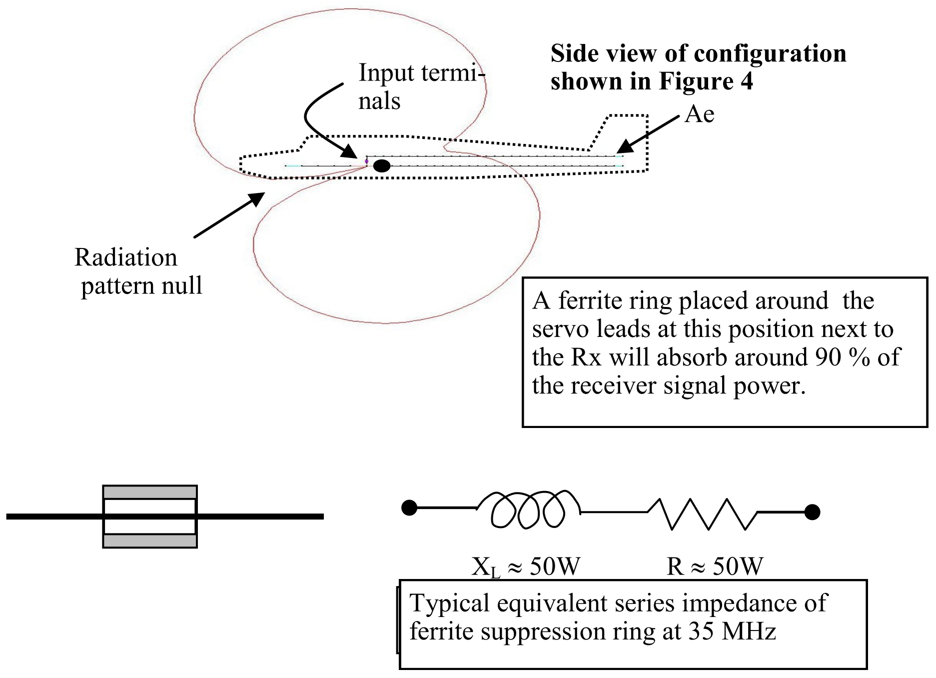


Figure 5 Poor Ferrite Positioning (Ref. Antenna in Figure 4)

