CAP 232

REVIEW BY: DERECK WOODWARD

The electrification of Great Planes CAP 232 for IMAC competition - will it work?

My introduction to Great Planes' CAP 232 was at a Fun Fly in Virginia, when designer Michael Cross gave a stunning demonstration of what can be done with a 60" (1.5m) model, an OS 70 Surpass and a four servo RC. After rolling circles, near-vertical descents into hovering with the rudder inches above the grass, knife edge spins, low and slow knife edge and the like, it was obvious that if you can't do it with Great Planes CAP 232, you are the limit!

I also met his wife, AnnMarie - Great Planes Product Support Manager. Have they got it together? AnnMarie discovered I flew electrics, asked if I thought the CAP could fly well enough on electric power for IMAC competition, and the result is here. She'd had plenty of electric 'advice' - someone suggested she'd need seven 1000 mAh cells for real power!

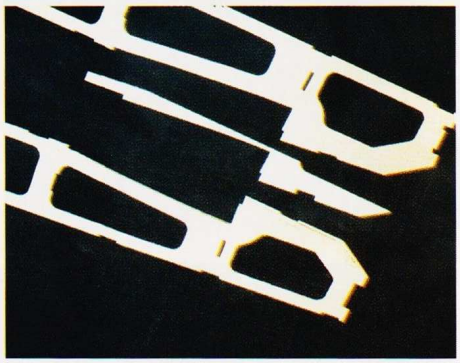
The Rules!

There are two rules in Glow to Electric Conversion -
Rule One - Don't mess with the aerodynamics.
Rule Two - There isn't one!

Woodwork

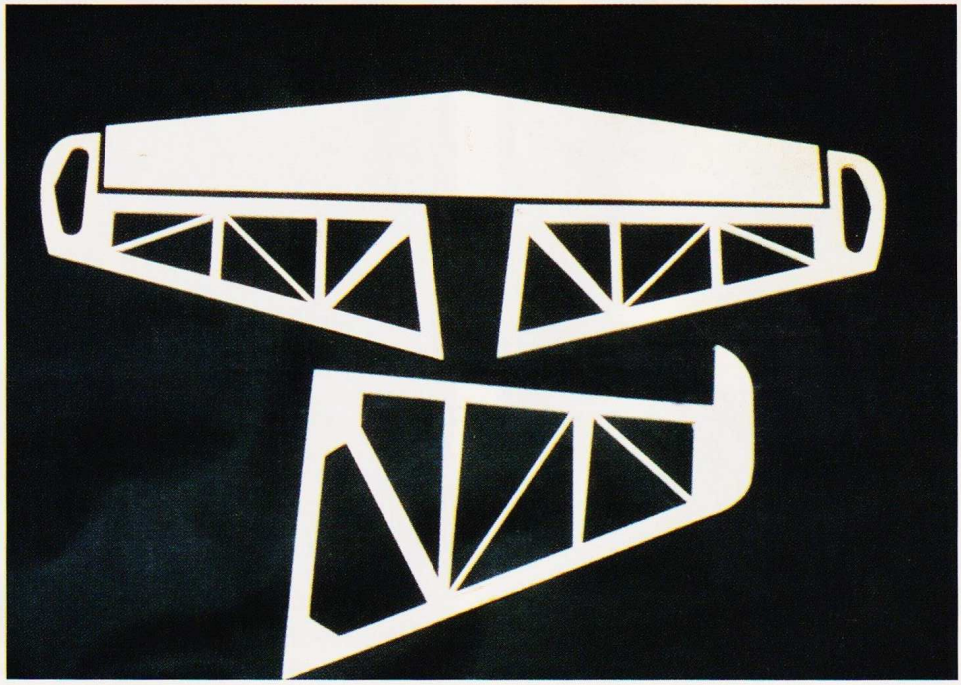
Under the cowling shows why electric models can weigh little more than glow cousins. Comparable power to a 70 four stroker weighs 10 ounces and is mounted onto an 1/8" (3.2mm) ply ring with four small bolts! That ring fronts a 1/64" (0.4mm) ply tube glued to a cut down firewall. AnnMarie at Great Planes devised this for her electric Giles 202 and emailed me some shots - much better than the complex widgets I devised!

