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5161 East Memorial Drive Muncie IN 47302
Tel.: (765) 287-1256 Fax: (765) 289-4248
www.modelaircraft.org

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What did you call me? Knowing your job at the flying field

By SAM WRIGHT

Recently, while flying on a bright, typical Sunday morning, I asked a good friend to call for me.

As he tailed my idling Ryan to the flightline, I entered the pilot's box and looked at him to see if it was safe to enter the taxiway. My caller looked back and released my aircraft onto the runway. I quickly moved to the taxiway, out of the way of an incoming 30% Edge 540T. That was a close call and could have been very expensive for me.

When the caller entered the station alongside me, I asked, "Why did you release my aircraft without my signal?"

His response was genuine as he said, "I don't know what a caller does."

After I regained composure, I asked him to watch what I was doing. After I landed, I would give him some caller tips. I will leave that friend's name out of the story because I was embarrassed that for all the Sundays we had flown together, we all assumed everyone knew what the purpose of the caller was.

The caller is your safety observer, your maneuver caller if you are competing, and your air traffic controller.

The caller is your safety observer, maneuver caller if you're competing, and air traffic controller. Some are psychologists, too, or offer that comforting pat on the shoulder.

A caller will save your airplane and most likely someone else's, too. The caller knows when to give you the signal that the runway is clear to taxi out and take off. Your caller also is watching the traffic to advise you of an aircraft on a collision course with yours. This occurs much too often, particularly when the pilot is on the correct flight path for the field.

While out of town at a popular Scale fun-fly, I was calling for a friend, who incidentally, is a better pilot than I am. On the other end of the flightline was a pilot demonstrating the flat figure eight. For those not familiar with that maneuver, it is the number eight laying on a table, and it is required as a mandatory maneuver for Scale contests. Needless to say, it breaks all of the rules of the race track pattern established for the fun-fly event, and my pilot would have hit this aircraft head on had I not alerted him to pull up. The aircraft executing the figure eight was, at one point, heading directly into my pilot's aircraft.

Many fields require a caller, but it is not yet an AMA requirement. However, some day it may become a necessity. Due to the blend of new pilots with expensive hardware, mid-air collisions would occur less often, and everyone would fly with more comfort.

What is a caller's job?

The caller's first responsibility is to keep you and your aircraft safe while observing the safety of others. Your caller should always observe the wind direction, field pattern, and any aircraft

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Caller, *continued from page 1*

in your flight path. If you are practicing your Scale maneuvers, your caller will indicate these to you, preferably about three quarters through the previous maneuver. This will give the pilot time to set up for the next maneuver.

The caller also loudly announces your takeoff and landing. At some fields, particularly the 1/8 Scale Fly-Ins, a good radio system is used.

If you are an experienced caller, do not hesitate to offer assistance to a pilot flying alone. At our field, we have some specific boundaries to observe in order to keep our neighbors happy!

Pilots flying the big 30%-plus aerobatic or the turbine-powered airplanes should never fly without a caller. Most of our infractions of extending our boundaries are due to these models. This is an opportunity for the caller to help save your flying privileges.

If you have never had the opportunity to call for someone, ask any pilot to walk you through the procedure. You will feel more comfortable when you fly as well as have the confidence to call for someone else.

Most of the pilots I fly with would be eager to assist a new pilot or to teach a caller all aspects of the responsibility. This will keep the field safe, your airplanes in one piece, and pilots will feel better knowing another set of eyes is scanning the airspace.

One other tip—the caller can note if the transmitter trims are out of whack or if the voltage has fallen below nine volts. These are simple things the pilot may overlook during the excitement of that first flight at the field.

I always make sure my pilot has the correct frequency pin and that all control surfaces are working properly. Also, check the half- or full-rate switches if the radio system has those functions. You may have saved the aircraft from a crash during takeoff.

from *Scale Dimensions*
Scale Squadron of Southern California
Sam Wright, editor
Racho Santa Margarita CA

Low-cost, post-cure oven for composites

By DAVID FEE

If you've ever worked with epoxy resins, then you know that waiting for the epoxy to cure is the most time-consuming part of the process. You also may know that heating the cured part to a specified temperature for a given time interval (known as post-cure) will ensure the best physical properties of the final product. This simple and inexpensive project will help in both of these areas.

