The Flightline

Volume 33,Issue 1 Newsletter of the Propstoppers RC Club AMA 1042 January 2003

Editorial - Design, Build and Fly Indoors

For a few Propstoppers and friends the flying season does not stop for Winter's worst. We fly indoors.

The really interesting thing about indoor flying is that you don't just grab the latest ARF and bolt in your trusty .40 and 10 x 6 prop, juice and fly. It takes some more initiative and a little work. This is not to say that almost ready to go options don't exist. Indeed the ubiquitous GWS Lite Stick and its various offspring is an easy and relatively inexpensive way to go. However, there are many other challenges that result in delightful flight opportunities indoors, and we are amazed with at least one new offering at each indoor meet we have attended in the last two years.

The first indoor meet of our current season was opened by Membership Chairman Ray Wopatek and his RC Blimp ("America" Ray?). These ingenious flying machines have two electric driven fans operating independently via a special controller. Each fan can be driven in forward and reverse and can be controlled in their pitch direction. So, by controlling these two inputs via the special controller you may create the aerodynamic forces to climb, descend and turn. When the machine is set up with neutral buoyancy the result is magic. Here is Ray with his blimp together with former President Mike Black and former Secretary Rusty Neithammer.

Mike flies a mini IFO, another indoor classic with aerobatic performance rivaling the best and most expensive IMAC aerobats. The IFO is available as a kit in several varieties. It is an easy build and rugged enough to survive the inevitable contacts with the "space limiters" natural hazard with indoor flying. There was an IFO in the air almost continuously at the first indoor.

Rusty flew his Fast Freddie stick-built design that he has been tuning for the last few indoor meets. Fast Freddie is fast and quite a handful in the small Tinicum gym. Rusty is also having difficulty finding the right power solution for this model that has so much potential. So he took advantage of the "modern method", he asked a question on the Ezone Internet discussion group. Advice poured in from others who have successfully developed similar models. The primary advice was to convert to the new lightweight Lithium Poly batteries. Rusty has ordered his upgrade and we will learn about it at the next meeting.

The "Building Machine", Mick Harris once again stunned us with his latest model, an Antoinette from the SIG kit. This model is similar in size and flight performance to his Bleriot. It is about 50 inches span and powered by a GWS motor and prop operating on eight small NiCad cells. (Gotta make the upgrade to LiPoly Mick). This one just floats through the air. We got a movie that we may post to the web.

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Agenda for January 7th Meeting at Marple Library 7:30 pm

- Approval of December meeting minutes
- Finance report
- Membership report
- Field Matters
- Club Auction planning
- New business
- Volunteer for Magazine Exchange
- Fieldwork day plans
- Show and Tell.

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Calendar of Events

Club Meetings

Regular Meting 7:30 pm
Tuesday 7th January
At Marple Newtown Library

Club Auction 7:30 pm
Tuesday 4th February
At Marple Newtown Library

Flying Events

Indoor flying at Tinicum School
7 till 9 pm
Friday January 10, 2003
Friday February 7, 2003
Friday March 7, 2003

Regular Club Flying

At Moore and Sleighton Fields

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

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Propstopper's 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.
Pictures courtesy of Bob Kuhn and Dave Harding

The President's Message

Dear Fellow Propstoppers,

I like to wish all of you a Happy New Year. Hopefully everyone has had an enjoyable holiday season.

As the New Year starts please remember that our club dues of $80 are due and that you can pay at the meeting in person or send Ray Wopatek a stamped, self addressed envelope with your dues and a copy of you 2003 AMA card. His address is on the back cover.

For most of us our flying time is winding down and more time hopefully spent building something new. Remember that our club auction will be here soon, so start looking through your vast collection and see what you may want to sell in order to make room for Holiday presents or that particular item you no longer have a use for. Al Tamburro always makes the club auction interesting for our members.

