The Flightline

Volume 34,Issue12 Newsletter of the Propstoppers RC Club AMA 1042 December 2004

Club Matters

Club news from this quarter is a little thin this month as I have been out of town visiting mum and although I took along two foamy kits I didn't either build them or make any visits to the UK indoor scene.

Retiring club President Keith Watson has explained to me that the club has done due diligence to our bylaws in respect to election of club officers with Vice President Dick Seiwell and Secretary Dick Bartkowski continuing in those offices and Jim Barrow will take over as treasurer. There have still been no nominations for the position of President. Dick Bartkowski has suggested the new board take turns running the meetings until a new President is found.

On field matters, as reported in the minutes, Moore field will be our primary field until the end of the year whereupon the new Christian Academy field will be used. This plan ensures we don't have the potential frequency conflicts arising from using both fields.

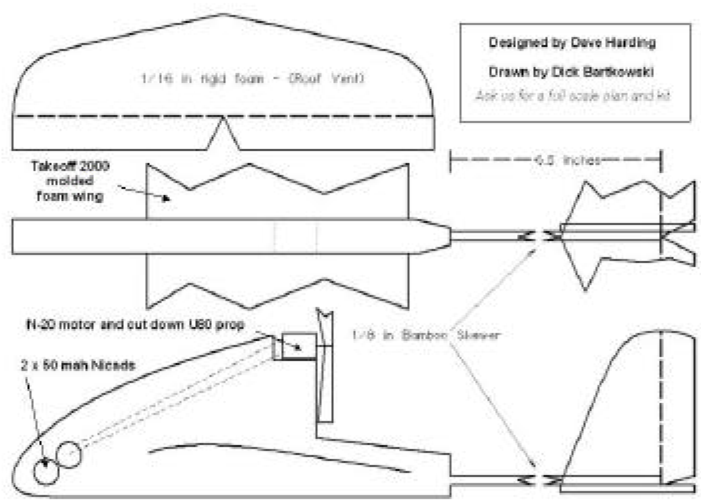
I understand there was considerable discussion on the field issue at the November meeting, some members expressing their displeasure in the lack of an available field for gas model flying. I tried to get some continuing discussion on the issues as a means of establishing a plan of action but have received not a single response to my invitation.

The club held its first indoor meeting at the Tinicum School gym in early November. What a shame that only four people turned up. These meets have been a well-attended blast for the last few years; perhaps it was a lack of reminders from the Yahoo group. Several of us regulars were out of town so hopefully we will have a quorum this Friday, 3rd of December.

Sorry if this "snail mail" reminder doesn't reach you in time for this one but my return from the UK and subsequent jet lag has slowed me down this time.

Dick Bartkowski and I have been preparing some kits for a simple and good flying indoor electric powered freeflight model. We will have some of these at this Friday's meet so come on out and get one to fly or build. The kits consist of one molded foam wing, the one we have been using on our scale indoor freeflights, and the foam parts for fuselage and empennage. The tail boom is a meat skewer. The motor, an N-20 and U80 prop are provided with the necessary wires and batteries. Construction with a hot melt glue gun takes only about ten minutes while the soldering takes another five. We also provide the charger, which takes four C cells and lasts about forever.

This model has proved an excellent flyer and is also durable due to its soft foam fuselage and pusher configuration. The inevitable contact with walls and ceilings are taken in stride. Come on out and try one.



In any case, I hope you can all make the usual club meeting on Tuesday 7th Decmeber at the Marple Newtown library.

Dave Harding, Editor

Agenda for December 7th Meeting
Marple Newtown Library, 7:30 pm

- Approval of November meeting minutes
- Membership Report
- Finance Report and Budget Review
- Nominations for President
- Flying Field Issues
- Show and Tell

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Calendar of Events

Club Meetings

Regular Meeting 7:30 pm
Tuesday 7th December
Marple Newtown Library

Tuesday Breakfast Meeting
The Country Deli, Rt. 352 Glenn Mills
9 till 10 am. Just show up.
Flying afterwards, weather permitting

Flying Events

Indoor Flying at Tinicum School 7 – 9pm

Friday 3rd December

Regular Club Flying

At Moore Field till year end

Daily	**10 am til Dusk**
Saturday	**10 am til Dusk**
Sunday	**12 p.m. till Dusk**

No Flying at Christian Academy till the New Year

Note; Flying must be done in accordance with the agreement forged by Vice President Dick Seiwell Specifically, only electric powered airplanes.
Experienced pilots only at Moore.