Mike Notter

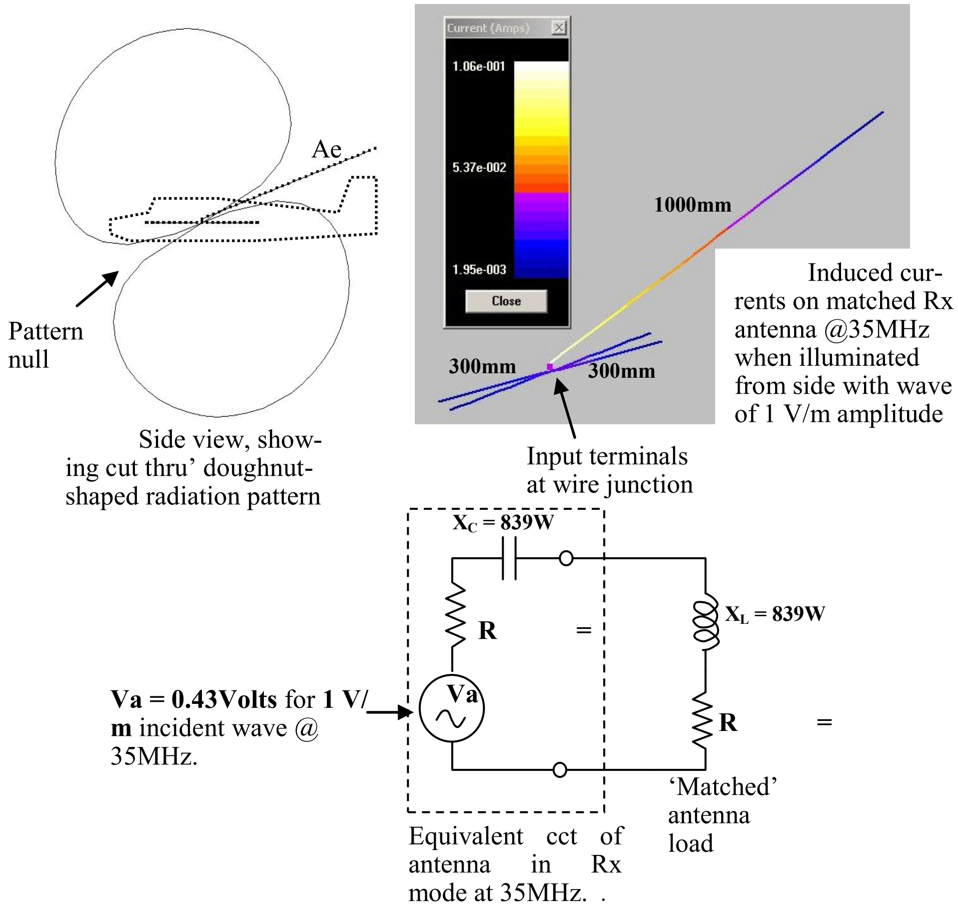


Figure 1 'Ideal Antenna Configuration Properties

and can replace the matched load with the actual load presented by the Rx. In this case I will consider the Micron 'Green-Bug' Rx, for which I happen to have the circuit details.

Before doing this, though, it is worth looking at a non-ideal Rx antenna arrangement, as represented here by the 'bird's nest' shown in Figure 2. I have routed the antenna wire so that it loops over one of the 'earthy' wires – a servo lead, for example. The analysis of this yields a radiation resistance of 0.82W and a series capacitive reactance of 838W. As the load power is still about 0.021W into a matched load, the

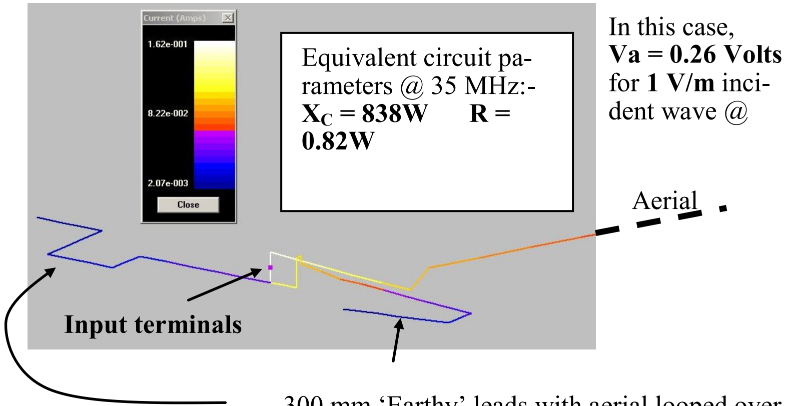


Figure 2
'Bird's Nest' Configuration With Re-

equivalent generator voltage Va has to drop to 0.26volts.

The trend should now be clear: as the antenna radiation resistance falls, then so does the effective antenna source voltage Va, as seen by the Rx. This would not be a problem if the Rx always presented a matched load to the antenna and no power was lost due to the inherent resistance of the connecting wires, coil windings, etc. Unfortunately, this is never the case and we end up with progressively less signal into the Rx.

Figure 3 shows the antenna matched load replaced with the above Micron Rx input circuit. The operation of this is actually quite interesting and can be explained quite simply – so here goes. Firstly, the 4.7pF input coupling capacitor serves to provide some isolation between the antenna and the Rx, a necessary measure since the designer has no control over how the antenna is deployed in practice.

The parallel tuned circuit is arranged to resonate a few MHz above the required reception frequency of 35MHz, so that it presents an inductive reactance to the antenna and the coupling capacitor. The coil forms part of a step-down transformer into the Rx front-end, where the turns ratio (here 4) sets the amount of resistive damping applied to the tuned circuit by the input amplifier/mixer stage impedance, and hence its bandwidth. The latter needs to encompass the whole 0.25MHz R/C range, so that the coil does not require retuning when changing channels.

Best reception occurs when the effective inductance reactance of the tuned circuit is made equal to the sum of the antenna capacitive reactance and that of the input coupling capacitor, i.e. all of the series reactances cancel. What we have done is create a

servo, as far as operating the servo is concerned. However, the servo loom also forms part of the antenna and will also carry the associated unidirectional RF currents. It is this current(s) only, that the ferrite will impede.

