The Flightline

Volume 41, Issues 6-7 Newsletter of the Propstoppers RC Club AMA 1042 June, July 2011

President's Message

Well the weather has really changed from too wet to fly to too hot but maybe we will get a break. With the two fields we should be flying. Fuel or Electric. Both fields are in great shape and ready.

There is a problem with Elywn Fuel field It's call Poison Ivy and its all over the field. I have been cutting it very short. Hopefully this will kill it if it doesn't get me first.

Don't forget that the next picnic is July 16th, the Saturday after the meeting.

The meeting should be short so come out and fly. It will be at C/A July 12th . 6:00 till dust. What happened to Thurs. Day flying airplanes at C/A . Could we get this started up again and maybe a day at Elywn?

Hope to see you at the meeting

Dick Seiwell

INSIDE THIS ISSUE

Agenda for July 12th Meeting At the Christian Academy field:

Meeting starts at 6:30, with flying before-hand

1. Membership Report
2. Finance Report
3. Show and Tell

Minutes of the Propstoppers Model Airplane Club, May 10, 2011

At the Christian academy field on a beautiful, 70°, clear, if calm day

Call to order took place at 6:20 PM by President Dick Seiwell

Roll call by membership chair Ray Wopatek showed 18 members present

Minutes of the April meeting as published in the newsletter were approved by the membership

Treasurer's report was given by Pete Ottinger and accepted

Old business:

Dick Seiwell gave us a briefing on the new field on the Elwyn institute property. The field is available for our use without cost as long as we maintain it. Dick has plans to improve the field with a picnic tables. He emphasized that we must stay away from the 352 highway which is far to our back as we fly. He notes that the field can be used by the club for fuel as well as electric motors.

New business:

The first club picnic will be next month on the dates listed in the newsletter.

Dick Seiwell suggested that we hold one of the outdoor meetings at the new Elwyn field. The date will be published in our newsletter and announced through the group e-mail.

Dick also suggested that we limit flying at the new field to two in the air at a time. He and the club also agreed that we would have no guest flyers at the new field at present until we see how things work out.

The number of planes in the air at the Christian academy field is limited to four, but gliders and old timers that are out of the pattern and at high altitude can be flown in addition.

Adjournment took place at 6:50 PM

Calendar of Events

Club Meetings

Monthly Meetings
Second Tuesday of the month.
Christian Academy Field
Next Meeting:

July 12th

Tuesday Breakfast Meeting
Tom Jones Restaurant on Edgemont Avenue in Brookhaven.
9 till 10 am. Just show up.
Flying after at Chester Park 10 am.

Regular Club Flying

At Christian Academy; Electric Only
Monday through Friday 10 am till dusk
Saturday 10 am till dusk
Sunday, after Church; 12 pm till dusk

Special Club Flying

Saturday mornings 10 am
Thursday evenings in the Summer
Tuesday mornings 10 am weather permitting after breakfast at Chester Park.

Check our Yahoo Group for announcements;
http://groups.yahoo.com/group/propstoppers/

Club Picnics

July 16
August 20

Beginners

Beginners using due caution and respecting club rules may fly GWS Slow Stick or similar models without instructors.

The club also provides the AMA Introductory Pilot Program for beginners without AMA insurance

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Minutes of the Propstoppers Model Airplane Club, June 14, 2011

At the Christain Academy field beneath darkening skies.

The was no attendance taken, or financial report due to the threatening weather.

Because of the confusion caused by the potential change of meeting venue due to inclement weather, if it is raining when a meeting would be held at the field, the meeting shall be cancelled rather than moving to another venue, such as the library,

There is an on-going poison ivy problem at the Elwyn field, so outdoor meetings will continue to be held at the Christian Academy field.

Dick Seiwell would like some feedback as to what nights people will be regularly flying, so that he can cut the grass appropriately.

The picnic tables for the Elwyn field have not yet been acquired since no sutiable tables have been found,

Safety officer Eric Hofberg did a brief review of safety procedures.

The meeting ended early when it started raining.