John Zebuski

Copyright Issues, Another Dragon Slayed

One of the concerns I have as an editor of a "publication", especially one that is published on the World Wide Web, is one of copyright in the material published. Although much of what you read in our journal is original, some of it comes from other sources and may be subject to copyright restrictions.

Publishing such material might bring us, the Club and me, into violation of the law. This is clearly not the intent but some areas are downright fuzzy.

What about reprinting articles and plans from old model airplane magazines? Well, if the magazine became defunct long ago then it may be all right, but what if another magazine bought the rights and still sells the reprints or plans?

So, this is where we were after accepting Al Tamburro's generous offer to prepare a regular column reprinting interesting material from his vast collection of old magazines. I choked and asked for guidance from the Club Board.

But Al, man of action, simply picked up the phone and called MAN. This is the reply he received;

Dear Al,
Thank you for your inquiry regarding your club's building some of the Model Airplane News free-flight plans and converting them to electric. We certainly do not have a problem with your freely distributing these plans among your membership. I also wholeheartedly endorse your contest! If you have a chance to take photos and write a few words about what you did, we would love to publish the story in one of our publications (Model Airplane News, Backyard Flyer and RC MicroFlight). You can send these to my email address or to me at Air Age Publishing, 100 East Ridge, Ridgefield, CT 06877-4606.
Thank you for your interest in Model Airplane News and in bringing these great designs back into commission.
Sincerely,
Debra Sharp
Executive editor, MAN, BYF, RCMF

Way to Go Al

Minutes of the December 3, 2002 Propstoppers MAC

President Mike Black called the meeting to order at 7:30, at the Marple Library.

There were 22 members and two guests present**.**

The previous meeting's minutes were approved as printed in the December 2002 newsletter.

Treasurer's Report – Treasurer Al Gurewicz reported an income of $203.50 and expenses of $183.00. Our total available funds are $2142.79

Old Business

Sleighton Field – Access to the field has been restricted due to the locked gate and reductions in the security force. Chris Catania has been in touch with John Cramp of Elwyn and is working out a solution. However, this just reinforces the need for us to find another field. Meanwhile, plans for runway relocation for the 2003 season at Sleighton are progressing.

Field Search – Mike Black has been in touch with Randy Bates of Arasapha Farms, regarding use of land on that site. Randy thinks that, due to our good relations with the owners and community surrounding Sleighton, that there should not be any problems at his site. He will approach the township supervisors at an appropriate time to open a dialog.

SAM - Dick Bartkowski has his picture in the latest issue of "Sam Speaks".

By-law Committee Report – AMA has confirmed receipt of the club's bylaws, but has indicated that we should not expect any action from them until March of 2003. If we do not hear anything after that time, then it can be expected that they have no issues and have accepted them.

Interboro High School Demo – There were very few program attendees, but the Propstoppers got some good flying time in large space

Indoor Flying – At the Tinicum School Gym, is scheduled for the following dates:

Friday, December 13, 2002
Friday, January 10, 2003
Friday, February 7, 2003
Friday, March 7, 2003

Club Auction: - Last year, there was some discussion regarding holding the auction during the January meeting, instead of the February meeting as has been done in the past. The membership was polled and it was decided to again hold the auction during the February 4 meeting.

New Business

Appointments – Incoming president John Zebuski has re-appointed last years' club officers and chairman positions as follows:

Membership Chairman – Ray Wopatek
Safety Officer – Jesse Davis
Field Marshall – Al Tamburro
Coffee Chairman – Tom Tredinek

Copyright Issues – This precipitated from an online discussion on our Yahoo Group regarding possible copyright infringement issues that could arise from publication of old Flying Models model plans in a series of articles that Al Tamburro is authoring. Al has done some research of US copyright laws as well as contacting Model Airplane News (who had republished some of these plans and could possibly claim ownership of them). The general sense is that MAN does not care if we use these plans, and this is supported by the copyright law which says that reproduction of such materials for private, experimental, educational and other such use is allowed. A disclaimer will be added to the web page to cover us in case there happens to be a complaint.