A typical ferrite ring, designed to present a 'lossy' impedance at VHF frequencies, may be assumed (at 35 MHz) to be roughly equivalent to having a series combination of a 50W resistor + an inductor of 50W reactance, in the wire at the position of the ring. These values need to be multiplied by the number of rings used or, alternatively, the square of the number of times the same wire is re-threaded through the ring.
Now, referring to the 'large model' antenna arrangement of Figure 4, suppose that a single ferrite ring of the above type is threaded over the tail servo leads next to the Rx, as shown in Figure 5. What happens to the antenna performance? After re-running the computer simulation, the antenna input resistance is found to have increased substantially (from 0.32W to 24W), while the capacitive reactance is only slightly lower. Unfortunately, this extra resistance does not equate to a desirable improvement in the radiating properties, but instead acts more like an actual resistor of the solder-in variety. In fact, the antenna efficiency drops from 100% (ignoring wire resistances, etc) to only 9% - meaning that 91% of the received signal power has been absorbed by the ferrite ring! The radiation pattern is largely unchanged. If the ferrite ring is then moved along the loom towards the servo, its effect on the antenna performance reduces progressively and becomes almost negligible at the servo end.

I think the lesson from this is clear: if you have to use ferrites, put them next to the servos! Whether they will effectively suppress the transmission of RF noise, which might emanate from the servo motor, is not clear. In my high-wing trainer, the aileron servo is next to the Rx and is connected via a lead of some 300mm in length. This arrangement has not yet caused any problems and no ferrite rings are used.

To sum up, then,
some golden rules getting the best range :-

Do not run the antenna wire close to and parallel with, the servo leads

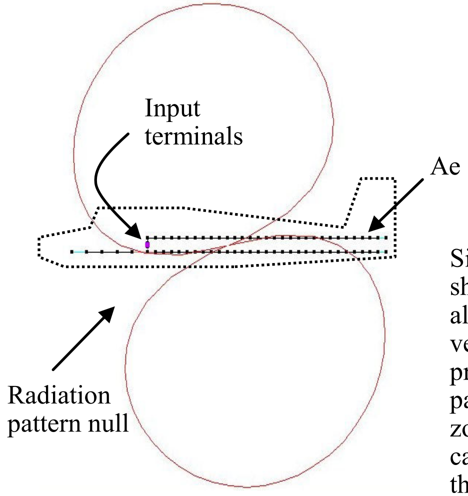
Do not tangle the antenna with the servo and battery leads at the Rx end.

Avoid cutting down the length of the antenna (unless a reduced range is OK)

Do not enclose the antenna in carbon fibre tubes (This material is opaque to the signal and could screen it out).

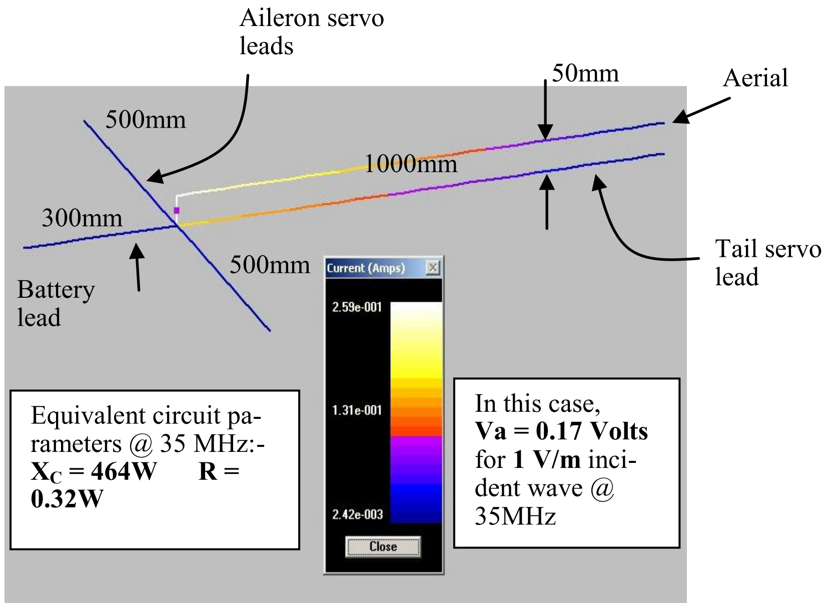
Do not put ferrite rings around servo or battery leads anywhere near where they enter the Rx.