Dave's Gloster Meteor Build

OK, it is all Jeff's fault. He launched into an F-22 build, but first he wanted to build it bigger than mine, then he wanted to make it a ducted fan model.

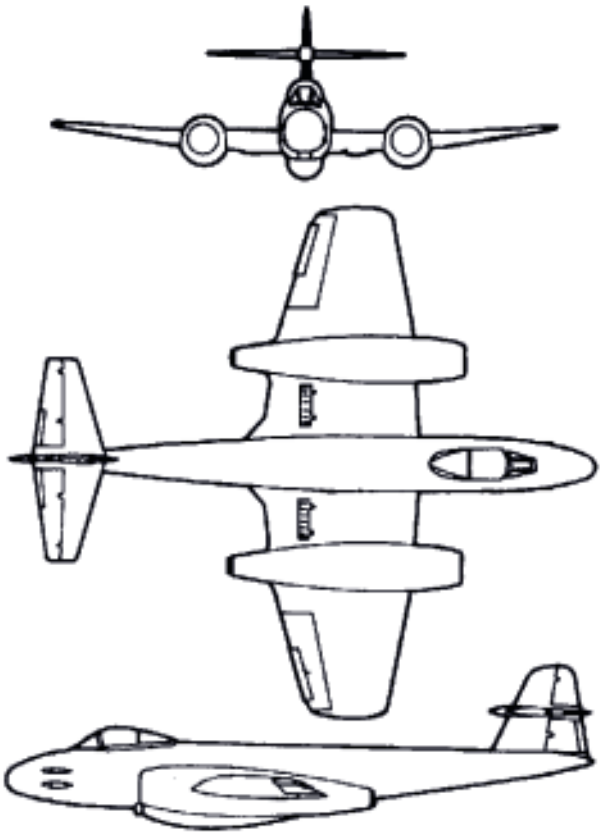
Well, bigger is one thing but the EDF is another animal altogether. He asked for help so I began to do some research. First on how much power he might need with a big model then what fans are out there.

This in turn led me to examine the two 90mm fans with motors I bought at the AMA show in California January

last year. These units were quite inexpensive and purchased from an oriental vendor on a small stall with limited stuff. I had no idea if they were any good, but it did add to the enthusiasm that rubbed off from Jeff and got me to thinking about what you might do with two of them. Well, obviously build a two-engine scale model! What to build?

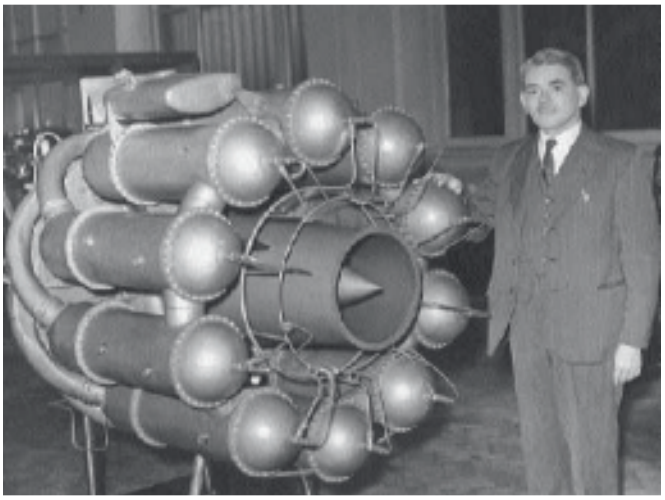
Of course being a Brit there is an obvious starting point and it is the allies' first jet fighter of WWII; the Gloster Meteor.