Lecture – The American Helicopter Society (AHS) and the Society of Automotive Engineers (SAE) are hosting a dinner and lecture at the Townhouse Restaurant in Media, Tuesday, December 10 ($26.00). The subject is "Use of Rotorcraft in Emergency Operations".

Discovery Channel - will be airing a series on RC modeling, starting December 29, sponsored by Dubro.

There will be a speaker at the **Amateur Radio Club meeting**, who happens to be an RC modeler, Thursday, December 5, 7:00, at the Gauntlet Senior Center, across from Marple Ford, (Media Line Road and West Chester Pike).

Fieldwork day – To initiate preparations for runway relocation at Sleighton. Chris Catania needs to confirm this with Sleighton first.

Break

The 50-50 winner was Charlie Crowell

Show & Tell

Sam Nevins showed his kit built Great Planes Li'l Poke. Power is a 280 motor on 7 500 MAH NiCad cells.

Sam Nevins explains his Great Planes Li'l Poke to Ray Kiker and Micky Callahan

Dick Bartkowski with foam indoor P-40. President John Zebuski is enthralled!

New member Joe Dearie with Thunder Tiger Raptor 30.

Rusty Neithammer takes notes.

Treasurer Al Guerwicz takes a close look at Del Glennon's Telemaster's new snow skiis.

Look at those flaps! This one comes in almost vertically.

Dick Bartkowski showed his free flight electric powered foamie indoor model P40, done in North African colors, with a Kenway M20 motor and two 50-mah cells. Dick noted that the shark's teeth motif at the front first appeared on British planes and was later copied by the US.

Joe Dearie showed his Thunder Tiger Raptor 30 helicopter, with a Thunder Tiger 46 for power. He noted that, while the manufacturer claims 90% pre-assembly, he did not find this to be the case and he actually disassembled some pre-assembled components so he would know how they worked.

Del Glennon showed his Telemaster with the new Dubro skis installed. Del also demonstrated the flaps, which make short field landings possible.

The meeting was adjourned at 9:00 PM.

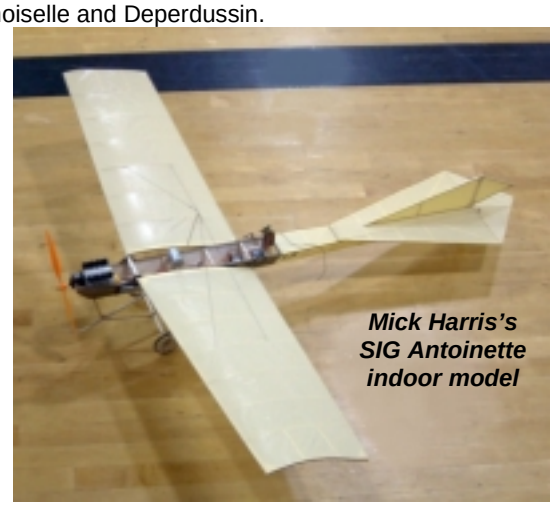
The next meeting is scheduled for January 7, 7:30 PM, at the Marple Library.

Rusty Neithammer

Indoor Flying –

continued from page 1

SIG has released three similar indoor kits, the Antoinette a Demoiselle and Deperdussin.



Mick Harris's SIG Antoinette indoor model

Perhaps the greater challenge is the inoor free flight model. These models are easy to build but sometimes difficult to trim for satisfactory flight. However, the satisfaction in a good flight is something to experience. Here, your faithful servant displays a couple of such candidates.

Editor Dave Harding with freeflight DeHavilland Venom and Dragon Rapide out for trials prior to finishing

Well, are you going to join us? Come on in, the air is fine.