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Propstoppers Web Site; www.propstoppers.org
Check the web site for back issues of the newsletter, pictures of club events and the calendar of future events.

The President's Message

Fellow Propstoppers,
I would like to thank the Propstoppers Club Officers for their continued service throughout this 2004 season. Also to all the nominated officers and club members who have gone "above and beyond" to help with events, planning and activities for the club.
I would like to ask every club member to dedicate some time to the club as many others have this coming 2005 season. It is the participation of many that makes our club strong and your input and help is needed and appreciated by all.
The club is still seeking someone for the President's position; please consider serving the club in this very important position.
Dec. 3rd and Jan. 7th are the next indoor flying dates at Tinicum School.
Richard Bartkowski and Dave Harding will be collecting donations for the Chester Salvation Army. The Salvation Army has provided the club with an indoor flying site and we, as a club should in turn help them in any way we can.
Our next club meeting is at the Marple Library on Dec. 7th, 7:30pm.
To you and your family have a happy holiday season!

Keith Watson
Keith Watson

Retiring President, Keith Watson, cruising with his glider at the Tinicum indoor meet in November. Do you know how this stays up continuously? Report at the next club meeting!

Minutes of the Club Meeting, 2nd November 2004 at Marple Newtown Library

Vice President Dick Seiwell called the meeting to order at 7:30 p.m.

The roll call taken by membership chair Ray Wopatek showed 22 members and no guests.

The minutes of the October meeting were accepted as published.

The treasurer's report was given by Treasurer Al Gurewicz and accepted by the membership.

Old Business:

President Keith Watson noted that Sleighton field is now closed and that Moore field is open only until year-end. Even then it is restricted only to electric models.

The Salvation Army gym in Chester is available to us again as last year. We can use it on Tuesday mornings from 10 to 12:00 a.m. except during the Christmas season when it is used for gift storage. We are negotiating Saturday sessions for the New Year.

New Business:

Vice-President Dick Seiwell secured a new field for the Club. It is adjacent to Moore field at the Christian Academy site. The lock arrangement is the same as at Sleighton. To get to the field, exit Middletown Road across from the Brookhaven Pathmark and make a quick right on Old Middletown road. Then, enter to the right of the school and follow the road to the field gate. In order not to interfere with activities at the school, we're limited to weekdays from 3:00 p.m. to dusk, all day Saturday, and Sunday afternoon. Again, we are currently limited to electrics only.

Moore field and the Christian Academy field cannot be used simultaneously because of frequency conflicts. The club decided to use Moore exclusively until year and.

The president and treasurer proposed a budget for the 2005-year. Because of uncertainty over the field situation, it is somewhat tentative. The proposed budget and accompanying dues of $60 per year were accepted by membership vote.

Show and Tell:

Sam Nevins showed a Great Planes kit, 46 FX powered weighing 6 lbs. with a 55 in. span and controls including flaps. He is anxious to see it in the air.

John Drake showed a scratch built, 20-size profile aerobat electric with hovering capabilities.

Paul Grothman showed a Hobby lobby Raptor with an AXI motor and lithium cells for use as an 11 ounces indoor flyer.

Rick Grothman showed a 12 oz foam aerobat electric ARF with hover capability which he is planning to use in the coming indoor flying season.

Dave Bevan showed a plane developed for Widener students to learn needed aeronautics skills to build a cargo plane for a contest. It has an unusual design with equal size front and back wings.

Richard Bartkowski, Secretary

Thick or Thin, CA That Is.

Don Stackhouse, designer and manufacturer of the Roadkill series of indoor / parkflyer sheet-balsa models states his position and the reasons for it.

We recommend medium or slow C/A on the Roadkill Series models, there are several reasons.