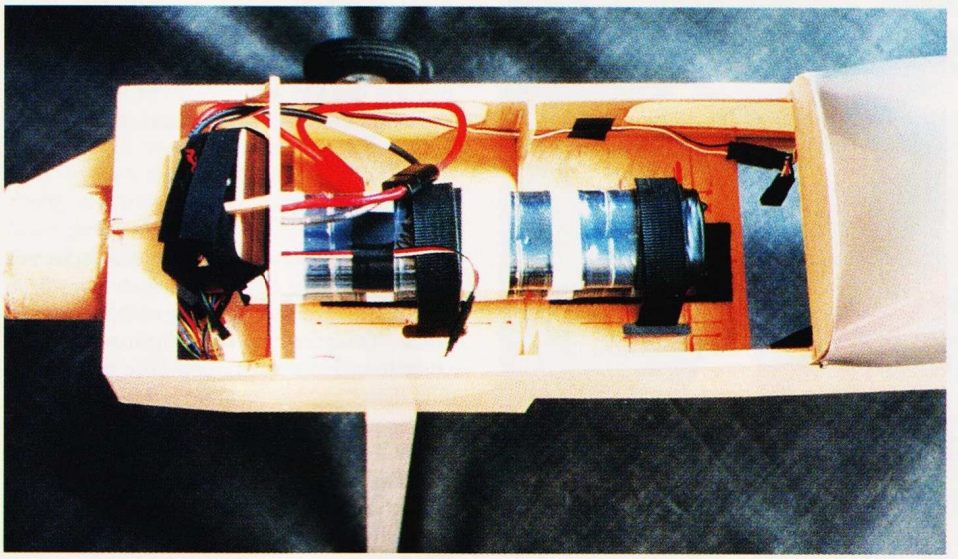
▼ Front end of the fuselage sides - well perforated Liteply! That's what I left of the doubler - it was that long but matched the side before the knife struck.



▲ Go on - admit it! That cowl is much better for not having holes all over it for cylinder heads and silencers. The UC is not narrow tracked, the wide, close to scale fuselage makes the gear look rather skinny. Kit includes rather smart spats - on my field, life expectancy of spats is in single figures of landings. That patch of tarmac is more for photo-posing than landing on.

▼ Tailfeathers - there is a fin but it is little beyond a long hinge line for that huge rudder. It's 8" (203mm) wide at that bottom edge. This gives excellent yaw response and knife edge - what a surprise!





▲ **The fuel tank bay - now. 40 ounce (1135g) nicad pack is seated on Velcro™, with double sided Velcro™ straps to really keep it where it needs to be. While the cowl covers back to that former between the sides, access to this hefty chunk of nicad is fine in practise.**

There's plenty of ply in the wide, deep primary structure of the fuselage. The doublers were cut down to provide a ledge for a battery mount over the wing. I used my fuselage jig to join the sides with balsa strips, instead of the top and bottom Liteply sheets. F3 got its top cut out so the nicad could drop straight in. 1/4 x 1/8 (6.4 x 3.2mm) spruce strip along the top inside faces of the sides put the needed stiffness back. A little cross grain canopy floor, plus a cross piece aft of the firewall finished the job.

The CAP comes with a curved top above the fuselage primary structure - this became a removable hatch with a base of cross grained 1/16" (1.6mm) balsa, three formers with light 1/16" balsa wrapped over the top and finished with 0.6 oz (20gsm) glass cloth. A single former under the back edge of the huge ABS cowl offers support when the model is inverted in my stand. Four short lengths of strip balsa locate the hatch side to side, while a rubber band holds it back against the cockpit former. The cowl is enormous and light - great for electrics with no bad vibrations to shake it up.