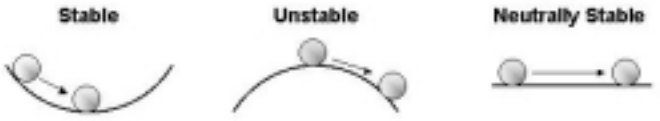
Dave Harding

Tech Note; Stability and Slaying The Big Lie

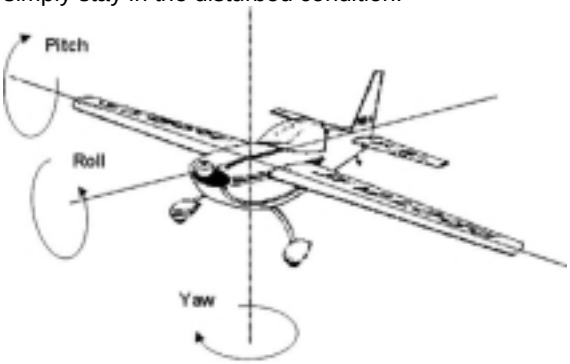
"You should use a "flat bottomed" airfoil on a trainer because it is more stable"

How many times have you read this much quoted statement? Well, like so much folklore it is just not true and I will explain why and what does make a stable model (or airplane).

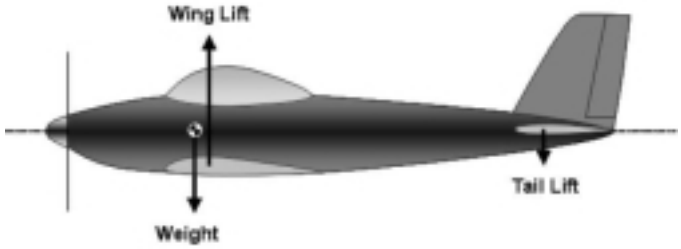
First we have to square away a few terms. When we say an airplane is stable we should first explain what "stable" means then we should add "about what axis" as an airplane is free to rotate and move in all three directions and rotations.



We call something stable when it returns to its original state following a disturbance. Unstable means, when disturbed it continues to diverge from its original state and neutrally stable events simply stay in the disturbed condition.



The axis of primary concern to us is the pitch axis. This is because if you don't get this right you won't get a chance to find out about the others. So let us examine the forces involved.



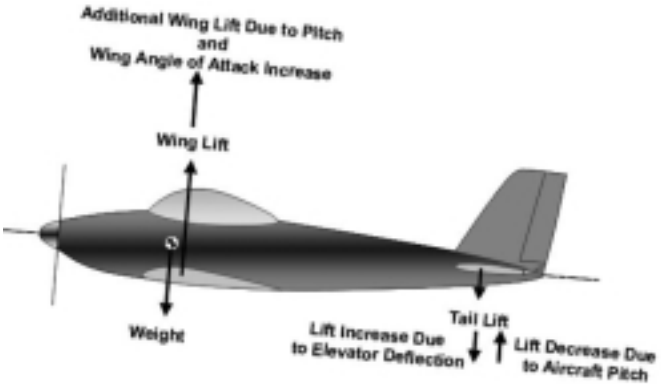
But before we launch into stability let's just add one more concept, one you all understand; trim.

Trim involves the balancing of the forces such that the airplane does not climb or dive at the chosen speed. So, examining the forces depicted in the picture above, trim requires that the sum of the lift forces, wing and tail equal the weight, and the sum of their moments are zero. The latter means that the airplane will not pitch up or down. Sum of the moments is what we do on a teeter-totter; the force times the moment arm, or distance, must equal the other forces times their moment arms. This calculation can be done about any point as a fulcrum, the nose, the CG or even the tail if you want. We'll use the CG.

