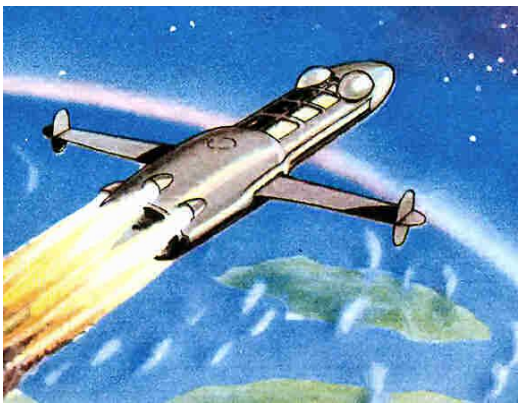
Smoke Trails 35

It's good to know that there will be enough Rapiers to go round for the coming season, and if the feeding frenzy of Jetex memorabilia we saw on eBay towards the end of last year results in more genuine Jetex models on the flying field, I will be very happy. I was also very pleased, through the good will of an antipodean modeller, to stock up on some extra 'solid fuel pellets' (as the original Wilmot Mansour advert calls them) for my Tiger motors. At a cost, of course, but then, I thought, 'what else is my Government 'Winter Fuel Allowance' for'? Having an adequate stock of motors – vintage and modern – should have inspired me to start building, except the workshop has been very cold, and turning up the heaters was not (now) an option!

So it has been more comfortable to sit by the fireside with a couple of Christmas books. *Empire of the Clouds*, by James Hamilton-Paterson, charts the sad decline of the British aviation industry during the fifties, though it does include quite a few test pilots' stories and some wonderful evocations of SBAC air shows along the way. *Dan Dare (Pilot of the Future) the Biography*, by Daniel Tatarsky, is a less depressing read, being a history of the *Eagle* magazine which concentrates (naturally) on the exploits of Dan Dare and his chums and chummette. Both books are highly recommended. In neither did I expect anything Jetex related; however, in *Empire of the Clouds* the author reminisces: "The rubber-powered propeller model aircraft began to seem old-fashioned … to be properly up to date, the models we made from balsa wood now had to be powered by little Jetex jet [sic] engines that sent them hissing through the air, trailing a plume of pale, acrid smoke behind their fashionably swept wings. We ran across a lot of fields, climbed a lot of trees and ventured into a good many back gardens to rescue our little plastic [!] pilots glued beneath their clear plastic canopies as they manfully strove to emulate our flesh and blood heroes in the sky". Quite so.