By way of change, I didn't change the sheet back deck! This and some balsa block filler pieces round off the back of the model around the small fin and forward mounted tailplane.

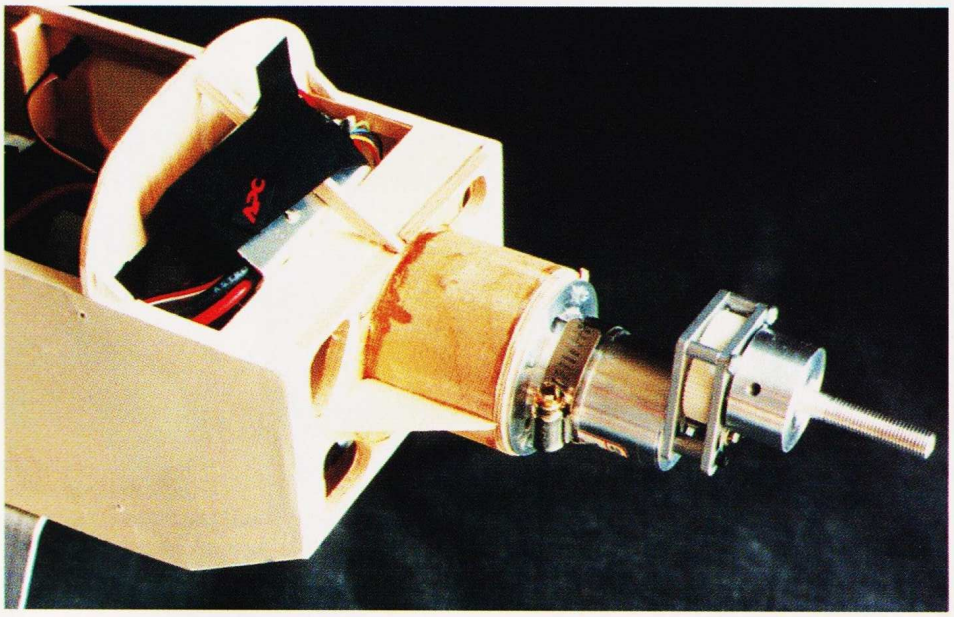
Tailfeathers

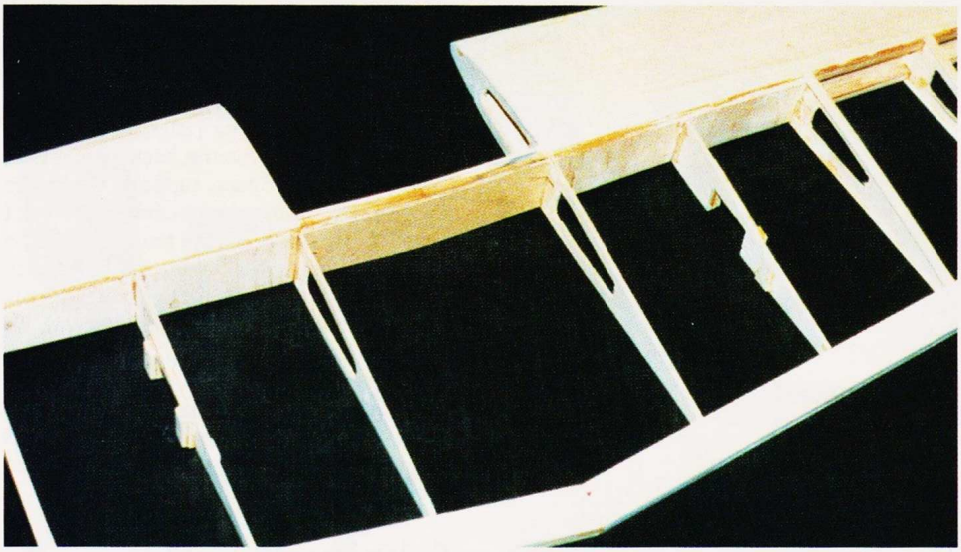
The tailplane is an 1/8" strip frame covered in 1/16" sheet, the fin, rudder and elevators are open frameworks. In the tailplane, I tapered the main spanwise pieces down from 1/2" (13mm) wide at the centre to 1/4" at their ends - every bit helps. The rudder is vast - and reputedly smaller than scale - while the elevator halves, each with their own pushrod, can hold their own in size with many fun fly machines.