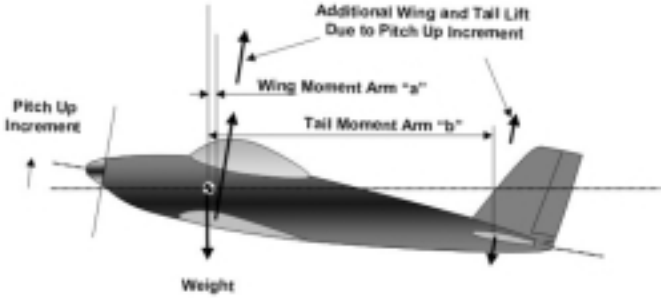
When we fly our (stable) airplanes we adjust the elevator such that we balance these forces by watching the pitch motion and rate of climb. The airplane is considered "in trim" when it holds level flight at the chosen speed.

What actually happens when we move the elevator is the lift changes on the stab such that the airplane pitching moment changes. This in turn causes the airplane to pitch or rotate nose up or nose down until the desired balance is achieved.

Note that airplane stability is not theoretically a necessary condition to achieve such trim or balance although in practice it is. You can balance a pin, but it is difficult.

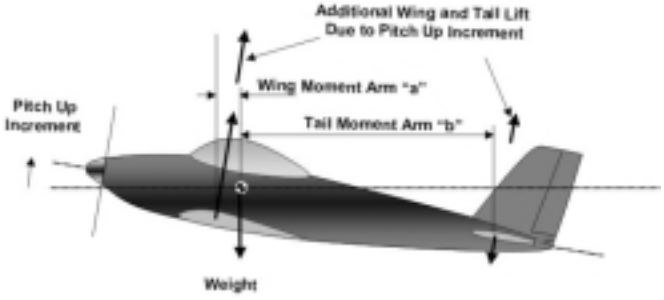


Now let's examine the pitch stability. Our airplane is said to be stable if, following a pitch disturbance, it returns to its original attitude. The upset from trim can be from any cause but let us consider the effects from a gust-induced pitch up.



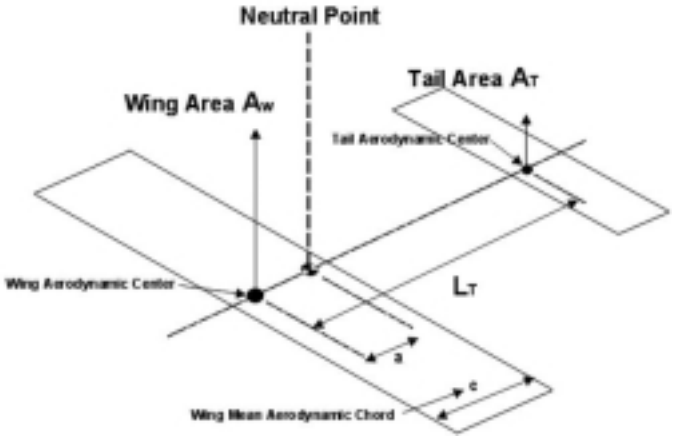
For the case shown above, the airplane is stable if the additional moments caused by wing and tail lift changes cause the airplane to pitch back down. Examination of the case above shows that if the CG is ahead of the wing center of lift (more on this later) the airplane is always stable regardless of tail area, tail moment arm *or wing section*; the wing will always produce more lift with more pitch so long as it is not stalled.

But CG ahead of the wing lift-center is not a necessary condition for a stable airplane. Consider the case where the CG is behind the wing center of lift, or aerodynamic center.



In this case the unstable moment from the wing (acting in the direction to increase the pitch upset) *must* be counteracted by the stabilizing effect of the tail lift increase.

In a simple world we might assume that a square inch of wing and tail would produce the same increment of lift for an incremental change in pitch. Then we could calculate the size of tail required to exactly balance the destabilizing effect of the wing. The condition would be for the wing area times the distance ahead of the CG to equal the tail area times the tail distance from the CG. This is known as the neutral point and is indeed a fundamental element of real airplane design definition.



