

17 ft Lancaster Editorial

Like the majority of modellers, when the weather turns colder, thoughts of winter building project start to take a grip...an overwhelming urge.....its a bit like animals needing to hibernate or birds flying south for the winter...I know for me its the most sensible time to build with little distraction in the form of gardening or DIY. So come November time its time to put the thinking cap on. Now it may not have escaped your notice that the subject chosen seems to follow a certain historic pattern! firstly building Lancaster's and secondly building them bigger.....so this years offering will probable not come as to much of a surprise to a lot of you.....not a lot of thought gone into this years subject then you may be saying but in fact to get this latest beast of a model I have been somewhat round the houses.

Before deciding on the subject, what was clear in my mind was the model was going to be a big multi engined model and powered by electric. So why make it electric! Well there are two reasons, the first is the pure challenge of going into the unknown with this size of model and secondly the cleanliness and ease of electric power over glow or petrol powered. I'm not adverse to IC powered models and have quite a few lining the workshop walls including a 11 foot B-17. Every time the model is flown and then cleaned, a little more paint will become sticky, a little more balsa will become fuel soaked.....you know the sort of thing. It can be quite disheartening to see your best paint job dulled by adding fuel proofer and even worse when you find the fuel proofer is not doing what it says on the tin!...have touched a raw nerve yet?.

I think also the success of the small 11' Electric Lancaster and last years 15' Spruce Goose was also a catalyst for keeping the electric theme going. With both of these models the secrete to their success was keeping them as light as possible. This also allowed the use of cheap brushed motors and in the case of the Spruce goose it was purely the number of motors (8 in total) that provide such an impressive thrust to weight ratio.

Having been so impressed with the flying characteristics of both these models, which have a lot to do with their size, the logical option seemed to be to go larger.

Feasibility

So what size would was it to be? Well approaching 17' in wing span and to weight less than 44lb (20kg) was my initial thoughts. My assumption for this was the 11' Lancaster weighed 23lb, the Spruce Goose weighed 32lb therefore in theory is should be possible to build an 17 footer for under 44lb.

You may be asking why 44lb, well this is the weight limit when models come under the scrutiny of the Civil Aviation Authority (CAA) and in particular the Large Model Association (LMA). Those of you who are familiar with the LMA will know that the association provides an invaluable services in raising the profile of aero modelling in this country through well publicised shows which I have to say are done predominantly as a PR exercise an that has to be applauded. I have only been a member for a few months now and have to say they are a great bunch of guys (and girls) aided by an excellent and dedicated committee and chairman.

So you maybe asking why do these guys build big models?....well just between you and me their eye sight isn't as good as it use to be so they have to build bigger to be able to see the models in the air.....

I digress...Although the aim was to achieve a weight of less than 20kg I could not be certain of achieving this so it seamed sensible to join the LMA and in the process register the proposed model with the '20kg Scheme'. This meant the design would have to be checked and the airframe would have to be inspected during the building.

So having made all the right moves I still hadn't decided on a subject. Initially I was extremely tempted to built and B-24 Liberator, similar in size to John Deacon's petrol version, which has been doing the show circuits for some years now. But on closer inspection the sheer bulk of the model persuaded me I could not make a 17' Liberator for 44lb especially when John's version weighed well over 100lb!

So thoughts were turning back to what could legalistically be achieved and each time I mulled the subject over the Lancaster kept on popping up. I wanted this project to be a success and the reassurance the model would perform on the minimal amount of power. So it looks as if yet another Lancaster will re-emerge from the Nijhuis stable. Mind you there's no real hardship for me when it comes to building a Lancaster, I really do love the aircraft. and should hopefully I should know what I doing this time.

Lancaster No.6

Yes that's right, this is 6th Lancaster I have built/owned so you could say I'm a bit of a Lancaster nut.

Those of you who have already guessed this latest offering is yet another scale up of the very successful 72" RCM&E plan.

Having drawn the original Lancaster on CAD it really wasn't too difficult to scale up the plan to the size I wanted. What of course had to be worked out was how the airframe would break down into manageable parts for building and transportation. In total, there would be nine parts, the wings in four parts, the fuselage in two and the tail plane in three parts including detachable fins. Once that had been figured out and I was happy with the plan a template CAD drawing was done and then emailed to SLEC for them to cut out using their CNC machine.

In order to build the model, the plan had to be printed and this was no mean feat! By arranging the plan to achieve the best use of paper it still required a 20metres roll of 1 metre wide paper just to print!