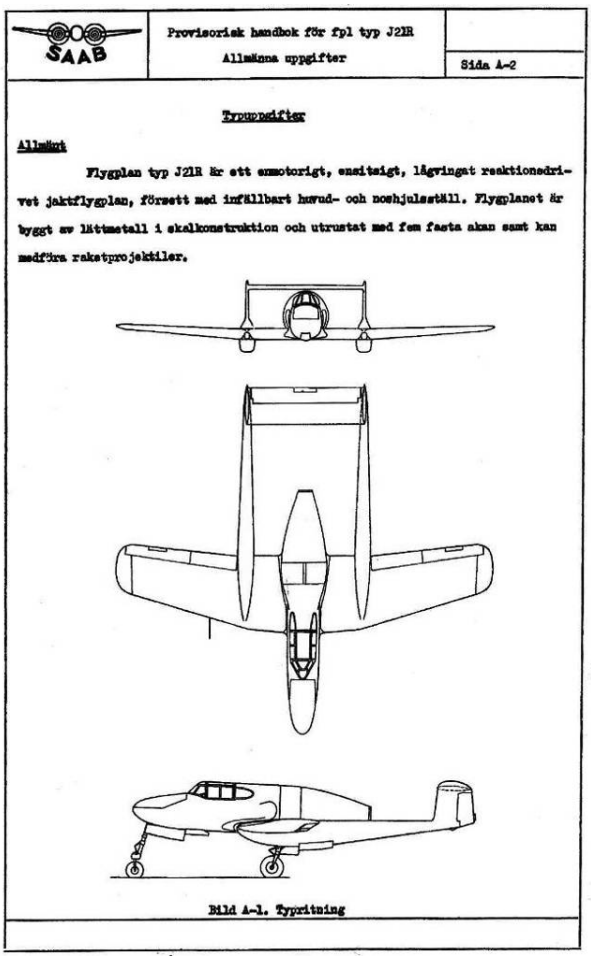


There is rather more about Jetex in the Dan Dare book. Frank Hampson, arguably the greatest of the artists, in his quest for realism, insisted not only that figures were drawn from photos of appropriately posed and attired staff, but also that models were made of the numerous spacecraft to help the artists with scaling, continuity and perspective. This led to experiments with working models, and Marcus Morris, *Eagle's* editor, excused artist Bruce Cornwell drawing work for a whole week to make a marketable model of *Anastasia* (left) that would actually fly. His choice of power was Jetex, which, Tatarsky writes, "was a marvel of its day and allowed model makers the world over to get their creations airborne. Although very small, it produced a powerful thrust … in effect it was a sophisticated firework". According to the author, Cornwell's first Anastasia "disappeared into the wild blue yonder, but, "The second was of sufficient quality to show to Marcus … sadly it was not an auspicious occasion. Bruce's *Annie* took off Ok but never got much height; it flew just off the ground along Marcus's garden, with bits breaking off, before it eventually crashes in the bushes. Marcus burned his fingers trying to retrieve it and instantly decided it was too dangerous a thing to be sold". This was a real pity – more development was obviously called for – but it's a nice story which captures some of the excitement surrounding Dan Dare, and Jetex propulsion, in those early post-war days.

Daniel Tatarsky concludes this story, “Somehow this death trap of a toy did make it into the shops. It was produced by Wilmot Mansour & Co”. There is, I fear, some confusion here: Jetex were as eager as anyone to cash in on the Dan Dare cachet, but their ‘Dan Dare Space ship’ (which was very different from Anastasia) was not an official *Eagle* product despite early adverts showing the *Eagle* logo (the one the left is from Dec 1954). Hulton Press objected to the misappropriation of their ‘Pilot of the Future’, and by April 1955 the *Eagle* logo and all references to Dan Dare had been removed.

Andy Blackwell has an early example of the Jetex Space Ship. There is no reference to Dan Dare (or to Digby, Groupie or the alluring Professor Peabody) in the instructions, and, significantly, all references to ‘Dan Dare’ and ‘Eagle’ on the box top have been pasted over. The beautifully restored box top artwork below was created by Christian Bryan from a photo copy of Andy’s kit.

If it has been too cold to build in the UK, it was presumably even colder further North, but this has not stopped Norwegian SAM member Per Harby, who writes: “the photos are of my Saab J21R [right], built from an original drawing acquired at the Swedish Air force Museum in Linkøping. The building process started with an enlargement of the 3-view plan using a Xerox copier. From that I made some simple drawings. The 13 formers for the fuselage were the most complicated, a mixture of educated guesswork and study of photos to establish the various cross-sections. The wings were easier, I settled for a slightly modified Clark Y. The tail booms are a box construction of balsa sheets, longer than the scale size, and the fins and stabiliser are also enlarged to counteract the ‘scale effect’. Only strictly necessary sketches were made and details like air intakes for the jet engine were adapted and made ‘in situ’ without any drawing. The appearance of the model could be better if I had used spray lacquering. As it is, I used water colour (the type children have) applied with a soft brush and afterwards covered with clear dope.



SAAB

Provisorisk handbok för fpl typ J21R

Allmänna uppgifter

Sida A-2

Typuppgifter

Allmänt

Flygplan typ J21R är ett enmotorigt, ensitsigt, lågvingat reaktionsdrivet jaktflygplan, försett med infällbart huvud- och noshjulsställ. Flygplanet är byggt av lättmetall i skalkonstruktion och utrustat med fem fasta akan samt kan medföra raketprojektiler.