1. It's lighter in actual practice than thin C/A. Medium or slow C/A will wick along a joint quite nicely, and will soak down into the surface of the wood enough for a good grip, but it doesn't soak into the thickness of the wood nearly as much as thin C/A, especially if you're applying the C/A through deliberate pinholes on the other side of the wood as Ted suggested. The thin C/A tends to saturate large volumes of wood, adding lots of extra weight, and also making the wood brittle. Also, medium or thick C/A gives you enough time to wipe off any excess before it sets. Thin will just soak into the wood, making it impossible to wipe off the excess even if it gave you time to try, which it doesn't.

This can be especially useful in certain jobs such as when edge-gluing the basswood leading edge strip to the leading edge of the lower wing skin. With thin C/A, the glue tends to wick down through the joint and all over the lower surface of the two parts. With thick or medium, I just put the two parts on a piece of waxed paper, hold them edge-to-edge a few inches at a time with one hand (this even works on the Spitfire's elliptical leading edge, without even wetting the basswood), apply a thin bead of medium C/A along the joint, wipe off the excess with a tissue (which also helps drive the glue down into the joint), then hold it till the glue sets. If I'm in a hurry I may fog just a little bit of accelerator onto that portion of the joint, but it usually isn't necessary.

I used to use mostly thin C/A in most of my own building, and through experience I've found that medium or slow works better in the vast majority of cases. About the only thing I use thin for now is to lock the little adjusting sleeves in the control linkages after they're set, and to wick into the reassembled splinters of a badly smashed part after a crash.

2. Medium or thick gives you enough time to put it on the parts and assemble them immediately after that, but it will set in about 30 seconds or so after that. This lets you assemble a part after applying glue, then hold it in place until the glue sets. I would not want to do that with the aliphatic and other glues that take many minutes or even hours to set. This can be a particularly important factor with certain types of structures.

Ted's technique of poking holes in the balsa and then trying to wick thin C/A through them to glue something on the other side is going to give you a very heavy and brittle wing structure, with a good chance of warpage, and it may still not succeed in getting the ribs bonded to the skin properly. The joint in this case is on the underside of the upper wing skin, where you can't see it as you hold the entire wing flat on your building surface while the glue sets. It's going to be very difficult to see just exactly where to make those pinholes, and it still requires soaking C/A all the way through the wing skin to a joint on the other side. With this technique you also stand a good chance of gluing yourself to the model in the process.

Thin C/A can wick along the grain an amazing distance (six inches or so is not uncommon!), particularly when you don't want it to. That method is also going to be difficult to do with the 1/64" plywood doublers on the fuselage. What I like to do with those is fit the doubler in position dry, hold it in place with masking tape along one edge, and then use the tape like a hinge to open the joint back up. This lets me take all the time I want to get the alignment perfect, then lock in that alignment with the tape while I apply the glue. It's based on the technique that was used by the test department folks to precisely position strain gauges on propeller blades, at my old job in the propeller business. I apply the glue to the ply piece, starting with a thin bead about 1/8" in from the edge all around the perimeter, then spiraling the bead inward with about 1/4" gap spacing from the previous bead, till I've covered the surface. The glue will have no trouble spreading-out to fill the gaps. I then flop the doubler back into position, double-checking the alignment as I do so, then hold the whole sandwich down on a flat surface till the glue sets about 30 seconds later. You'll know when it does if you're paying attention, because you will feel a slight warmth coming through the wood. Peel off the masking tape and you're done!

It's quicker and lighter than trying to hold everything together in alignment with one hand while trying to precisely drip thin C/A through a bunch of pinholes in the plywood that you had to punch beforehand (weakening the plywood in the process, and possibly distorting it as well).

The same technique will work with white glue, but the sealing nature of the plywood will tend to trap moisture in the joint, making it more difficult for the joint to cure properly.
Medium C/A will also wick into an assembled joint when applied to it from the outside, just like thin does. However, it will tend to follow the joint instead of just soaking aimlessly in all directions into everything in sight the way thin likes to do. Once again, medium results in a lighter, stronger, tougher, more forgiving joint.

3. It's much easier to control the amount of glue you apply with medium or thick instead of thin. Besides needing a larger volume to compensate for the way it tends to soak into everything else besides the joint itself, it's tough to get small, precisely controlled amounts from a bottle of thin C/A. A good glue tip with a really fine orifice helps a lot, but it's still difficult, especially for someone not experienced with it. *(See me for your free length of the ideal fine tubing; Dave)* Controlling the application of medium or thick is much easier, and as I said above, you can wipe off any excess before it sets if you do get too much on. It's similar in viscosity to the other glues they're already used to, so working with medium is typically an easier adaptation for beginners.