Sometimes, especially in the winter months, the workshop air temperature can be low enough that epoxy cure times are greatly lengthened. In fact, some resin/hardener systems may not cure satisfactorily at all. For this reason, it is desirable to have a way to heat the part to a temperature around 75 to 80 degrees Fahrenheit. Some of us have used the kitchen oven from time to time, but temperature control can be difficult, not to mention the constraints on physical dimensions (kitchen ovens are not shaped like wings or fuselages). There also may be complaints from wives, domestic partners, or Mom. There must be a better answer.

Implementing a post-cure procedure will do several things for you. The fundamental benefit is that you will have a fully-cured part in several hours, instead of several days or even weeks. Caution must be exercised, of course, because a 250-degree post-cure will quickly turn your beautiful new glass and carbon over blue foam vacuum-bagged wing into a lumpy little potato chip. Don't ask how I learned that!

If the epoxy manufacturer's spec sheet suggests 220 degrees for two hours, but your foam or mold will distort at a lower temperature, then simply post-cure for a longer time at a safe temperature. Remember, any post-cure will be better than none, as the elevated temperature serves to drive the curing process to completion.

Also, post-cure generally should be done after the initial cure. That is, the epoxy should be firm and not liquid. For the most part, overnight at 75 degrees is a sufficient initial cure for room-temperature epoxy systems.

So now that you're convinced (or even if you're not) that a post-cure oven would be helpful, how do we go about building one without investing a lot of time and money? You will be pleased to know that the solution is simple and inexpensive. Total cost is around $20, and you may already have several of the required items in your home or garage.

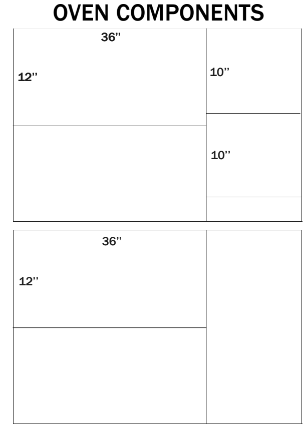
Materials needed

- Two 2 x 4' sheets of 1-inch metalized Mylar-coated insulating Styrofoam
- A 4'2" conductor extension cord
- Two plastic lamp holders
- Two 40-watt light bulbs
- A wall-mount light dimmer
- A light dimmer switch plate cover
- A plastic wall receptacle box
- Duct tape (high temperature)

Construction

Take your Styrofoam board measurements and figure out the dimensions for the oven you desire. I chose to make an oven large enough to hold an S400 Pylon wing or fuselage. This size was convenient since the finished oven is not overly bulky. You could experiment building a collapsible oven for convenient storage. If you make your own box, keep in mind that this system uses light bulbs as a heat source, so you want to leave plenty of room between the tallest part and the bulbs. One you have worked out your dimensions, you can get started.

OVEN COMPONENTS



from *Hangar News*
First Weed Wacker Aero Squadron
Don Westergren, editor
Lakeside CA

A sure guide to determining a modeler's skill level

By JEF RASKIN

After a while in this hobby, you can walk up to someone, look at his or her model or workshop, and immediately put the person into one of four classes: Novice, Builder, Expert, or Master. Here are a few tips so you can tell one from another.

1. Take a good look at the control horns. If you weren't reading this guide, you might think to look at how they are positioned and attached, but here's the real secret.

Novice: They still have the little bumps where they used to be attached to the plastic runner.

Builder: The little bumps have been neatly cut off.

Expert: The horns are scratch-built from aircraft plywood, sanded, and varnished.

Master: The horns are handmade from polished T2024 aircraft aluminum and carbon fiber, coated for corrosion protection with the metal parts anodized to match the finish of the aircraft. Did I mention the stainless steel ball joints?

2. Covering quality is a dead giveaway.

Novice: It looks like the entire Belgian Army has slept on it for a week.

Builder: It looks like it has been slept on by a cat for one night.

Expert: It is as crisp as a freshly made bed.

Master: It looks as taut as a bed made up by a drill sergeant at boot camp.

3. Study the trailing edges of the wing.

Novice: Square and over 1/8-inch thick

Builder: Nicely rounded

Expert: Feather edge

Master: Uses the trailing edge to shave

4. How well are the uncovered wood parts finished?

Novice: Raw wood

Builder: Sanded and painted

Expert: Sanding sealer, five coats of urethane paint, and each coat was wet-sanded, followed by rubbing compound and a fine European hard wax

Master: Impossible to tell how it's done because it looks like one piece of polished granite; wear sunglasses

5. On many models, it is possible to see the framework. Look carefully.

Novice: Hard to tell that it's an airplane

Builder: Reasonably straight and true

Expert: Joints have no gaps, no warps, corners, gusseted, looks like it was carved from a solid piece of wood with the grain always going in the strongest direction

Master: It *was* carved from a solid piece of wood with the grain always going in the strongest direction.