Bild A-1. Typritning

"As you can see from the photos, the formers and stringers are a little too prominent, and the cockpit details are not according to the original either. I expected it to be a great flyer. It was not – it glides well, but when I tried it with a Rapier L-2 it went up very fast last, looped and hit the ground behind me. It was slightly damaged, now repaired. I will need an L-1 for it, or perhaps the vicious looping can be corrected by fitting a downthrust reflector just behind the nozzle". I think Per is being unduly modest about his splendid model, which nicely complements the Lansen and Draken. The planform is distinctly 'Flitzerish' so it should fly as well; I'm sure a downthrust deflector and an L2-LT will ameliorate the looping. As Per builds in the time-honoured tradition of Pete Smart and Derek Knight, i.e. directly over an enlarged 3-view (in this case a nice 'vintage' example from the Linkøping Museum, see left) Per warns those who want to make his Saab J21: "Only the strictly necessary sketches were made, but these are not so detailed that anyone could use them. The builder will need to be skilled". However, he has sent me what drawings he has made, so please ask if you would like copies.

I'm not the only one to find unexpected treasure trove in his Christmas books. Graham Banham found the photo on the right in James May's *Airfix Handbook,* and thought it should have a wider circulation among the modelling community. The caption reads, "Exhibitors arrive for the Model Engineer and Aircraft Exhibition at the New Horticultural Hall in Westminster on August 19, 1958. Peter Blanchard cycled from Chiswick with his Staysail Schooner on a trailer. Colin and Leslie Smith are carrying their father's Fairey Delta II and Deltaceptor".

This, quite naturally, brings us to a discussion of ducted fans and the latest developments in EDF, which, I was surprised and gratified to learn at the SAM AGM, many people are interested in. I covered the history of ducted fan propulsion quite comprehensively in *Smoky Addiction 6*; more recently I discussed Phil Smith's work for Veron in *Smoke Trails 25*, and Steve Bage's GWS-based 30mm EDF package in *Smoke Trials 6*. This, it will be remembered, had an installed weight of about 30g and delivered a thrust of 500 mN for a minute or so, giving Steve Bage's 17" span MiG 17 a sprightly, and, alas, 'flyaway' performance. Phil Worth's EDF Wilmot Mansour SARO A1 flew well with a GWS 40 mm fan, despite its bifurcated 'jet pipe' (albeit at the expense of a burned-out motor) and a commercially available package with a 50 mm GWS fan can give 1.5 N thrust without unduly stressing the motor (see *Smoke Trails 28*). As a consequence, currently (!) there is much modelling activity with EDF units of 30-50 mm diameter.

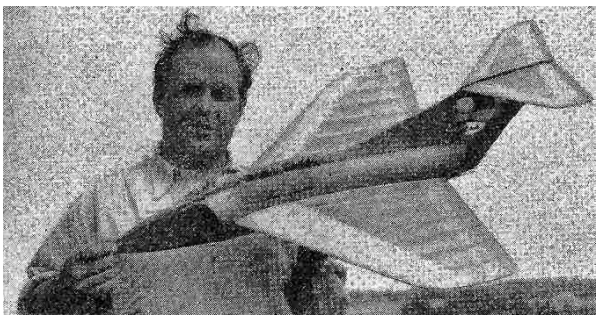
Top: Derek Knight's well-campaigned 13" span Swift has a new lease of life as an EDF test bed. It looks better than ever though it now weighs 80g. Note the sophisticated charger. **Middle:** LiPo battery instillation with ESC controller. **Bottom:** Derek's 24 mm EDF unit. The tiny 10mm x 15mm motor is well-ventilated and can run at 65,000 rpm for up to two minutes at a time.