During the design stage, discussions took place with various suppliers of electric motors. This proved invaluable and it soon became apparent that conventional brushed motors were not going to be suitable due many to the size of project and also the efficiency of these motor. I had originally calculated that 50W/lb power to weight had to be achieved for a model such as the Lancaster to work successfully. This equated to 2.2kW of input power based on 44lb(20kg). This rule of thumb has worked well to date but as models get larger, the wing loading gets higher and therefore the power to fly the model will be increased.

The alternative to brushed motors was of course brushless. This led me to speaking with John Emms at Puffin Models. Now I have to say brushless is still a bit of a mystery, and trying to compare sizes of brushless motors to brushed 'can' size ie 400, 600, 700 etc, it was soon clear there was no relationship and each manufacture has there own form of

specification and numbering. So it is more important to be able to speak to a knowledgeable person and in this case John Emms had the answers. Puffin Models are the UK distributor for the AXI motors which I have to say have so far proved to be excellent both in quality and performance, and will not break the bank also. Because my original plan was to use 16-cells per motor, the AXI 4120-14 seemed to fit the bill based on an input power of 650W. One of the main advantages of brushless motor is their efficiency which can be anywhere between 80 to 95% depending on the load they are put under. With brushed motors if you achieve 60% you are doing very well indeed. I was also advised when selecting speed controllers it pays to go for one with a high current handling capacity than the motor will pull. The reason for this is the reassurance this will give knowing the current draw is well within the handling capacity of the controller and therefore the chance of failure through overload is much reduced. The type that were finally selected was the Jeti 75NC, again supplied by Puffin Models and all next day delivery. These really are a quality speed controller.

So with the power system sorted, it was time to get on with building. Now for those who have read past articles of mine will know I like to build quickly. I usually have a short span of attention and often lose interest after a couple of months of work on one model. If things are dragging on I find to break the monotony I try and fit another smaller and simpler model in

Work began on the big Lancaster the day after New Year's Day this year (well it would have to be it) and for 10 weeks solid doing approximately 40 hours of evenings and weekend a week the model was ready to test fly. As with all my previous electric models, I like to test fly the model 'uncovered' so I am absolutely sure the model is right and more importantly the power set-up was going to work. For an electric model of this size both John Emms and myself were entering uncharted territory!

Between completing the model ready for testing and actually testing the model, a two week breather, due to inclement weather allowed me to design and build this year's RCM&E dog fight double, the Mosquito and Moskito.

Being reasonably confident the model was well under weight it was only the day before the first test flight that I thought I would check the weight of the model. I was in for a bit of a shock! Weighing all the pieces separately and tallying up I found the model's weight to be nearly 43lb I have to say I was mortified but nothing stood out as any one single cause. The weight of the cells, motors, radio had been taken into account so it seemed it was the effect of lots of small items not weighing much singularly, but together they conspired to make the difference. I did have to add 2lbs of lead to the nose, which for this size of model I was not too much of a concern. However I did have a concern about the power requirement. The finish weight would be heading towards 50lbs and reducing my target power to weight 50w/lb.

The only positive point was the model just crept under the 20kg limit and therefore I could go and test fly without the exception paperwork in place.

So with good weather set for Sunday 28th March, the Lanc was put on charge ready for an early start.

Fortunately, belonging to the Hastings MFC means I have access to a first class flying site, all safely set out, not a single tree within the flying zone and a 150metres long grass runway, which is second to none in the southeast. The Lancaster takes about an hour to

put together and even though the model was unfinished I have to say it still look pretty impressive Powering up the model for the first time and taxing out revealed the same excellent ground handling characteristics as the smaller 11 foot version Although the power seemed fine on the ground it was very noticeable the prop which although being 14" in diameter only just cleared the bottom of the cowls. I was not happy with this and bigger props would have looked so much better and been more efficient.

However this was not going to stop the moment of truth The Lancaster was lined up into gentle 5-knot wind and the throttle progressively opened. Slowly she started to roll and after 10meters or so the tail was off the ground and she balanced perfectly on the main wheels with no elevator correction. Because the power is uniform across the motors there is no tendency for the Lancaster to swing or do anything other than run straight down the runway with no correction at all. The maximum ground speed seem to occur at about 50meters or so at which point I started to feed in up elevator. Progressively more elevator was used and after some 70meters she was airborne and climbing in a very scale like manner. The wheels were retracted and the nose immediately rose and the model noticeable picked up speed. The climb out continued through a right-hand turn and by the time she had completed one circuit about 150foot or so had been achieved. All the controls felt fine but I was holding in quite a lot of up elevator to maintain level flight. At this point the elevator stick was neutralised and the Lancaster nose pitch down quite suddenly. Full up trim had to be applied to maintain level flight but all the other main control surfaces required only the smallest of adjustments before the model was flying 'hands off' and at a very scale speed. By the second circuit I felt very comfortable and knew the model was every thing I had hoped for. After some six minutes of gentle circuits I call a landing and lined her up. The model doesn't have or need flaps and power has to be applied all the way to the ground. Backing off to about half power, the Lancaster descended slowly and gracefully to about 3meters at the threshold of runway. At this point I cut the motors and the model noticeable slowed and began to wonder to the right slightly. This caught me unaware slightly and I had to power up again to drive the Lancaster forward and on to the runway. The final touch down was a bit out of shape and as a result one of the undercarriage legs broke away and the model unceremoniously ground to a stop 'wun wing low'. Never the less I was absolutely delighted with this first outing and it was now full speed ahead to finishing the model ready for Sandown.