HAPPY FLYING



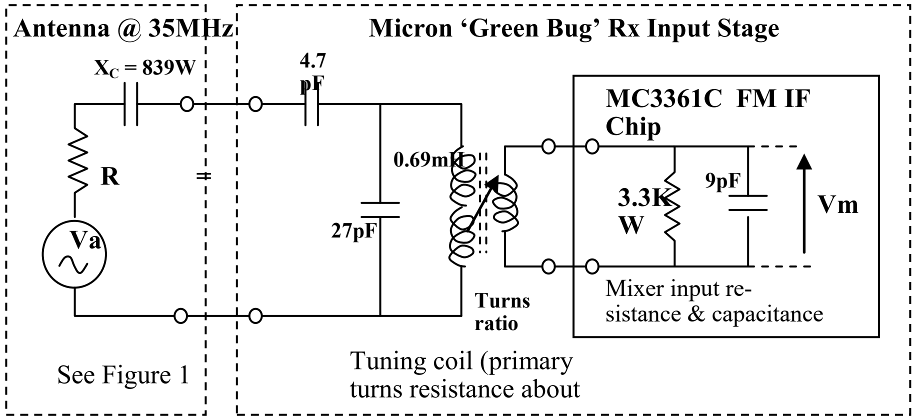
Typical 'large model' antenna configuration

Side view, showing cut thru' doughnut-shaped radiation pattern. The null is not along the antenna axis because the small vertical portion around the feed point provides a strong contribution to the pattern. In this arrangement, the horizontal RF currents are largely self-cancelling and ineffective, in terms of their impact on the radiation properties of the antenna.



Note: If the aileron leads are retracted (servo mounted in fuselage), **X_C = 527W R = 0.08W** and **Va = 0.086 Volts** for **1 V/m** incident wave @ 35MHz

Figure 4 The Effect Of Having A Servo Lead Running Parallel With The Aerial (compare to Figure 1)



Maximum (saturated) Rx output occurs when Vm =

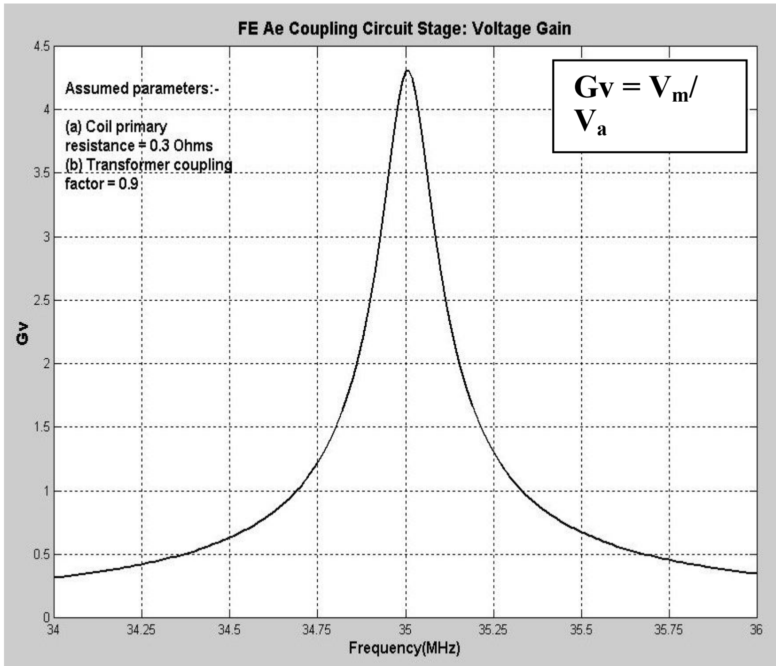


Figure 3 'Micron' Rx I/P stage and Response With 'Ideal' Antenna Connected

resonant *series* tuned circuit (of which the antenna is part), which ensures that maximum possible voltage is generated across the coil winding. With the 'ideal' antenna of Figure 1 connected, the voltage Vm into the Micron Rx mixer can be related to the antenna generator voltage Va over a range of range of frequencies, as shown in Figure 3.

At this stage, you can see that the overall tuned Rx response relies on the antenna having fairly stable, non-resonant impedance properties. The last thing we want with this set-up is to have a tuned antenna with an impedance which is highly sensitive to the local environment.