There is a place in the world for just about all glues, and I use a wide variety of them in my work, including thin C/A. However, after extensive testing and builder feedback, we've found that when using C/A for general-purpose construction, medium seems to be the best overall choice, with thick in the areas where you need a bit more working time.

Don Stackhouse @ DJ Aerotech

Contra Rotating Props

By Don Stackhouse

Recently, Don was asked the following question; "How much less efficient is a push pull arrangement a la Savoia-Marchetti>SM-55, LeO H-24, Dornier Wal, ... than two tractors?"

Simple question, but as usual no simple answer. For the types of disk loadings we see in models, it's likely to be less efficient than two independently mounted tractors.
A propeller imparts a swirl to the air passing through it. It takes energy to accelerate the air into this rotation, and therefore represents an efficiency loss. The idea behind a contra-rotating propeller system (i.e.: two props rotating in opposite directions on the same axis; "counter-rotating" means two props rotating in opposite directions on different axes, such as on the Lockheed P-38) is to have the swirl from one prop cancel the swirl from the other, eliminating the rotation in the slipstream. Supposedly this can provide efficiency improvements of as much as 15%.

The problem with this concept is that there must be that much efficiency loss already in the basic design, that is available for recovery. This is only true in props with extremely high disc loadings (i.e.: massive amounts of horsepower being forced into a relatively small diameter prop), such as the "propfans" that NASA was experimenting with back in the 1980's. Those were trying to absorb 12,000 horsepower or more in a prop only about 10 to 12 feet in diameter, less than the diameter of the 4500 horsepower props on a C-130 Hercules!
When you have that much power going into such a relatively small prop, there is lots of swirl, and therefore a lot of energy that can be recovered by the second prop. That's also why those props use so many blades; more disc loading requires more blades to absorb the power. At the disk loadings typical of our models, there is very little swirl by comparison, and I doubt that you could expect more than a percent or so of recovery from it at best, *IF* you did everything exactly right (a virtual impossibility in the real world).

About the only case where swirl in models is a significant factor worth doing something about is in ducted fans. In that particular case we have a lot of power going into a very small prop, so there is lots of swirl. To combat this, we put stator vanes in the duct behind the prop to straighten out that swirl. Those stator vanes are nothing more than the special case of a contra-rotating propeller system, with the second prop in the system designed to run at an RPM of exactly zero. Even so, those stators must be designed and optimized very carefully, or the energy losses due to their own drag will be greater than the energy revered from the swirl, resulting in a net loss. This is the exact same problem most energy recovery devices (such as winglets) face, that of delivering a benefit that exceeds their cost.

The other benefit of a contra-rotating system is that it can cancel out the torque and P-factor effects of a large engine. This is one of the main reasons for its use in planes such as the later Rolls Royce "Griffon" engined versions of the Spitfire, the Bugatti racer, or the Fairey Gannet.

Unfortunately, that also requires the use of a fairly complex gearbox, and gearbox-driven props of any kind have a long history of nothing but trouble. The British seem to have had the best luck with them (the gear drive that combined the two crankshafts into the single propshaft on the Napier "Sabre" 3000 to 5000 horsepower H-24 engine was particularly ingenious, and very successful), but other than those successes, the propeller gearbox has historically been the ruin of many airplanes. Gearbox problems were on of the biggest factors that kept the Northrop XB-35 flying wing bomber from being ready before the end of WW II.

In any case, torque and P-factor are generally not significant issues on models. However, the asymmetric thrust in the case of a failed engine on a twin (yes, even electrics can have those) can be a significant issue. The "centerline thrust" of a contra-rotating twin arrangement can solve this. This was one of the biggest reasons for this layout on the Cessna 337 and the Rutan "Defiant".

For a typical un-ducted contra-rotating propeller system, one of those two props is a pusher prop, and therefore you have all the problems and efficiency losses inherent in a pusher prop, which can be considerable on any size airplane.