This is all very well and good, but the 'Holy Grail' for antique jet jockeys is an EDF system compatible with the classic Jetex 50 models that Albert Hatful and Ray Booth designed for Keil Kraft and Skyleada in the early fifties. Though Marty Richey in the US has made good progress towards this goal, 'ultra micro EDF' (or should that be 'nano EDF'?) systems are not, yet, something Jetex Jim could buy off the shelf. But this might be about to change.

Derek Knight's 13" span Swift has been flying well with Rapiers for some years now, but, in its latest EDF incarnation, it is even more impressive, and its speed, 'Nene-like' whine and endurance caused the jaw of even the most die-hard rocketeer to drop. Its 24 mm fan is driven by a tiny Turnigy 1015 motor rated at 11500 Kv, which means (in English) that, depending on load, it is designed to run at (up to) 11,500rpm for each volt it's supplied with. Complete with motor, the fan unit weighs 9g, but the total instillation weight, with batteries, leads, ESC, etc, is typically 30g. This accounts for the Swift's 80g, roughly twice what it was with a Rapier L2 – note that Derek has added the characteristic 'saw tooth' leading edge of the later versions of the Swift to add a little more wing area.

Two (200 mAh in this case) LiPo batteries represent a considerable 'over voltage' (7.4V) of the motor, which turns at 65,000 rpm. At the moment the thrust is about 40g (390 mN) for around 30 Watts input, but Derek is sure this can be increased with a more refined fan. The current (sorry!) performance is only possible with modern brushless motors and batteries, whose awe-inspiring capabilities compensate for the very low efficiencies of such small fans, which, in order to provide a useful thrust, have to accelerate a small mass of air to high velocity, and thus present a very poor impedance to still air. In comparison, a large propeller will provide a streets-free thrust of 90g with only 5 Watts.

Nevertheless, Derek has developed a nano EDF 'power train' that that is suitable for a KK MiG 15 or Skyleada Swift. Please drop Derek a line if you want to know the latest about this exciting development!



Top: By common consent, the most successful Veron Ducted Fan model. This nice advert comes from *Aeromodeller*, Dec 1958 **Below:** Phil admired P E Norman, who flew this radio controlled delta at the 1959 Northern Heights Gala. It was powered by a FROG 1.49 V*ibramatic* and weighed 28½ oz for its 270 sq in wing area.

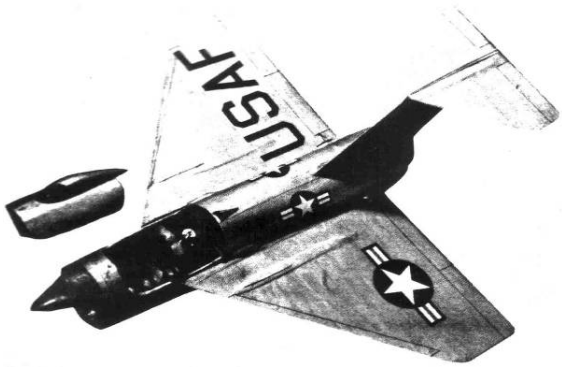
Phil Smith remained interested in ducted fan propulsion to the end, remarking in a letter (Jan 2010) that, after my *Smoke Trials 6*, article, he had sent out several Hawker Hunter plans, always stressing, he said, that the plan was, "Of historical interest only". Phil was sceptical that a scaled down version could be made to fly with a Cox .01 or .02, writing after one particular enquiry: "When I first thought about the Hunter as a kit, I built one with an Allbon Super Dart for power, having had a modicum of success with the Avro [707] and Skyray.