In this simple model the Neutral point is a distance aft of the wing aerodynamic center "a", where

Elemental Equation For Neutral Point

$$\frac{a}{c} = \frac{\frac{L_T}{c} X \left(\frac{A_T}{A_W}\right)}{\left\{1 + \left(\frac{A_T}{A_W}\right)\right\}} X\ 100$$

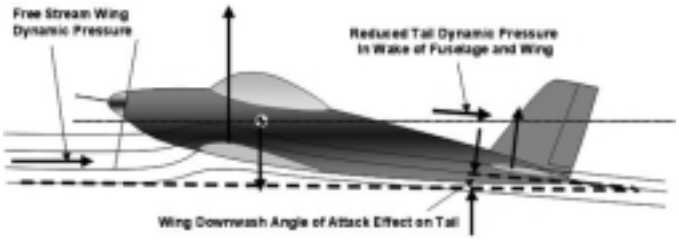
Where; AT/Aw is the ratio of the Tail to Wing area.
The distance "a" is expressed as a % of mean wing chord.

However, the real world is more complicated than this and wings and tails do not produce lift as a pure function of their area. The rate at which a wing produces lift with changes in angle of attack varies with aspect ratio. A low aspect ratio wing builds lift more slowly than a high aspect ratio (this is one of the aspects of Delta wing flight that is quite noticeable). Interestingly enough, all wing sections produce about the same amount of lift per increment of pitch. No difference in "Flat Bottom" and "Symmetrical" sections here.

The aspect ratio factor also applies to the tail, which experiences two additional modifiers. These involve the fact that the tail operates in the wake of the wing.

The first, and usually the most powerful effect, is that the wing, in producing lift, generates a downwash. This downwash is proportional to the lift on the wing so as the wing increases in angle of attack, the downwash angle increases. This is "seen" by the tail as a reduction in effective angle of attack, it could be as much as 75% reduction.

The second is the tail operating in the wake of the wing experiences a loss of dynamic pressure (the airflow is not as strong as free stream). On airplanes with high drag fuselages this loss can be as much as 50%. So, high T tails operating above the downwash and wake are much more effective than low tails in the wake of fuselage excrescences. Usually, tails have lower aspect ratios than wings, further reducing the tail effectiveness. This reduction in effectiveness must be accounted for in calculation of the actual neutral point. It can be considered as an effective reduction in area. Of course, in a comprehensive calculation of neutral point you must also consider the fuselage and all other wetted surfaces and features.



All these factors mean that the calculation of neutral point is quite difficult, but never mind; we deal with this by fudging!

Let's try it with an example;

Tail area is 25% of Wing area, but it is low, lower aspect ratio than the wing and behind the blunt fuselage and landing gear. Let's assume its effectiveness is 50% so the effective tail area is .5 x .25 = .125

So, At/Aw effective = .125

Tail moment is 4 wing chords so Lt/c = 4

From the equation a/c = (4 x .125 / 1 + .125) x 100

Or a/c = (.5/1.25) x 100

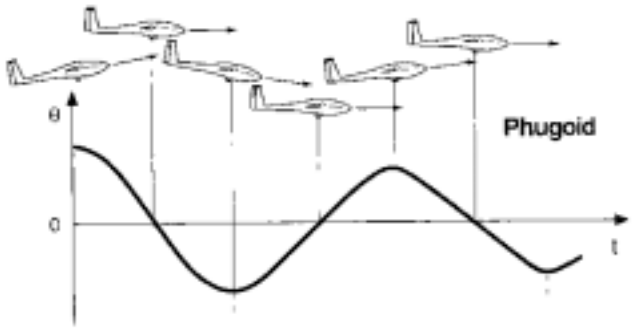
So a/c = 40% of mean aerodynamic chord.

Note, if we had not decremented the tail effectiveness we would have calculated the neutral point at 80% chord!

We never design and test airplanes with the CG on the calculated neutral point. Experience shows that various levels of positive stability are achieved by positioning the CG within specific ranges ahead of the estimated neutral point. The typical range is from 5% to 25%. So, a good starting point might be 15%. If we apply this to the example above we would start with the CG at 25% chord. Wow, that's scary! It might even be right!