The myth of pusher efficiency assumes that by putting the prop at the back end of the airplane so the rest of the airframe in line with the prop does not feel the increased speed of its slipstream, you save on airframe drag. In actual practice this may be true, although in the vast majority of cases the savings from this are microscopic. If we convert that airframe drag savings into its equivalent in terms of propeller efficiency, we're looking at typical differences on the order of a small fraction of one percent. Recent wind tunnel studies by NASA even show that the majority of the flow behind a propeller tends to be laminar, not turbulent.

Meanwhile, putting the pusher prop at the back, so the airplane does not have to fly through that prop's slipstream, means that the prop now has to fly through all the disturbed airflow coming off the airframe. The efficiency losses from that are typically at least 2-5%, and can be well in excess of 15% in some cases, not to mention the increase in vibrational stresses and noise, the added FOD ("Foreign Object Damage") of stuff coming off the airframe, rocks kicked up by the wheels on takeoff, etc. Keep in mind that on a propeller driven aircraft, only a very small percentage of the airframe is actually immersed in the propeller slipstream, and therefore only the slipstream affects a small percentage of the total airframe drag. Meanwhile, essentially all of the thrust comes from the propeller, so anything you do that hurts the propeller's ability to do its job will have big effects on thrust and efficiency.

In addition, pusher props are usually restricted in diameter because of ground clearance problems. This tends to force additional efficiency losses. Diameter is probably the single most important factor in the efficiency of most propellers, and even a small restriction on it can have big effects. This is especially true at high power and low speed, such as takeoff and climb, although less so at high speeds.

This is one of the major reasons the Prescott Pusher (among others) was such a disaster. Try comparing its takeoff performance with conventional tractor aircraft in the same power and payload class and you'll see what I mean. A pylon-mounted arrangement like you're considering doesn't have ground clearance issues, but has restrictions due to the height of the pylon. All that thrust way above the C/G and the hull tends to shove the nose down, especially on takeoff.

I know of at least one amphibian with a pylon-mounted engine that has been unable to accept larger engines, because any significant power increase beyond the plane's current engine tends to make the plane want to become a submarine when you open the throttle for takeoff. With a pylon-mounted arrangement, the forward prop sees some disturbed inflow due to the flow next to the fuselage and wing, but the aft engine also sees the disturbances from the forward engine and nacelle, as well as the pylon and any external bracing. The net result of all of this is usually little or no measurable benefits from reducing airframe drag, but quite significant losses due to these other factors, for an overall net loss.

Even the possibility of recovering swirl energy, as in the case of a contra-rotating propeller system, usually does not start to see measurable benefits until you get into the sorts of horsepower typical of turboprops and very large piston engines.

I used to be an engineer for a propeller company that happened to have more experience with pusher installations than probably anyone else in the business (Voyager was one of those). Our usual first reaction when someone approached us with a new pusher application was to try to talk them out of it.

There are a number of aircraft designers (including Rutan) who have at some time in their careers been a big proponent of pusher designs. In general, they are airplane designers, not propeller designers, and tend to overestimate the benefits to the airframe of a pusher arrangement while badly underestimating the detrimental effects on the prop. There is a tendency to think of props as these mystical devices that you just bolt to the engine to make thrust, with little thought given to the prop's own needs and idiosyncrasies. To really get a decent working relationship between a pusher prop and the airframe usually takes an incredible amount of work.

Piaggio came up with one of the better pusher designs (from an aerodynamic standpoint) in their P-180 "Avante", but it took a huge amount of engineering effort including over 2000 very expensive hours in Boeing's wind tunnel to achieve it.

So, back to contra-rotating props: what do we need to do to get the most from them? First, you need enough power to make it worth the extra weight and complexity. OK, so the vast majority of models do not satisfy that requirement, but we want to have a contra-rotating system anyway for scale appearance purposes. What should we do to minimize the detriments?

The swirl dissipates through friction with the surrounding air. To recover the maximum of whatever swirl energy is available, the two props should be as close to each other as possible. However, that also worsens the vibrational effects of the blades passing each other. That arrangement also generally requires one of those complex and troublesome gearboxes I discussed above. It's a tradeoff.

In the case of the Cessna 337, Dornier Do335 "Pfeil" ("Arrow"), Savoia-Marchetti S-65 racer, etc., they give up some of the possible swirl recovery, and also worsen the inflow environment and efficiency of the aft prop, to eliminate the gearbox. The mechanical simplicity may make it a worthwhile tradeoff.