The Wing

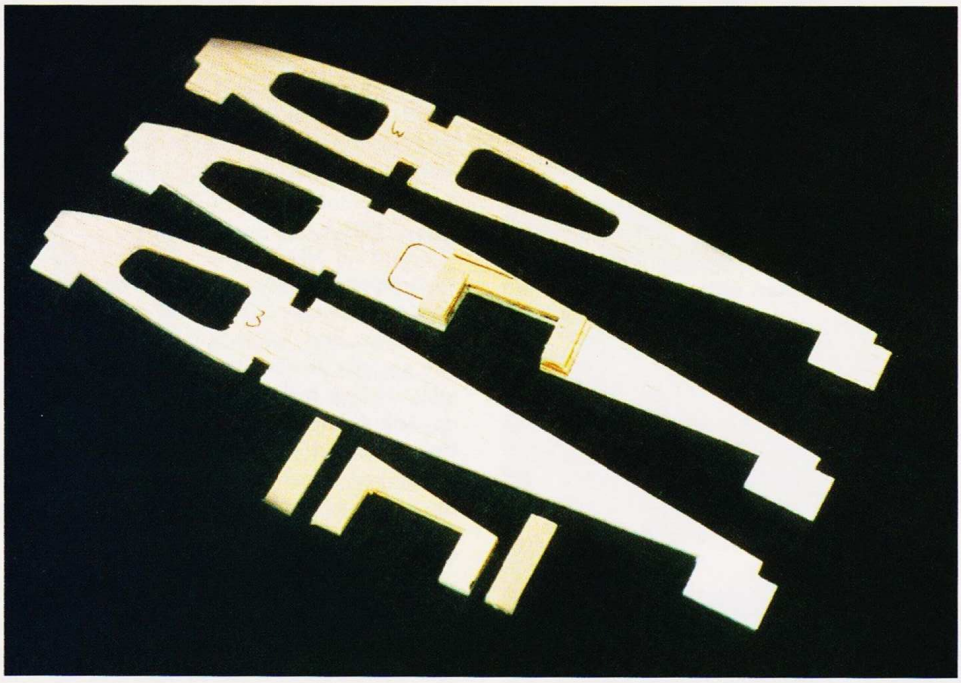
- is tapered, with a thick symmetrical section, strip ailerons, and a 'D' box LE tube, cap strips and 'U' channel TE framework. Die cut ribs feature top and bottom jigging tabs to allow building on a flat board. I made up some 'cheat' tapered spars, with full length 1/8" x 1/4" spruce, doubled up for the centre half of each wing panel - less than half the weight of the kit spars. As this meant dif-

▼ **What makes this level of electric flight performance possible - MaxCim's NeoMax 13Y motor, and 3:1 gearbox. Under ten ounces sits on the end of a tube made of two laminations of 1/64" ply. That's the controller behind the firewall.**





▲ **Wing centre area - fuselage fits between those first ribs, allows scale UC location onto fuselage. Rib cut-outs come with the kit, but I fitted the second ribs out as servo mounts. Spar is straight across wing, LE and TE taper sharply - this wing is all about aerobatics, snap and spin handling is excellent.**



▲ **Here's the ribs modified to accept the aileron servos. At the top, the kit rib, at bottom, the start of the new version which takes centre stage here. The ply pieces at bottom make up the stiffening and take the servo screws.**

▲ **From the front, she's mostly cowl and prop. The power to weight of mine is close to the full size, but there's a lot less space under the bonnet of the big CAP 232 than mine runs to - most of that cowl is empty around the MaxCim and its gearbox.**

ferent spar cut outs in the ribs, I made up another set from light quarter grain balsa from my stock.