After test flying any new model I away like to analyse the flight in my mind. My immediate thoughts turn to the power system. Although the power seemed adequate there were a number of things niggling me, Firstly the size of the props which if larger would be more effective. Secondly, the finished weight may add another 10lbs and could the current power system cope. Thirdly, the nose weight will probably rise to 4lbs by the time the finishing is applied to the tail and one thing that greaves me is giving ballast weight a free trip round the sky.

So first thing Monday morning I got on to John Emms to ask whether it was possible to increase the prop diameter and squeeze another 10% of additional power. The answer was not favourable and it soon became clear the only option was to re-motor and go for the AXI-4130-16 (the largest AXI motors currently available) and as a result increase the cell count from 16cells to 20cells per motor. Fortunately the battery compartment in the inner nacelle are caviness and could easily accommodate the extra cell. The other benefit which soon became apparent was the additional cells would reduce the necessity for the nose weight. In short, each new motor using a 16x10 prop on 20cells would give an additional 200W in power (800W in total over the four motors) which, equates to a

whopping 30% increase power at the same current draw. This would give the Lancaster an incredible input power of 3.5kW.

Once again John Emms came to the rescue and replace the motor after first checking the original Jeti speed controller were up to the job, which, fortunately they were.

Both the AXI 4120 and 4130 have the same shaft size and mounting points so no modification had to be made. Once again the motors being a little heavier would further reduce the need for nose weight.

Feeling now very confidence about the model and the modified power system, it spurred me into action to get the model finished. I needed to keep the finishing weight as light as possible so I was tempted to film cover, add some detail and paint to a similar standard to that of the 11' Lancaster. But then our esteem editor thought he would make a casual passing comment....'yes the smaller Lancaster was nicely finished but what it really needed was a bit more detail... you know just a bit of turret detailing and maybe just a rivets...what do you record?.....I hate it when he say that. Its like a red rag to a bull. But I have to say he was right. The bigger the model the more detailing is required. Fortunately I have a mass of Lancaster books and pictures collected over many years so knowing the detail was not a problem, it was just the length of time it might take to complete it.

Although the model was test flown, the canopies and turrets had not been made and this required VAC formed patterns to be made. This took about a week or so to do and once made the cockpit detailing could be started. The model was also ready for covering. Because the detailing was now an important feature, cover with a solar film material was really not an option so I decided to use a lightweight glass cloth (17grm /sqm) but instead of using epoxy, I used a 2-pack flooring varnish (Sadolin PV67) which dries in about 30minuites. One of the main benefits of glass cloth is it does give the model protection against 'hangar rash', which for this size of model being manoeuvring around the workshop, is very likely indeed.

Prior to the covering being applied the model was given a coat of sanding sealer so the varnish does not sink in to the wood. The glass cloth is applied dry and smoothed out over the airframe. The varnish is only then applied, using a 4" foam mini roller This method is really quick and because of the short drying time, you can re-work the model after an hour or so. After three long evenings the model was covered. Just to give the finish that extra surface hardness, a thinned coat of epoxy was applied to the glass cloth. At this point windows were cut into the side of the fuselage. Contrary to belief the early Lancaster did in fact have windows along each side of the fuselage, but these were often painted out as night flying operations rendered them pointless. However on the dam buster Lancaster research shows these remained unpainted.

Prior to any further detailing the model was given a light coating of grey primer to pick out any anomalies with the covering. All being well it was time to move on to the riveting detail. Now the simplest way to apply dome rivets is by using PVA glue but the thought of hand doing 100,000 or so individual rivet filled me with dread and to be honest had better things to like watch repeats on tele or wash the car again.....It seemed a compromise had to be reached. So I took a piece of hard wood about 1/2" sq by 12" long. At 1/2" intervals, small holes were drilled along its length. In each hole was pushed a 1" long panel pin and epoxied into place. The sharp point of the pins was then finished to a flat end and there you have your multi rivet maker. To make a suitable glue tray I cut a length of 22mm plastic pipe down the centre, glued plastic piece to each end to enclose and hey presto, a glue trough. To achieve a good dome rivet you will need to thin the PVA glue with water slightly. To make a line of rivets just dip the rivet 'comb' into the

trough of glue by no more than a few millimetres, and carefully 'rock' the comb from one end to the other and lift vertically away.....and there you have it 30 plus rivets instantly. Because the glue grips the comb pins the comb can be used another couple of times before being recharged with glue. So assuming you know where the rivet line goes and applying at a reasonable pace you could do 200 a minute, 12,000 in an hour.