The real key then to getting the most out of any pusher installation, including one with a tractor up front as well, is to get the airflow into the rear prop as clean as possible. Any fat fuselages, bracing, struts, and especially any flying surfaces or any large bodies that are to one side of the prop's axis can spell serious trouble. For example, I know of one prominent twin-pusher that had fairly fat nacelles sitting on top of a fat wing root ahead of the props, and a fuselage to one side of the prop disk. The inflow angle over approximately one-fourth of the prop disk was fifteen degrees different than over the other three-fourths of the disk! Imagine what would happen to your glide ratio and the comfort of your passengers if during a max-performance glide you started rapidly and continuously porpoising the nose up and down over a 15-degree range. That's what was happening to the blades of those props. The vibration problems were extremely serious, and the performance fell well short of original projections. They ended up having to go too much more powerful engines (with their attendant increase in fuel burn and other operating costs) to make up the difference.

So, the key is to keep the inflow as undisturbed as possible, and also to have it as symmetrical around the axis of the prop as possible. Anything that creates turbulence is bad, and anything that deflects the airflow to a different angle (so that the angle of attack seen by the blades varies as they sweep around the disk) is even worse. Wings, tail surfaces and deflected control surfaces can be serious problems. A thin, shoulder-mounted wing mounted well ahead of the prop on a slender, smooth fuselage (such as the case for the aft engine on the Voyager) is better than a high wing and a lop-sided fuselage right in front of the prop such as the Cessna 337.

Speaking of the Cessna, some folks like to trot out the fact that it climbs better on the aft engine alone than on the front engine alone as support for their flawed claims that pushers are generally more efficient than tractors. In truth, the aft prop of the 337 is less efficient. However, the lower aft fuselage of the 337 slopes upward at such a steep angle in front of the aft prop that, without the induced flow from the aft prop, the airflow over the aft lower fuselage separates, causing massive amounts of drag. When one powerplant is shut down and feathered, the plane climbs worse on the front engine alone because of the massive increase in fuselage drag due to the poor aft fuselage shape, in spite of the front prop's better efficiency.

OK, so we've learned that pushers are usually a detriment unless you really do your homework, contra rotation is not generally worth the trouble on models, but if we're going to do it anyway, we should try to keep the airflow into both props as clean, smooth and uniform as possible.

What's that bit someone else mentioned about different diameters due to "slipstream contraction", and what about the need for different pitches and/or rpm's for the two props?

A prop makes thrust by grabbing chunks of air from in front of it, and accelerating them out behind. About half the acceleration occurs in front of the prop, and the other half behind. The reaction to the force required to accelerate the air's mass shows up as thrust. Because the air has to be accelerated to make thrust, the velocity of the air behind the prop is faster than the velocity in front of the prop.

As the velocity changes, the roughly cylindrical stream of air flowing through the prop has to obey Bernoulli's principle. If its airspeed increases, then the cross-sectional area (and therefore the diameter) of the stream has to decrease in proportion to that in order for the volume of the flow to remain constant. If this were not so, the flow through the prop would violate the law of conservation of mass and energy, which happens to be one of the most inflexible laws in all of Newtonian physics.

Thus, the diameter of the inflow to the prop is actually larger than the prop at some point upstream of it, and then contracts during that first half of its acceleration until it is equal in diameter to the prop when it reaches the prop disk. It continues to contract after it passes through the prop, during the second half of its acceleration. This is that "slipstream contraction" that some other posters to this thread have mentioned.

This means that a second prop, aft of the first one, that is supposed to be working with the slipstream of the first prop, needs to be a little smaller in diameter in order to match the boundaries of the now-contracted slipstream. Just how much faster (and therefore how much smaller in diameter) depends on a number of factors.

Suppose we have a twin-engined model that weighs 1 pound, and we're planning to modify it into a twin contra-rotating arrangement. Let's also assume that the L/D (essentially the same as the glide ratio) at our expected cruise speed of about 25 mph is 4:1 (I know that sounds low, but remember, typical cruise speeds are higher than best gliding speed, and besides, this airplane has a bunch of extra stuff hanging out in the breeze).