The centre servo and torque rods were replaced by a pair of FMA Direct S200 servos mounted in ribs. The wing is fastened to the fuselage by two dowels at the front and two bolts at the rear. In US fashion, one drills and taps two thick ply plates for 1/4 - 20 nylon bolts. For me, spares are easy to get, you might care to replace them with local sizes! The big bits were soon together, in correct alignment, and Sue was muttering "it looks big" as she does when I go beyond 48" (1220mm) span.

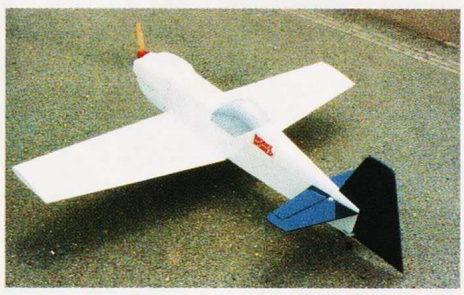
Radio Gear

Flying controls are shifted by FMA Direct S200 minis on ailerons, with two standard servos on elevator and rudder. A Futaba 8 channel Rx allows me to drive the ailerons using computer mixing circuitry off channels 1 and 7. I traded the kit's metal elevator pushrods and rear mounted rudder servo for two standard units in the overwing area. Sullivan 'Goldenrods' drive the elevators, while closed loop control actuates the rudder, another ounce or two saved.

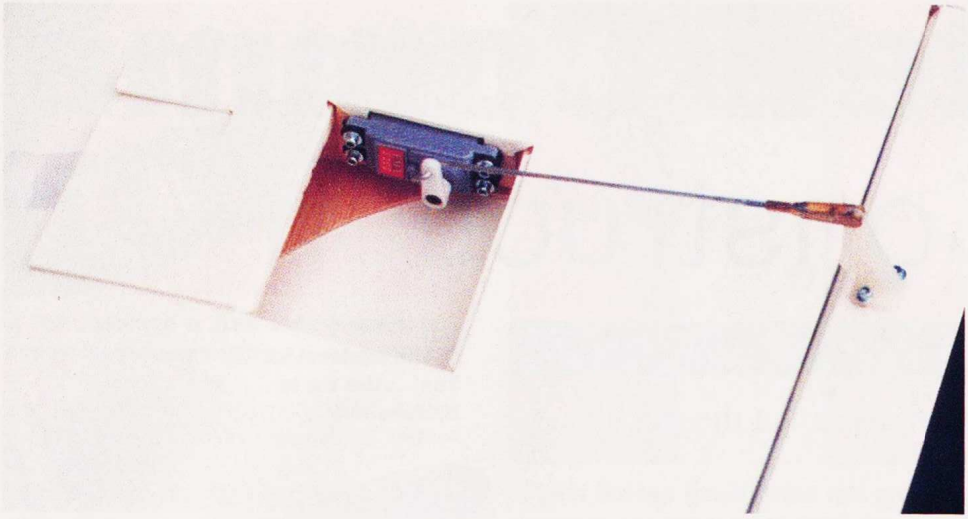
Lastly, the nicad pack is restrained onto its ply tray by good old Velcro™, with a pair of double sided Velcro™ straps to hold it down, with plenty of room around the pack to grasp it for removal. While some reckon a model this size can live with a receiver nicad pack, I prefer to look at weight saved as not there when we go vertical.

It's a cover up!

There are some scale colour schemes around - all very complicated - so most fly in the builder's ideas. Mine got wrapped up in white 'Towerkote' - much lighter than the ubiquitous 'Monokote' - with blue tailfeathers. And there, apart from a single RCMW sticker, she languished, another victim of 'The House Move'. Honest folks, this winter the rest goes on to make her look like she flies! Having said that, the colour scheme has no bearing on where this bird shines, you'll get to see the finished trim scheme in a long term report later on.