The next step in this process was to find a 3-view drawing and my starting point is always Eduardo's page; http://www.fortunecity.com/marina/manatee/272/ and sure enough he had one;



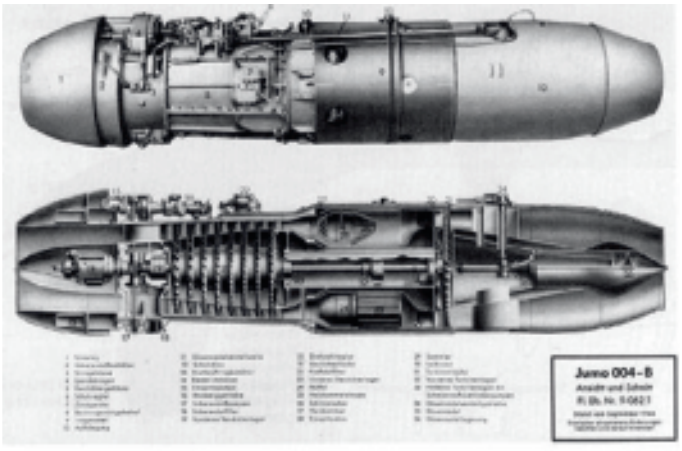
The next stage is to figure a size that would match the propulsion and expected weight. Now, with jet models, two key factors are how well the EDF unit will fit the nacelle and how well will the necessary inlet and exhaust match.

At this point it is instructive to consider the development of jet engines and jet powered airplanes. The first engines were developed independently by Frank Whittle in England and Hans Ohain in Germany. Here is Whittle's engine;



Note the diameter over the combustion chambers in relation to the jet exhaust outlet diameter. Whittle's engines incorporated centrifugal compressors like this one;

The German engine that achieved the early adoption was the Junkers Jumo 004 shown here.



Note that this engine uses axial compressors in several stages and is more compact in diameter than Whittles engine. The initial use of this engine was the Messerschmitt Me-262 Swallow;

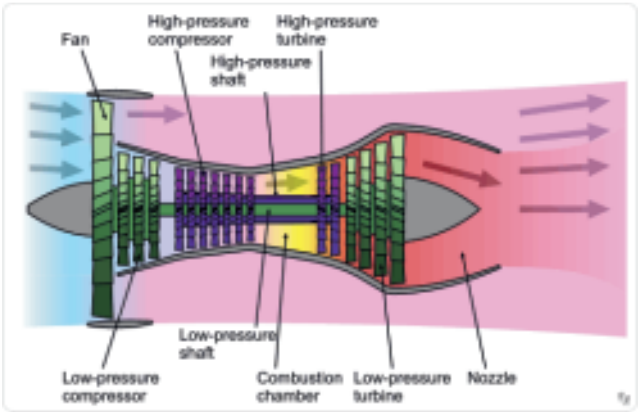
What you see in these early jet planes is the intake and exhaust diameters are small in comparison with the overall diameter of the nacelle; this presents a problem with the EDF model as there is a considerable loss in performance when the inlet and exhaust are constricted compared with the fan area.

Air propulsion is achieved by grabbing a mass of air from in front of the plane and pushing it out the back. This is so for both propellers and jets. But the efficiency, or power required to achieve this thrust is very much affected by the size of the propulsor; the area of air induced. Thrust is approximately the mass of air per second times the increase in speed as it is exhausted. But the power required to do this is approximately equal to the thrust times this increase in speed of the exhaust. So it follows that for the same thrust the smaller the mass of air the greater the acceleration and therefore the greater the power required.

This is the reason that jets, particularly pure jets, are so much less efficient than propeller driven airplanes.

In the case of airliners this inefficiency is largely offset by flying at high speed and high altitude, but we can't go there…

But even this factor does not make the pure jet efficient. Jet engine development has been very much paced by the addition of fans to them and fan sizes have increased steadily over the last sixty years.

