

**Dave Clarkson introduces plans for a Russian R/C combat wing, designed by Anatoly Litvinenko and Viacheslav Beliaev**

I first visited Leningrad (as it was called then) on a business trip in the spring of 1972. It was a grey, oppressive place, populated by silent, unsmiling people who just didn't want to talk to or even help any foreigners. My enduring memory was of the leader of the Russian client team who spent his time in the business discussions

information, that I had ever seen. Up until then I didn't even know that much R/C was flown in Russia, never mind anything as good as this!

I have since visited St Peterburg quite a few times and good impressions of the people and their modelling prowess increase with every visit. On my last trip I went flying with Viacheslav Beliaev, soon to become the only C/L combat flier in history ever to have successfully defended his World Champion title, and was surprised to find that we were going out to fly his R/C combat flying wing. Not being an R/C pilot at all, I declined, but was able to take considerable pleasure in watching what Slava and his 'teacher' Anatoly



# COMBAT KING

shouting at me and calling us 'Capitalist Pigs' and the like. Nothing could be good about this awful place, I thought, and so it was with considerable trepidation that I returned there in 1990 for a Control Line (C/L) Combat contest, if only to see how things were changing under Gorbechev and how the Russian aeromodellers had got to be so very good, which by then they had become in Free Flight (F/F) and C/L.

This second visit turned out to be very different indeed, for the Russian people were now very friendly and wanted to talk, learn and show us everything. I learnt a great deal about aeromodelling, the World and everything! One of the things that astonished me at this contest was at the 'Opening Ceremony', where the local R/C fliers put on the best display of R/C combat flying, both with streamers and

Litvinenko were able to do with their 'Combat King' models. It was almost like watching a F2B C/L aerobatic model being put through the schedule – squares, eights, triangles, insides and outside loops – the lot done smoothly and close in when wanted. I took a photo and sent it with a letter describing what I had seen to the Editor, and he not only published the picture (Nov '92 issue), but also asked me to try and get the plan and some photos for publication. Here it is and I hope that my inexpert scribbles will help any of you who want to have a try with one of these most unusual 'Combat King' models to do so without too much difficulty. In writing this I must express my thanks to Slava for his help in explaining the 'how to's' when we met at the last C/L World Champs, for whilst there he had something much more important to do – like winning!

## Construction

I am not going to bore you all stupid with a 'stick A to B' description, if only because it is not necessary. This is a very simple model to build, having very few parts, and all of these are simple shapes and from relatively large section materials. The plan calls for metric wood sizes that are not generally available in this country, despite the fact that we are supposed to have converted to metric some years ago. No real problem though – when it says 4mm or 5mm balsa, use 3/16"; when it says 3mm pine, use 1/8" spruce and when it says 1, 1.5 or 10mm veneer, use 1/32", 1/16" or 3/8" plywood. If you don't fancy laminating the 1mm veneer and the 2mm balsa sheets (1/32" ply and 3/32" balsa) together for the fuselage sides, then 1/8" plywood can be used in its place,

*Seems like aeromodellers the world over wear the same gear – denims and a pair of trainers! Here's the designers, Anatoly and 'Slava' (holding the model). Top right shot shows off the large size of Combat King. A 2.5cc motor provides more than enough power.*

especially if you are using a .20 size R/C motor instead of the STELS 15 F2D C/L combat glow called for on the plan (since the STELS weighs just 4.5 ozs). For the wing trailing edge (T.E.) use 1/2" sq. strip balsa and for the elevons use 3/8" sheet balsa.

The unusual wing construction comes from current C/L combat practice where it is the norm, for the very good reason that it gives an immensely strong and rigid structure for not much weight. You will not believe how strong and rigid it will be. The trick here is to hot-wire cut 2" thick EPS (Expanded Polystyrene) foam blocks, both exactly the same shape, to the planform shown. Then glue, using white PVA, the 1/16" ply spar to the centre of the rear face of each panel, followed by the root and tip ribs, accurately positioned one to the other and to the spar so that they line up with no wash-in or wash-out. Where the ribs stick to the foam blocks, they should have their top and bottom profiles 1/32" thicker than shown because they form the guides for cutting the foam to section using a hot wire cutter, proceeding from the spar forwards so as not to get the wire arrested by the balsa grain that follows.

Now attach, with pins, guides cut from 1/32" ply to the front of the root and tip rib outer sides, to cut the L.E. slot. This should be 1/8" deep, tapering from 1/2" wide at the root to 1/4" wide at the tip. To match the slots in these ribs, make the guide slots 1/32" undersize on each cutting surface to allow for foam melt-retreat when hot

wire cutting. Now cut the L.E. slots and glue in the pre-tapered spruce L.E. strips using PVA.

Once the white glue holding the tapered spruce LE strips in the foam has fully dried out (allow at least one full day for this), sand, using fairly fine Aluminium Oxide sandpaper around a sanding block, the root and tip ribs and the spruce LE strips so that they conform with the foam profile. Gently sanding the foam surfaces smooth whilst you are doing this is also a good idea to ensure that the finished structure, when covered, is smooth and projection free.