▲ **This is the kind of finish one achieves when trying to move house and build a big, powerful electric model from a glow power kit all at once. Would have gotten at least an LE stripe if I hadn't packed all my trim materials! Keep an eye open in Over Here! for when I get the colour scheme finished.**



▲ **Finished aileron box, with hatch taped out of the way. Straight direct pushrod, minimal protrusion outside of the wing.**

Power

A MaxCim NeoMax 13Y, geared 3:1, 20 cells, 30 amps, 7,000 RPM on a 13 x 6-10 Zinger wood prop. MaxCim's controller has a battery eliminator circuit that can run five servos - the only company to offer this. 'Fuel' is 20 matched Sanyo 2000mAh cells, four sticks of five cells soldered end to end.

This is not Grandpa's seven cell snoarer!

And so to fly

I had estimated that the centre of the nicad pack would be over the model's CG, but I had to move the pack forward 3/4" (19mm) - flying electric means never adding ballast. Comparing my power train to what Michael Cross designed for, I guessed good! The instructions give high and low rate control settings, advising that radios without rates should use the low rate settings.

The CAP 232 has no swing on take off but is not on the ground for long anyway. She handles cross wind take offs with no drama, the high ground stance on her scale undercarriage is no problem and keeps those big props well clear of the ground. How loud the prop noise was came as a surprise, nearly as big a surprise as the awesome climb rate!

The controls are well harmonised and neutral in all axes. She is a steady flier, inspiring confidence early in flight testing with a gentle, straight stall. On flight one, with the CG at the front end of the design range, I could not provoke a stall power off from level flight but later entered a spin from a climbing stall entry. The roll rate is fast enough for normal use and axial. The elevators are powerful, while the massive rudder proved neutral and fairly normal in handling.

By flight three, we were into Avalanche loops, four points, slow rolls and added a hesitation to the top of stall turns. Inverted flight is much the same as level flight - but the wheels point upwards. Knife edge is a matter of rolling onto a wingtip, adding top rudder and watching, while four point rolls are a delight. The CAP is not particularly fast but performs aerobatics effortlessly - this and her scale-like shape give her plenty of 'presence' in the air.

Her low speed handling is exemplary, on flight one I flew a circuit to a low overshoot and went around to land. Accurate touch down on our short tarmac strip was easy and she rolled out straight without correction. Flight testing was done without spats - too much of our field is grass, too long and harsh for spats.

Great Planes have a classic with their CAP 232. This model delivers plenty of good, honest performance, while the MaxCim brushless system supplies the reliability and power to make it sizzle. I can thoroughly recommend the Great Planes CAP 232 for electric power conversion, and she will be my regular sports aerobatic ride for a long while. We'll be at the US Mid-Atlantic E-flies in 'Y2K' but if they are out of range, drop me a line through Traplet or email me on 'woodwadd@erols.com' if you'd like more specific info on this conversion.

Going shopping?

Great Planes kits are difficult to miss in the US, the web site is www.greatplanes.com. In the UK, check with your local model shop or contact Ripmax on 0181 282 7500.

MaxCim Motors are at 57 Hawthorne Drive, Orchard Park, NY 14127-1958, or www.maxcim.com. In the UK, check with 'Fanfare' at 18 Hillside Rd, Tankerton, Whitstable, Kent CT5 3EX. John Swain's snappy email address is john.swain1@virgin.net **EFI**

▲ **While it is difficult to put too much rudder on an aerobatic model, the GP CAP 232 is not short in the yaw control department. Nicknamed 'Casper' for her stunning trim job, a 'RCMW' sticker saved the day! Steerable tailwheel unit is rubber band coupled to the rudder, wasn't too keen on the kit idea of the tailwheel being glued into the rudder.**