At this point we have to ask what level of stability do we want and what are the associated effects. There are of course, various answers depending on application and it is a fundamental that ***stability*** and ***control*** must be in harmony. High stability means more difficult to control.

The fundamental relationships involved with longitudinal stability are a coupling between pitch attitude, lift, flight path and speed. An upset in pitch causes the stable airplane to climb and lose speed whereupon it pitches down and gains speed until it once again pitches up and repeats the process. This motion is know as a Phugoid. In airplanes with high stability the motion can be quite severe although with good design it damps out quickly.

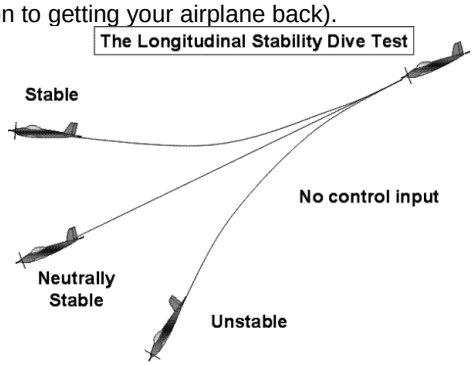


The other behavior of high longitudinal stability is the strong coupling between speed and pitch trim. This is because with high stability there is a larger offset between the CG, where the airplane weight acts, and the neutral point where the aerodynamic forces act. As speed increases the aerodynamic forces increase but the weight does not. This requires a large aerodynamic trim change to rebalance. To fly a straight flight profile with large speed variation you must input large pitch trim control inputs that are well coordinated with speed. This is undesirable in an aerobatic airplane where you really want to point it and have it stay pointed without further input.

This is not a problem for a trainer where you want the airplane to overcome the inadvertent upset by the novice pilot.

Sailplanes are designed to have the most efficient aerodynamics, this means the lowest drag. Now if we examine the effects of greater stability it involves either reduced lift on the tail or, frequently, a down force, which counteracts the primary wing lift. The wing must lift more and this means more drag too. This is known as trim drag. High performance sailplanes have very small tails and aft CG locations to minimize this trim drag while exhibiting the minimum stability necessary to achieve controlled flight. Indeed, there is a flight trimming technique widely discussed but perhaps not so widely practiced known as the dive test.

The process is to take the airplane to altitude then put it in a dive then let go of the stick. If the glider pulls out strongly then the CG is too far forward or the airplane is too stable. You then move the CG aft and repeat the test. At some point when you put the airplane in the dive it will pitch down and steepen the dive without further input. If you can save it, you have controlled an unstable airplane and I am sure there is some kind of award (in addition to getting your airplane back).



Actually, this is not too unlike the maneuvers that are performed in the certification of real airplanes.

The Lockheed 1011 airliner was retrofitted with a fuel tank built into the horizontal tail. In takeoff and landing it is empty but in cruise flight fuel is pumped into it so the CG is moved aft and the trim drag reduced. This had a significant effect in reduced fuel consumption. Pumping the fuel back forward allowed for the increased stability necessary at low altitude flight in turbulence and in landing.

So, how much stability should you provide, or where should you start with the CG location?

In practice the Stability Margin, expressed as the distance between the CG and the neutral point, is between 5% and 25% of MAC, with trainers and sport/scale airplanes favoring the forward location and aerobats and gliders favoring the aft. But beware, the actual calculation with the full suit of effects is complicated and a minefield in which mistakes can be made. For example, the calculation of mean aerodynamic chord and aerodynamic center of complex wing shapes can be really tricky. Just ask us about Mick's Spirit of SAM model with the swept wing and large tail! So start conservatively and move towards the "dive test".

Oh yes, notice that the effects of specific wing airfoils (and tail airfoils if it comes to that) do not feature markedly here. You have probably even forgotten that I already stated that the airfoil has little or no effect on longitudinal stability.