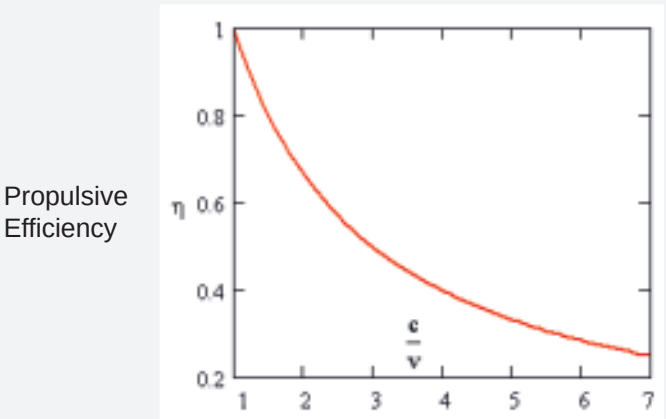


So what does this have to do with our electric ducted fans? Well, the same physics applies. If you have an airplane with a nine inch prop and a 100 watt motor, changing to a 3 inch fan will drive your power required to over 300 watts due to the reduced area of the propulsor grabbing one third of the mass of air, so you need to accelerate it to three times the prop slipstream value.

In practice the increase in power required could be much more as there are other losses in a fan installation and these are affected by the degree of realism in a scale model.

The complete installation includes the fan, of course, but it also includes an intake aperture and duct as well as an exhaust duct; all these elements introduce losses in terms of internal drag and loss of momentum. This is particularly true with models of the early pure jets with their long small diameter ducts. Let's look at the Meteor engine installation.

The ideal propulsive efficiency as a function of slipstream to flight velocity

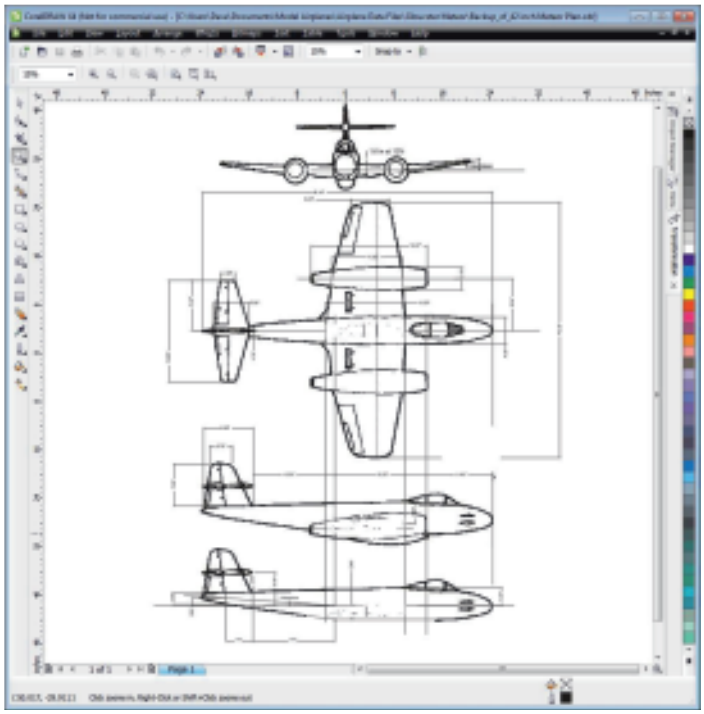


But before we do that let me explain how I go about designing a scale airplane. I start with the 3-view drawing, which is usually a graphic file like a jpg or gif. For years I have used the Corel Graphics suit with PhotoPaint, Corel Draw and Corel Trace. Photo paint does graphics manipulation on jpg and gif files. It is where I can clean up, cut and

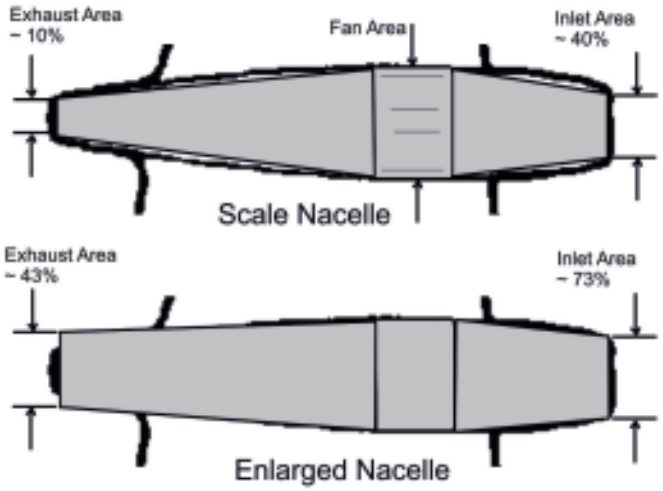
rotate some elements or rearrange elements. I then import that graphic into Corel Draw, a drafting program.