This means our drag is equal to the weight divided by the L/D, or 0.25 pounds. In level flight, that is also equal to the total thrust. Let's also assume the front prop is doing about 55% of the work (0.138 pounds of thrust) to allow for the lower efficiency of the aft prop.

We'll define the prop as having a 6" diameter (0.5 feet).

Plugging all of that data into our formula we get:

Vt = 30 mph.

That's a velocity ratio of 1.2, or 20% more than the freestream velocity.

This means that if the aft prop is far back enough to sit in the fully developed slipstream from the forward prop, it will need either 20% more pitch (the preferred solution) or 20% more rpm (which opens several other cans of worms).

In addition, the slipstream contraction will be;

SQRT (1/1.2), or 0.913.

That means the aft prop should be 91.3% of the diameter of the forward prop, or just a little less than 5.5" diameter. See, that wasn't so hard, was it?

I helped advise a guy recently who scratch-built a VERY giant-scale electric model of the Voyager. As I recall, his original setup used the same size props on both ends. It flew much better when we put a prop with more pitch on the aft motor.

So, that's all there is to it! Just correct for slipstream effects on the rear prop, and keep the inflow into it as clean and undisturbed as possible. You will probably not have as much prop efficiency as a pair of tractor props with nice clean inflow, but it shouldn't be too bad.

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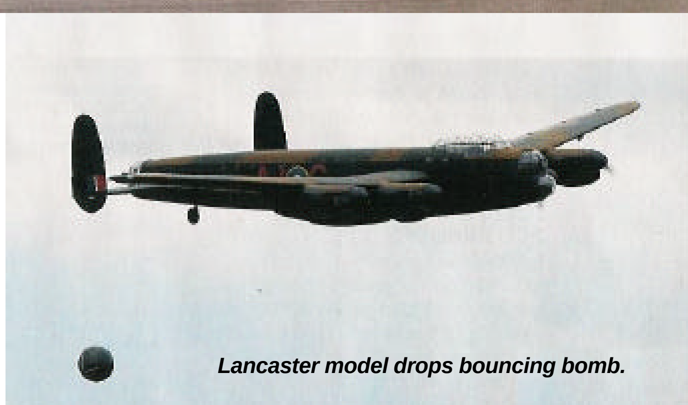
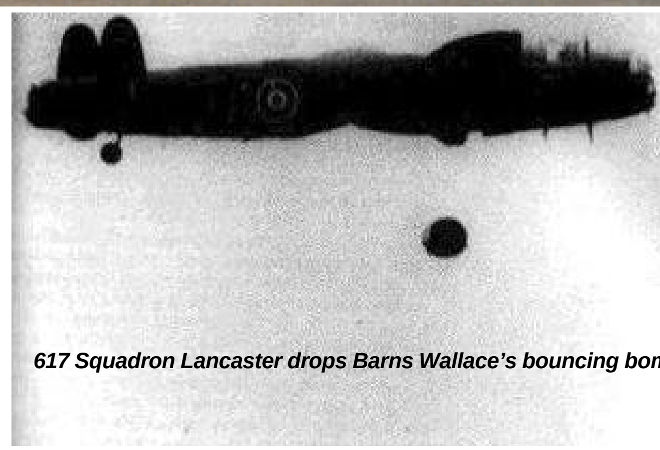


Lancaster model drops bouncing bomb.



617 Squadron Lancaster drops Barns Wallace's bouncing bomb.

17-Foot Span Avro Lancaster

This Lancaster model is one of the British Large Model Association models and was described in some detail in a recent British magazine; RCM&E, November and December 2004. This is actually a model of one of 617 Squadron, the "Dam Busters" aircraft and it drops a model of Barns Wallace's bomb.

These aircraft flew one of the most dangerous missions of WWII. They were specially modified Lancasters flown by select crews in a mission to burst three dams in the industrialized German Ruhr valley. The dams were protected by a vast array of interlocking antiaircraft weapons and the aircraft were particularly vulnerable because they had to fly a constant, straight and very low altitude approach to the targets. Barns Wallace had developed a "bouncing" bomb to skip over the water and then sink against the face of the dam.

The mission was a success in that they breached the Mohne and Elder dams although the losses exceeded 50% and the Germans quickly repaired the damage.

Oh, yes, the model is electric powered!

Dave Harding