It took me only two evenings (about 8 hours in total) to complete the model and although I had misgivings after the first hour or so and wished I had never started, I carried on and by the time I had finished it was clear that the time spent was going to make the single biggest visual impact on this model. I have since not been disappointed.

Carrying on with the detailing, bomb-aiming lights were added and these were angled to achieve convergence at 10 feet! 1/6th the scales drop height of the full size. A working bomb rotating and drop mechanism was fabricated and to complete the detailing navigation lights and retractable landing lights were installed into the wing,

Applying the final colour scheme was straightforward using Flair Spectrum paints, thinned to a 50/50 mix using cellulose thinners, and spray applied. To finish off, the paint was given a light rub down using 1200 grade wet'n'dry. This nicely revealed the tops of the rivet heads and that evocative Lancaster look.

To avoid damage, I decided to make the turrets and observer dome removable. This also allowed me to do this detailing last of all. Because the turrets are such a large noticeable feature on the Lancaster the detailing had to be convincing. So armed with all sorts of bits and pieces, I spent a week just detailing the front and rear turrets and the observer dome. Once again the visual impact certainly brought another dimension to the overall realism of the model.

Endeavouring to keep the model as light as possible, I managed to source a pair of lightweight 9" wheels from Len Gardner. The wheel covers were home made and made from mould which was then vacuum formed in plastic. The oleo legs were from J Perkins and the retract units were the Ripmax 'Giant' spring/air. These retracts are supposedly designed for model up to 15kg so with a model approaching 30kg (60lbs) they needed to be strengthened somewhat. This was done by making a saddle plate from 2mm thick aluminium to the profile of the retract housing which supported the rather vulnerable plastic.

At the time of writing (in late June 2004), the Lancaster has achieved 8 flights amounting to just over an hour's worth of flying. Enough to achieve exception and ready for public display. Although the one hour's test flying did seem onerous when starting out it does allow your confidence to build in readiness for the show season. It also allows those teething problems to get sorted which it seems as the model gets larger, the more gremlins there are

Although the size of model has entered uncharted territory and is the first electric model to come under the LMA 20kg scheme, the Lancaster has lived up to all my expectations and hopes and has pushed the boundary of electric flight to greater limits.

When displaying the model at Sandown I did have a hard job of convincing one or two modelling enthusiasts the model was indeed electric. A question which was often asked was what's the comparison cost of electric package when compared to IC. Well strangely, if you bought four OS120 4-strokes or equivalent petrol engines, you may well have to find another £100 or so. Surprised? I know I was.

When going to large or giant scale one of the great benefits of electric is the batteries become useful ballast. In essence putting 5lb of lead in a 100" model is not uncommon. Even the best and lightest builder such as Richard Rawels had to concede and put 10lbs of lead in his beautiful 1:3 scale Spitfire, almost 15% of the overall weight. So the weight of conventional NiMH or Nicads for large format models must be considered an advantage. The Lancaster carries over 12lbs of batteries and no ballast. I think that says enough. What this all means is far from electric model of this size being heavy, they can be and often are lighter than their IC counterparts. The only slight drawback is the flight times which are currently around the 7-minute mark. Although for display flying this fits nicely into the usually 10-minute slot, to increase duration, I will either have to increase the number of cells to increase the voltage on to the motors or wait for a higher capacity which is seeming less likely with the advent of Lithium technology or go in the direction of lithium cells but we are talking serious money here.

Specification

Wingspan- 4850mm (195") (approx -16.5')

Length-3528mm (130")

Tailplane span- 1660mm (66")

AUW- 60lb (electric) -120lb (petrol)

Radio- 5-function (min)- Dual receiver required with battery back-up system

Electric motors- 4 x AXI 5330

Controllers- 4 x 75amp

Batteries- 4 x 24 cell pack (3700 nimh) or Lipo

Petrol engines- 4 x 23cc-38cc Zenoah

Undercarriage- Unitracts Int. pneumatic medium retracts(max weight 90lbs)

Wheels- 225mm dia (sack barrow type pneumatic)

Fibreglass cowls available separately direct from Falcon Aviation

To be built under the LMA 'over 20kg' scheme