## On paper!

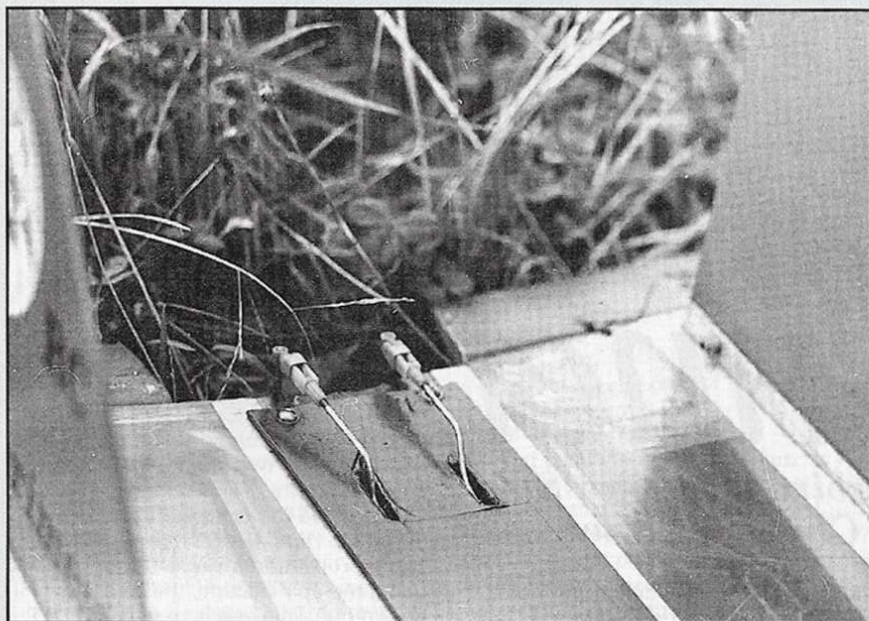
At this stage the foam leading edge structure should be paper covered, including overlaps onto the ply spar, using gift-wrap paper or, even better, unperforated computer printer paper. Use wallpaper paste, applied to both paper and foam, then brush the paper free of wrinkles, smoothing down in place immediately the paper has been applied. Leave the paper/foam/wood structures in a warm room, well away from any heat source, for a couple of days for the paste to completely dry-out before gluing the remaining parts of each wing in place. Do not omit this paper covering, for it performs a number of vital functions, giving the structure almost all of its rigidity, as well as providing an essential insulating layer to protect the foam from heat and solvents when the covering is applied.

All that remains, now that you have two almost finished wings, is to assemble the fuselage, glue the wings and spruce wing joiners in place, followed by the ply boundary strips on the top and bottom surfaces at the root ribs, and the top surface of the No.1 ribs where the fin will bolt in place.

It is a good idea to check and, if necessary, correct the lateral balance of the model to avoid the possibility of having a heavy tip cause an unwanted turn tendency in flight. Do this after the 1" sq. balsa tip blocks have been added and sanded to shape by gluing, with 5 minute epoxy, appropriate bits of solder into the light tip.

The plan calls for Solarfilm covering and this should prove to be an easy job because of the simple shapes involved. The original models I saw in Russia were covered in 25 micron thick clear polyester film, again following F2D C/L combat model practice. This material is used in C/L Combat because it has proved to be vastly stronger and tear resistant than some other covering materials and is, together with the STELS motor and many other Russian contest materials and motors, now available in this country from: ENGINES FROM RUSSIA, 100 Lowfield Road, Stockport SK3 8JR. Tel/Fax 061-477-7395.

You will have noticed, from a close look at the plan, that the motor is mounted on a 3/8" ply plate, so positioned as to provide a little left side and down thrust to the motor. This is necessary to give a neutral flying model.



It is possible, if you are not planning to use the high revving STELS motor called for on the plan (incredibly noisy too!), but rather a 'cooking' .20 size R/C motor, that because these are much lower revving motors, the side and down thrust requirements will be different. In this case it may well prove much better, and at the same time easier, to use a normal R/C radial mount installed onto a 1/4" plywood bulkhead in the fuselage. With such a conventional motor mount it will be much easier to trim the thrust-line to give neutral and straight flight characteristics. No doubt Slava would have done this if such things were sold in Russia! Equally, I am sure that he would have used a 4 oz plastic 'clunk' tank, instead of the 100cc metal version shown on the plan, if he could have found one.

For anyone who has built a few R/C models, finishing this one should be easy. As a non-R/C flier myself, I wouldn't even dare to try to give instructions. All Slava told me was that it is very easy and that he had just followed what he had seen on the few R/C aircraft he had seen in the West.

As to what R/C gear is right for this model, well what can I, a non R/C flier, say? All I can say is that both of the Russian designers use Futaba Challenger 6 sets on dry cells. This Futaba equipment seems to be the standard for use in Russia, but is not available in Russia. Both of their sets of gear were bought here in Manchester!