The GE90 on the Boeing 777 represents the state of the art in fan jets.

The next step is to decide on a size. This can take in many factors but in the case of the Meteor I decided to examine what size would be necessary to allow incorporation of my 90 mm fan within a nacelle close to the scale size. This resulted in a wing span of 42 inches and fuselage length of 48 inches which seemed about right for a hand launched model and the level of power available.



Now, if we fit the 90 mm fan and then fit the inlet and exhaust to match the scale outlines and orifices you see from the graphic below that both orifices are severely constricted with respect to the fan area. This may well result in unacceptable losses in the higher velocities of flow through both inlet and exhaust as well as much of the ducts. These losses appear as a velocity and therefore a mass flow loss through the fan. I doubt such losses would allow reasonable flight performance.



Now the bottom of the graphic shows enlarged inlet and exhaust orifices with much greater area and these might be acceptable and not detract too much from the scale look. But the proof of the pudding as they say is in the tasting so I think I decided to make a single fan, simple flight test model on which to measure the flight performance before launching into the Meteor build.

Meanwhile I have bench tested the "cheapie" fans and a pair of greater quality and potential performance that I acquired ten years ago on a trip to England. They are actually German fans quite similar to the Wemotec fans that started practical EDF flight at that time.

I then proceeded to run tests with a 50 amp ESC and a variety of two, three and four cell LiPos.

The “cheapie” fan ran satisfactorily on the four cell pulling 22 amps at a speed of 22,000 rpm. I don't know the thrust but it seemed healthy.

The German fan with the 3900 Kv motor was hand held

by Chuck Kime, then Jeff Frazier while pulling 52 amps with very healthy thrust. I have ordered another motor so as to have choices for the Meteor. Note that these two different fans use about the same overall power; 22 amps on four cells for about 260 watts and 52 amps on two cells or about 300 watts.

The next step will be to build the single fan test model using an existing wing and a simple box fuselage to accommodate the test mount screwed into the top.

So watch this space and see the tests at the field. Anyone have a radar gun?

A few days later I was ready to go. Even the $26 four-cell 2200 mah LiPos arrived from Hobby Partz. So I fitted the "cheapie" fan located longitudinally so as to balance the plane with the 8 ounce four-cell LiPo in the nose. Note that I incorporated a tail-dragger landing gear with a wide stance. Problem is this plane weighs in the mid 30 ounces and the wing loading is in the 30s too. This is four times the loading of our Old Timer planes so the takeoff speed will be double (aerodynamic forces increase with the square of speed). This is too high a speed for a hand launch so ROG is preferred. I was worried about the high thrust line and "long" grass causing the model to nose over on acceleration, but if I could get the plane to accelerate to a speed where up elevator would keep the tail down, it might work.

So, on the first nice Saturday of the season the tests began. The first few attempts resulted in the model turning sharply right as the right hand wheel was not running freely. Application of the "wet dipstick" did the trick and now it just nosed over in a straight line. We tried to keep the tail down for the first few feet by having Chuck hold it down and run alongside. Still it tipped. So, since President Dick Seiwell has preserved our "testing long grass" energy absorber we just tried a hand launch. With an untried and untrimmed plane we knew this was a low success probability but what the heck, we came to test. Sure enough, it just rolled to the right and into the weeds. Damage: just pulled the motor/fan forward on its fuselage mount. An easy fix.

The "cheapie" fan on the left came with an Aerowind 1900 Kv, 28 mm diameter motor good for 26 amps I bought a Turnigy 3640 3900 Kv motor from HobbyKing for the Germa fan. Since I had no experience running Motocalc with EDFs thought I should bench test them first so I made a simple mount to attach to a 2 x 6 clamped in a big vice.