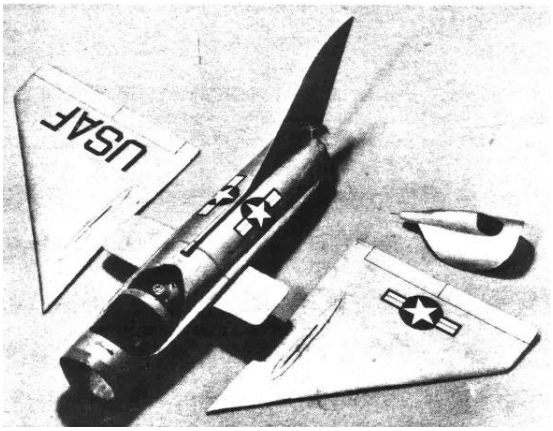
What I did not appreciate was that the very low aspect ratio of the Hunter's wing only derives enough lift to carry the model's weight at very high speeds (which was what the [full-size] Hunter was designed to do in the first case). Such speeds at a model size cannot be obtained with a small engine. The La. 17 had very little of the [original] aircraft's 45° wing sweep. I had to sweep forward the wing form a lot to derive enough lift for success, even with the Dart turning at 16,000 rpm. A lot of modelists [sic] didn't have much success with the La.17 because they didn't understand that only with a *racing* engine and a model built light with little or no décor was good flying a cert. My first la. 17 was 11¾ oz (it had sprayed on camouflage). My second was sprayed with silver mist dope and was just 11 oz. David Wright built his La.17 with just plain décor (tissue stars) for a Cox TD .049, and, as he demonstrated at Middle Wallop, it does some superb flying!

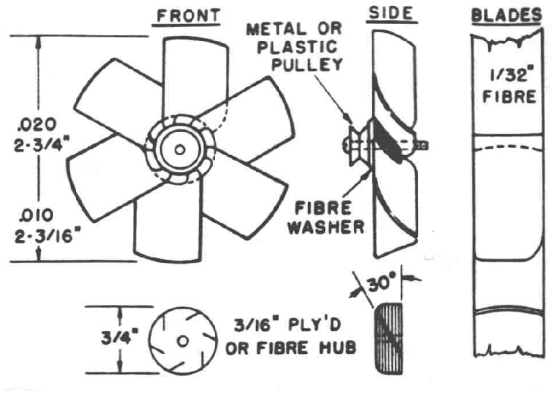
"One has to appreciate that P E Norman used very much larger engines, glows such as Fox 19's, which I wasn't allowed to. His models, which I have watched, went at lethal flying speeds, with knock-off wings every time they landed. But they were very good!

"Another thing is that my fans had recessed centres to clear the carb[urettor] intakes on most engines. P.E.'s fans had very much smaller centres fitting directly over the engine crankshaft extensions secured with a hollow prop nut, giving him six or seven blades (from the fibre I gave him) with 45° pitch right down to the base of the blade. So his impellers were probably more efficient with his power available than my ones which had more pitch at the tip of the blades and relied on tip velocity to generate thrust. We must recall that everything was very experimental in those days. [It was only when] Bob Kress in the US came out with his developed impeller designs that ducted fans really took off – but with KB 40's for power" Phil was well aware that modern modelists (his splendid neologism) were playing with Chinese brushless motors of minuscule diameters, but observed, "These need huge LiPos to derive the amperage, which won't fit in every model design, especially Hunters". Phil comments on an EDF Hunter he has seen,"I don't believe you will have much success with such small limitations of power and available wing area … it has to be catapulted into the air to maintain an airborne attitude, and is very prone to turning off into the left or right, lacking

directional control at lower speeds and just dives into the ground". It's nice to have some of the great maestro's final thoughts on an area he had done so much to develop. It's nice also to know he had kept up with EDF developments to the last. With typical intelligence, he reviewed what he had written about the Hunter, and finished his letter, "I expect some bright person will eventually prove me wrong with an EDF version".