Let's just examine this a little more. In defining the stability model we assumed that the aerodynamic center of both the wing and tail do not move over the pitch range of interest. This is generally true because most airfoils operating in the Reynolds number region of our RC models do produce their aerodynamic forces at a relatively fixed location; the quarter chord.

Some airfoils, actually cambered ones (say Flat Bottomed or Semi Symmetrical if you will) do have a small change in this location, which results in a pitch up with increased angle of attack. Note that this means slightly *de-stabilizing*! Hmmmm.

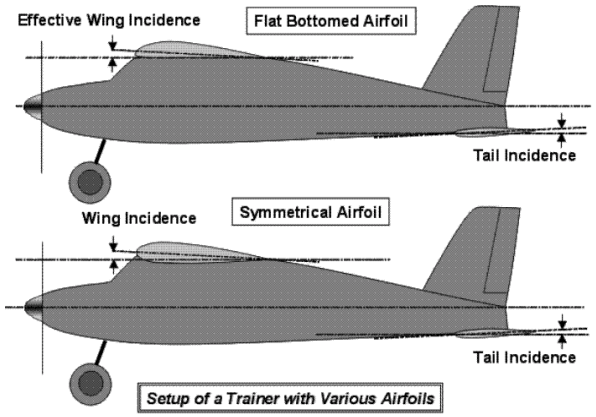
Symmetrical NACA airfoils have practically no pitching moment with angle of attack. This was the primary reason that the airfoil of choice in most early helicopters was the symmetrical NACA 0012. The early helicopters had mechanical controls and the pilot would have to physically hold the controls against the blade control forces. The advent of hydraulically boosted controls and the aerodynamic efficiency advantages of cambered airfoils meant that the later helicopters no longer use the 0012. But I digress.

Flat Bottomed Airfoils for Trainers?

So why do they say you must use a "flat bottomed" airfoil on a trainer?

Well, although they are no more stable than a symmetrical one they do have a higher lift capability so allow for lower takeoff and landing speed, or more maneuver margin to accommodate inadvertent control inputs or recovery from poor flight path control.

Another factor is in setting up the initial trim condition. Highly stable airplanes have downward lifting empennages while the wing lifts upwards. To satisfy this condition the decalage, or difference between the wing and tail incidence has to be large;



Setup of a Trainer with Various Airfoils

The wing must have, say + 4 degrees and the tail zero to minus 3 degrees. Now if we build the conventional "trainer" fuselage with a flat top and bottom then use a "flat bottomed" airfoil and a low slab tail we will automatically have 4degrees of decalage. This is because the zero lift line on the flat bottomed airfoil like the Clark Y, is at about +4 degrees. A no brainer!

On the other hand, if we want to use a symmetrical airfoil we must make a more complicated upper fuselage to mount the wing accommodating the lower surface curvature and the necessary 4 degrees of real incidence. Much harder! Yeah Right!

Could it really be this simple? Tell me if you know the right answer…….please.

Dave Harding

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Propstoppers R.C. M.A.C

Propstoppers at Tinicum School Indoor Flying Session – December 13th 2002

Membership Renewal For 2003

Membership renewal for 2003 is now due. You can renew by mail or at the club meeting in January.

Dues are $80.

Ray Wopatek
1004 Green Lane
Secane, PA. 9018
Please enclose a copy of your current A. M. A. Membership card,
And Please, Please enclose a Stamped self- addressed envelope.
Ray Wopatek Membership Chairman

New Magazine Exchange Program Works; $7.50 Raised First Night

Bring any old (or new) copies of model airplane magazines to the club meeting. We will put them on a desk for members' perusal.

Magazines may be purchased for $0.50 each or 3 for $1. You may keep them or bring them back and recycle them. All proceeds will go to the club.

Any volunteers for this program? All you need to do is bring the box to each meeting and collect the money.
Dave