Back to the ROG takeoff with thrust modulation so as to build speed with low thrust then nail it before running out of runway. Yep, got that far but then on takeoff the un-trimmed airplane just got away from me and rolled in to the left striking inverted. This time the damage was still confined to the fan unit which pulled completely off the fuselage but the fan case was also damaged so now I am down to one of these.

But in the couple of hours before coming out to the field I prepared the 50mm fan from the pair I bought at the same time as the larger pair. These came with 5400 Kv Günter motors and although a four-cell battery would wick these up to some unGodly speed I thought I would just "suck it and see". So I mounted this fan to the model and gave it

a short burst; wow, this thing has promise. But on the first takeoff attempt the motor just wobbled as though one of the leads had come off.; It hadn't, but the motor was really hot so I thought I might have just fried it!

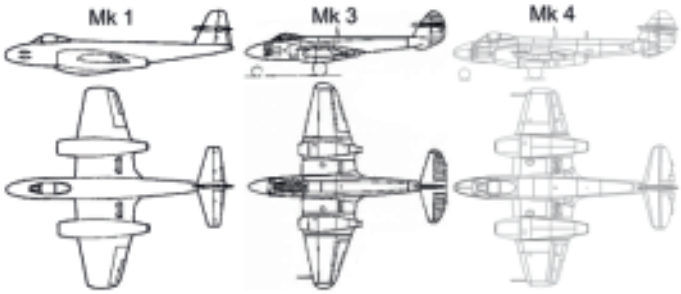
Later, at home, I measured the resistance of the windings and they seemed to be OK so I tried it again but this time on a three cell battery. It pulled 17 amps running seemingly well, but on the second attempt it just wobbled again. So something in the heating is holding it back when it gets warm. So, being a guy I decided now was the time to look at the instructions! Well, there are none but, Dymond from whom I bought the motor had the info on his website, http://www.rc-dymond.com/ It says this motor ($10) is good for 2 cell batteries and 150 watts. My test on the three cell was pulling about 190 watts! Might take it but I think I need to play with the ESC timing first.

Now to address the fundamental problem with the test bed model. I need to stop it nosing over. Quick fix, a couple of hours later it was fitted with a nose gear.

Since the main gear is forward of the CG the nose gear will only touch when the thrust and wheel drag are high, but it should solve the takeoff problem. But now I must wait for a suitable test day at CA. I don't think it will handle the long grass at Chester Park.

But back to the thrust of this whole exercise; a twin fan Gloster Meteor. All this testing activity is to figure out the thrust available from various fan and inlet/exhaust systems then fit them into a suitably sized airframe. Up to this point I have been focused on the 90mm fans but I could build a smaller model for a smaller fan ~ say the 50 mm units that I have on hand. Or even a different size.

Now, I have shown you a variation on inlet/exhaust for the basic Meteor plan but I have discovered that in the process of building over 3000 of these planes during its production lifetime there were many different versions with different engines. Each with different nacelles. Indeed,