Now we come to crucial question: what is the Tx/Rx range and how does it depend on the radiation resistance of the antenna?
Colin Stevens tells me the typical RF power output of an R/C transmitter is about 20mW. On this basis, let us suppose that this power spreads out uniformly over an expanding spherical shell (I am ignoring the presence of ground reflections and other effects). At 1000m range, the RF power flux is thus:

$$0.02/(4p \times 1000^2) = 1.6 \text{ nano-W/m2}$$

The corresponding electrical field strength incident at the Rx antenna (using 377W as the impedance of free space), is:

$$\text{Square root of } (377 \times 1.6 \times 10^{-9}) \text{ V/m} = 0.77 \text{ mV/m}$$

With the ideal antenna in Figure 1, the value of the generator voltage Va is thus scaled down from its value of 0.43 volts for 1 V/m incident, to give Va=0.33mV (By the same token, the 'bird's nest' arrangement would give Va=0.2mV).
As the voltage gain of the Micron input tuning circuit from Figure 3 has a maximum value of 4.3, (assuming some resistive loss in the tuning coil), then the voltage applied to the mixer stage is just 0.33mV x 4.3 = 1.4mV.

From the data sheet of the Micron MC3361C FM IF integrated circuit, the maximum output occurs for a nominal RF mixer input voltage of 5.2mV. However, the IF stage of an FM Rx possesses very high gain and is non-linear. On receipt of a signal, or even as a result of the internally generated noise, it will saturate and clip the signal. This is quite normal and, in fact, responsible for its superior interference rejection properties compared to AM. The slight sting in the tail is that it also gives rise to a 'capture effect' which can force the rejection of the wanted signal once an interfering signal exceeds a given threshold level. Standard practice is to arrange for the wanted incident signal power to be at least 4 times that of any potential interference and also sufficient to give a signal to noise power ratio at the Rx output of 100. The MC3361C data sheet implies that a minimum operating input voltage of 20mV would be satisfactory.

Hence it seems we have an extremely healthy x70 voltage margin before the R/C

link starts to look vulnerable, which is equivalent to a received power margin excess of nearly 4900, or 37 decibels. The situation in practice, though, is somewhat less optimistic, due to the following:-

- Both the transmitter and Rx antenna radiation patterns have ripples and nulls, which could easily reduce the received signal power at the model by a factor of 100.
- Fairly sever polarisation mismatch between the Tx and Rx antennas can be expected, since the model antenna is close to being horizontally polarised, while the transmitted signal will tend to be mostly vertically polarised due to ground effects. A typical reduction in the signal power level of (say) a factor of 4 can be assumed.
- Image channel interference :- an incident signal at a frequency removed by 2 x 455KHz below that of the channel in use, will not be filtered out by the IF stages in the Rx. The only rejection is from the RF stage tuned response, which is probably insufficient to prevent communication failure in practice. Solution: get a dual-conversion Rx.

If the above is added up, then the original power margin shrinks by a factor of 400 to 12.3 (or 10.9 decibels), which is still quite reasonable and is acceptable from a safety point of view (the last thing the R/C equipment manufacturers want, is to get sued if an accident occurs).

Having said all this, it is possible to severely erode this safety margin by adopting 'inadvisable' antenna configurations and also by the inappropriate use of ferrite rings. Consider the antenna layout in Figure 4, as sometimes seen in large models, in which servos are mounted in the rear of the fuselage. The associated 'earthy' servo leads run close to and parallel with the antenna wire and couple very strongly to it. The computer simulation result for the example shown, indicates a big drop in radiation resistance and a halving of the antenna reactance, as compared to the above previous cases. This yields a reduced value of Va, here equivalent to an effective net reduction in the received power by a factor of 6.4, compared to that for the 'ideal' antenna in Figure 1.

It is worth mentioning that the aileron servo leads appear to play a critical role in preserving what is left of the antenna performance. If they are removed (simulating a centrally mounted aileron servo), then the effective power level into the Rx falls by a factor of 25, rather than 6.4.

Finally - what about ferrite rings? These come with a whole range of electrical properties, according to the manufacturing process and the physical dimensions and are intended to block uni-directional RF currents. This means that if a ring is threaded onto (say) a pair of wires carrying equal and oppositely directed RF currents, then it will have absolutely no electrical effect. If the currents are not equal (unbalanced), then there will be net flow direction and the ring will act to suppress this component only. Note that the 3-wire servo loom constitutes a 'balanced' current system into the