Since the control of the model is effected by elevons then the use of an electronic or mechanical mixer is necessary. Slava uses the usual sliding tray mechanical mixer on his 'Combat King' and no throttle on his STELS motor.

His co-designer, Litvinenko, uses a throttle equipped TYPHOON 2.5K glow on his, and this makes his version more flexible in terms of what he can

do with the model in the air. The TYPHOON, like the STELS, is a front induction, twin ball race, 12mm shaft, twin stack, rear exhaust, ABC, Schnuerle glow, but of lower performance and therefore price (would you believe £25 in this country?) and he added a throttle that looked very much like the simple airbleed type found on the smaller OS motors. I am sure that a 'Combat King' would perform just like the Russian originals when fitted with one of these motors.

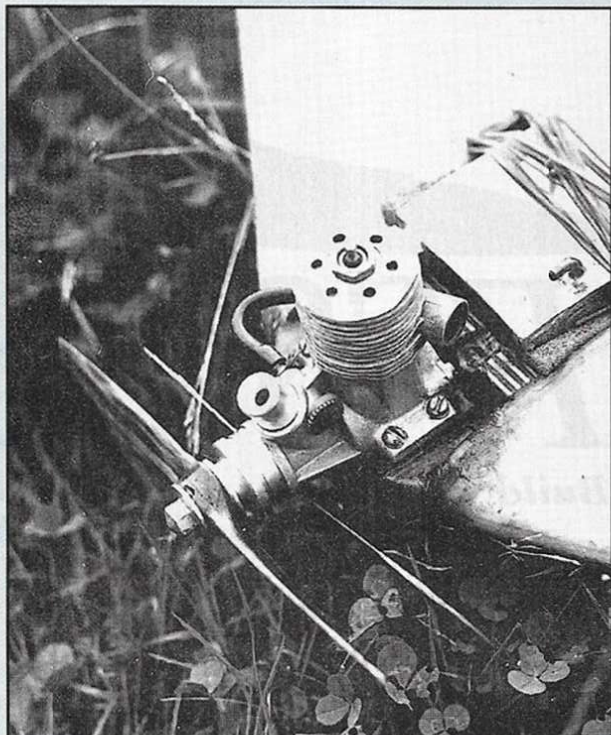
## Flying

With such an agile model, some care needs to be taken in fitting the radio gear and when flying it for the first time.

The plan shows the permitted CG range. The location of the battery pack, receiver and servos in the short and boxy fuselage should be made to place the CG within this range – further forward and the model will be sluggish in flight, further back and it will be uncontrollable. The same care should be exercised with regard to wing warps – there should not be any and time spent in checking for and, if necessary, removing these will be well rewarded.

The Russian originals I saw had about 30 degrees up and down movement on each elevon and in the air they acted as though this was as much as you would want since full control deflection (up, down, roll left or roll right, or any combination of aileron and elevator) certainly produced spectacular results.

It follows that it would be a good idea to use reduced control throws for those first flights and to be prepared for big trim inputs in case motor thrust line adjustments are needed, or if warps are still present. Once you have got your 'Combat King' fully trimmed out you can move



progressively to the maximum control movements indicated above – then you will find that you have a tiger by the tail!

Hand launching is an obvious requirement and this should be done straight into the wind, with the nose slightly raised. A bit of a throw is necessary to get the model into the air, but not that much, for this is a light model for the power available and its wing loading is low. This low wing loading makes for gentle landings, but not very accurate ones, so make allowances for this at the end of those first flights. Such little warnings as these will be found appropriate for any highly manoeuvrable R/C aircraft and I hope that they don't put you off having a go with 'Combat King', a very different model from Russia. ●

*Prototype used a STELS 15 F2D C/L combat motor, propped by a 6.4 x 3.5 glass prop, both available from 'Engines From Russia'. Right: Close up on the elevon links. Use a sliding mixer, an electronic mixer or computer radio – it's your choice!*

## DATAFILE

### Plan Specifications

Name .....	Combat King
Designed By .....	V. Beliaev & A. Litvinenko
Aircraft Type .....	Aerobatic flying wing
Wingspan .....	1340mm
Wing Chord .....	180mm (tip), 480mm (root)
Wing Area .....	44.2sq dm (685sq ins)
Aerofoil .....	Symmetrical – 13.9% tip, 10% root
Dihedral At Each Tip .....	None
Fuselage Length .....	440mm
Fin Height .....	170mm
Engine Range .....	15-20cu ins
Fuel Tank .....	4oz
Rec. Number of Channels .....	3
Control Functions .....	Elevons and throttle
C.G. (from L.E.) .....	210-220mm
Elevon Throws .....	+/- 30 degrees
Sidethrust .....	3 degrees
Downthrust .....	3 degrees

### Materials used in Construction

Fuselage .....	Balsa and ply
Wing .....	Ply, spruce, balsa and foam
Weight Ready to Fly .....	30-35ozs
Wing Loading .....	7ozs/sq ft