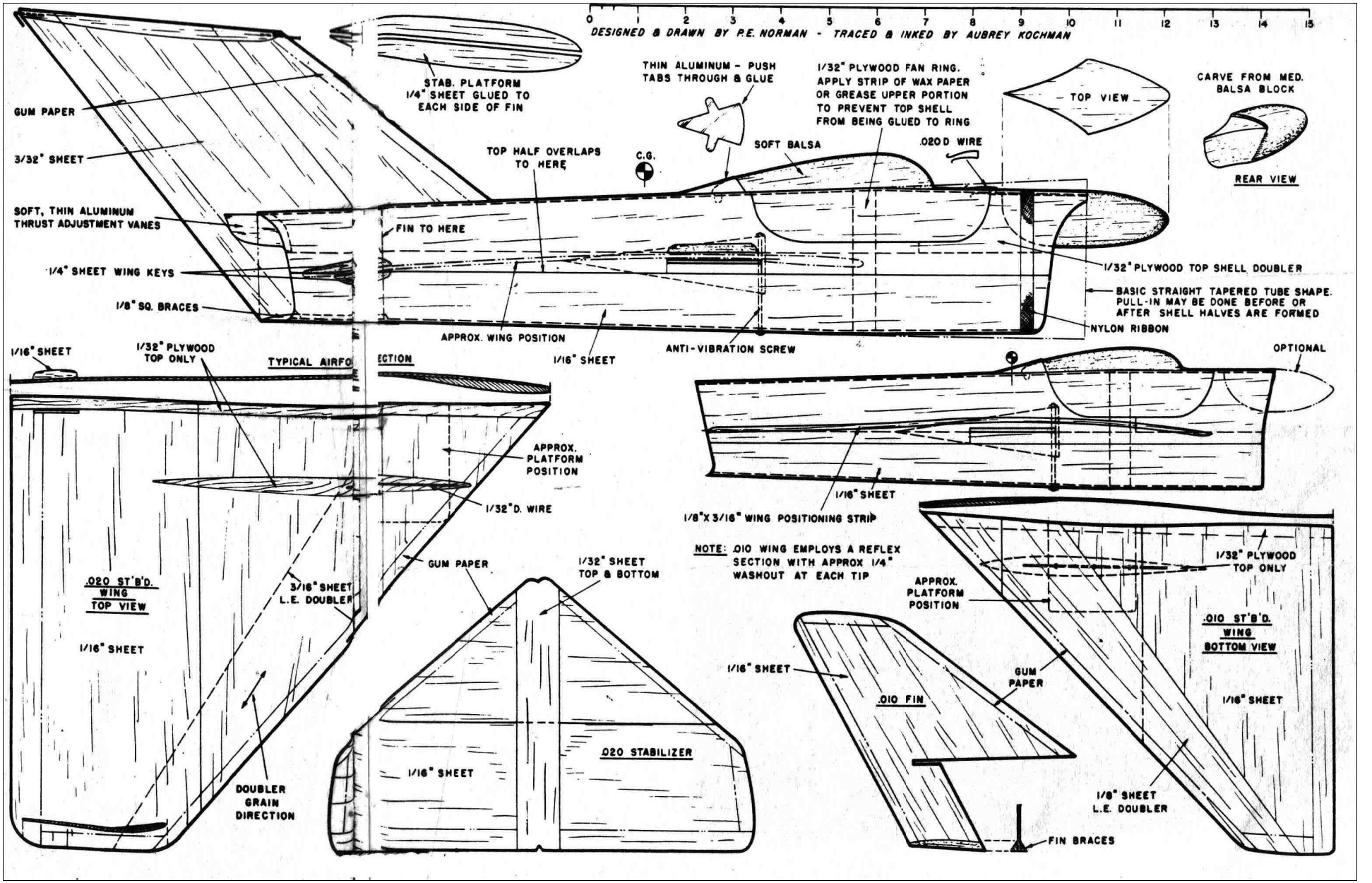




Not all of P E Norman's creations were large and heavily loaded *Exocets* – his R/C Delta was (for him) comparatively lightly loaded at 15 oz/sq.ft and powered by the wonderful little FROG Vibramatic. So perhaps I should not have been too surprised that, in liaison with Bill Dean, P E had experimented with 'micro DF' just before his untimely death in 1964. His 21" span 'Shrike' and 16" span 'Mini-Delta', for the Cox TD 020 and for TD 010 respectively, were published in *American Modeler*, Nov/Dec 1964. The accompanying tribute article, written by Bill Dean, begins: "For more than a decade, Percival Edward Norman successfully built and flew F/F and R/C scale and semi-scale ducted fan models. […] We sent 'P. E'. samples of the little Cox .010 and .020 engines and asked him to develop simple all-sheet balsa designs for readers who wanted to try out D/F flying for the first time. Both are semi-scale in appearance and feature rugged light airframes with knock-off flying surfaces". The plan, (next page) shows their straightforward construction which would have been facilitated by Dean's neat diagrams. The use of epoxy resin glue throughout with 'fairly lightweight balsa' was recommended. All-up weights of 7 oz for the Shrike and 3½ oz for the Mini-Delta were quoted. Bill Dean concludes his article: "when it comes to flying, the Shrike lives up to its name (predacious bird with a strong bill) and can absorb an amazing amount of rough treatment without sustaining major damage". Hmm … very much in the P. E. tradition, then!

Both the Shrike and Mini Delta would be an excellent introduction to modern micro EDF, and, being over 45 years old, these designs can be attempted by the antique modelist with a clear conscience.