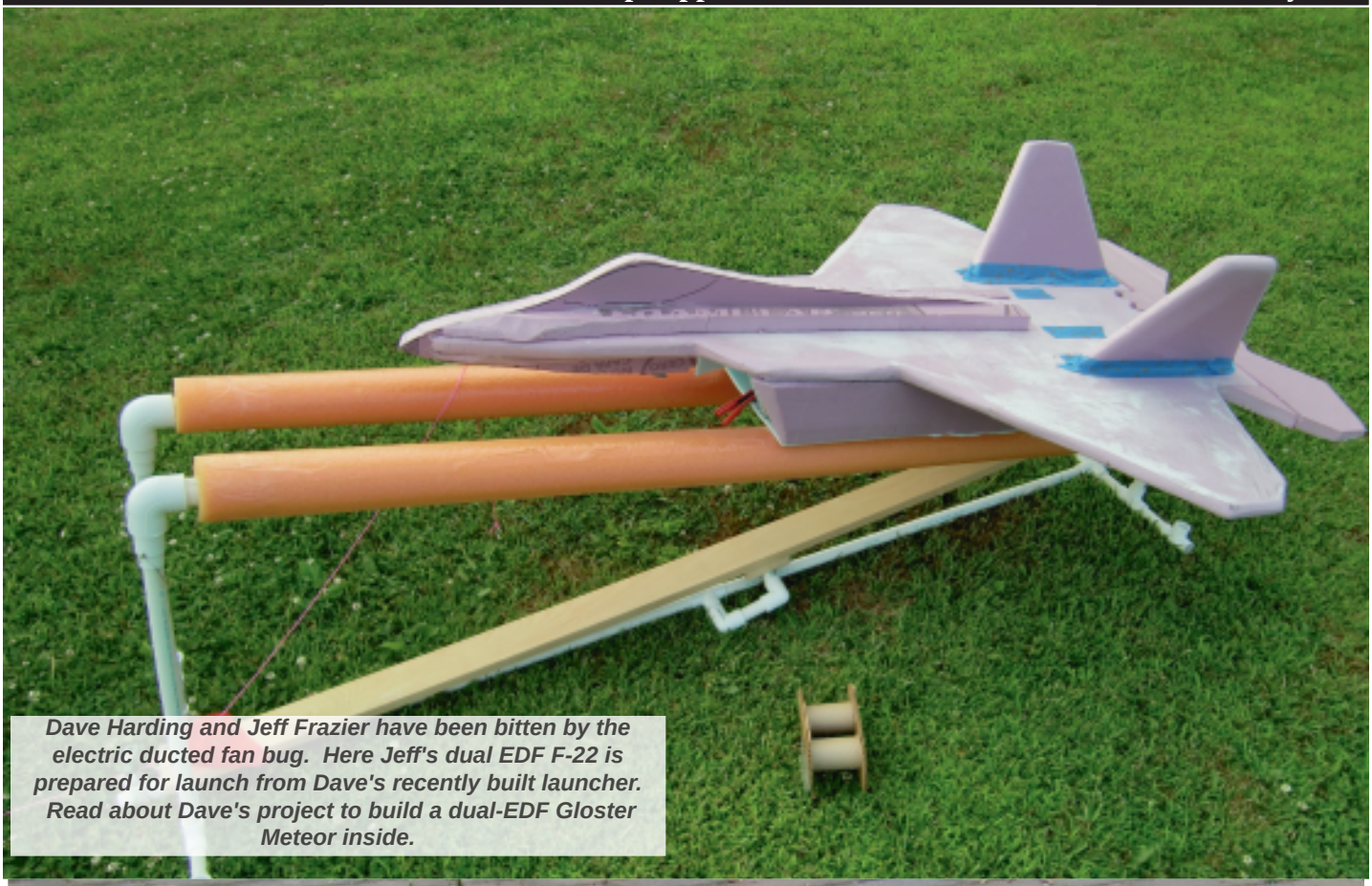
there are variations in size of the various elements probably to suit emerging missions. However, here is a comparison of three different marks each sized to the same wingspan;

Note the Mk 3 has a greater wingspan if scaled to match the engine spacing. It has a short fat nacelle. But the Mk 4 has the most generous nacelle in comparison with all other dimensions.

But there are other considerations in my plan. First this model must be an easy build and it must look like an early jet in flight and flight performance. This means no landing gear which in turn imposes other factors like it must either be small enough to grab and toss, or I must launch it with a bungee; like these two EDF pioneers at the Mid Winter Electrics in San Diego in 2001.

So this is why the fan testing is so important. I must find a fan/motor/battery/inlet/exhaust configuration that suits such a model and having done so I must size it to fit.

Dave Harding



Dave Harding and Jeff Frazier have been bitten by the electric ducted fan bug. Here Jeff's dual EDF F-22 is prepared for launch from Dave's recently built launcher. Read about Dave's project to build a dual-EDF Gloster Meteor inside.

One of Dave's test beds for his electric ducted fan project. It turned out to be a nice sport model when he was done with it.