Top Left: This picture of Bill Dean appeared at the head of the *American Modeler* article. The original caption reads: "Larger 'Shrike' (left) and smaller 'Mini-Delta'. Both ducted fans" **Next**: the Shrike. **Below:** the Mini-Delta; note the knock-off wings, a feature of P E's designs that Phil Smith comments on in his letter. **Bottom:** Instructions for the (quite large) impeller were given in the text. A a 30 mm GWS fan might be more efficient and allow a fuselage of less Junoesque proportions.


0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
DESIGNED & DRAWN BY P.E. NORMAN - TRACED & INKED BY AUBREY KOCHMAN
STAB. PLATFORM 1/4" SHEET GLUED TO EACH SIDE OF FIN
THIN ALUMINUM - PUSH TABS THROUGH & GLUE
1/32" PLYWOOD FAN RING. APPLY STRIP OF WAX PAPER OR GREASE UPPER PORTION TO PREVENT TOP SHELL FROM BEING GLUED TO RING
TOP VIEW
CARVE FROM MED. BALSA BLOCK
REAR VIEW
GUM PAPER
3/32" SHEET
SOFT, THIN ALUMINUM THRUST ADJUSTMENT VANES
1/4" SHEET WING KEYS
1/8" SQ. BRACES
TOP HALF OVERLAPS TO HERE
C.G.
SOFT BALSA
.020 D WIRE
FIN TO HERE
1/32" PLYWOOD TOP SHELL DOUBLER
BASIC STRAIGHT TAPERED TUBE SHAPE. PULL-IN MAY BE DONE BEFORE OR AFTER SHELL HALVES ARE FORMED
NYLON RIBBON
APPROX. WING POSITION
1/16" SHEET
ANTI-VIBRATION SCREW
1/16" SHEET
1/32" PLYWOOD TOP ONLY
TYPICAL AIRFOIL SECTION
OPTIONAL
APPROX. PLATFORM POSITION
1/32" D. WIRE
1/16" SHEET
1/8" X 3/16" WING POSITIONING STRIP
NOTE: .010 WING EMPLOYS A REFLEX SECTION WITH APPROX 1/4" WASHOUT AT EACH TIP
.020 ST'B'D. WING TOP VIEW
3/16" SHEET L.E. DOUBLER
1/16" SHEET
GUM PAPER
1/32" SHEET TOP & BOTTOM
1/32" PLYWOOD TOP ONLY
APPROX. PLATFORM POSITION
.010 ST'B'D. WING BOTTOM VIEW
1/16" SHEET
GUM PAPER
.010 FIN
1/16" SHEET
.020 STABILIZER
1/16" SHEET
1/8" SHEET L.E. DOUBLER
DOUBLER GRAIN DIRECTION
FIN BRACES