6. What aircraft do they choose to model?

Novice: Piper Cubs

Builder: WW II fighters

Expert: Anything with elaborate detail or impossible surface finish and markings, scale operating engines, retracts, and working instruments; windshield wipers start automatically when it rains

Master: Piper Cubs

7. What glues did they use?

Novice: Mucilage

Builder: CyA, epoxy

Expert: CyA in three viscosities, aliphatic resins, four different epoxies, contact glues, special canopy cement, and has a friend in the adhesives industry

Master: Parts interlock so well that no glue is needed

8. Find out what shop equipment they use.

Novice: One old hobby knife

Builder: Hobby knife, supply of fresh blades, handheld electric tools, box full of small tools

Expert: 2,000 square-foot shop with drill press, lathe, milling machine, table saw, router, vacuum-forming machine, foam cutter (all computer-controlled), rolling tool chest with larger tools, and a magnificent walnut machinist's tool chest with expensive precision tools

Master: One old hobby knife *and* a sharpening stone

9. Aerodynamic knowledge

Novice: Totally mystified since sixth grade

Builder: Has read one book on the topic and has forgotten it

Expert: Runs simulations on computers that make NASA jealous, solves differential equations mentally, and can give name, date of publication, and the author of every theoretical work since 1892

Master: If it looks right, it is right.

10. Radio system choice

Novice: Two-channel radio with elevator on left stick

Builder: Four-channel radio with two sticks

Expert: 17-channel radio made in Germany with an unpronounceable name and more levers and switches than the cockpit of a 747

Master: Free flight

11. How they fly their airplanes

Novice: Crashes on takeoff

Builder: Crashes on downwind turns

Expert: Only crashes when it's someone else's fault

Master: Knows better than to fly them

from *The Clanking Armor*
Lincoln Sky Knights R/C Club
Dave Brazee, editor
Lincoln NE

Jef Raskin has been a computer professor at the University of California at San Diego, has done seminal work on Graphical User Interfaces, and was project head for the development of the Apple Macintosh computer. To view his home page and this article, visit http://humane.sourceforge.net/home.

Think about it

"Why don't they pass a Constitutional amendment prohibiting anybody from learning anything? If it works as well as prohibition did, in five years, Americans would be the smartest race of people on Earth."

Will Rogers

Teaching Radio Control flying: Basic flying questions

By MIKE LYNCH

This is the second in a series on teaching Radio Control (RC) flying. Watch for additional information in future newsletters.

In this article, I'll discuss some of the most commonly asked RC questions. While these questions are, for the most part, directed to the beginner, I urge you to read them to help with your ability to relate these important topics to your students at the field. You also can copy this information and give it to beginners.

When it comes to actually teaching, I break teaching RC flying into four steps. In any form of teaching it is good to limit the number of things a student must learn—and RC flying is no exception. The steps are:

1. Mastering turns and level flight
2. Setting and holding headings
3. Mastering takeoffs
4. Landing

While this may sound simplistic, think about it. To get to the point where you are flying by yourself, every technique you master fits into one of these four categories!

Before taking a beginner up for the first time, you should have explained several things. We assume, for example, that the student knows the basics of aerodynamics and flight. He or she knows the stick controls on the transmitter (ailerons, elevator, throttle, and rudder) and knows the function of each control. And, of course, I assume the student's airplane has been checked out by a pre-flight instructor and has had at least one trim flight.

Flying preferences

Instructors tend to teach what they know in the same fashion they know it. There are several alternatives to almost every important function of flying. Good instructors recognize that their own ways are not the only—and in some cases not the best—ways of doing everything.

Fingers or thumbs? Thirty years ago, I was taught to fly with my thumbs. I have flown with my thumbs all this time, and though I'm considered one of the better pilots at my flying field, I admit flying with fingers is better. I've tried to get comfortable with fingers, but I have not been able to. As you teach a new person to fly, I suggest starting them off using their fingers. The further they progress and the more precisely they wish to fly, the more important it is that they be able to fly with their fingers. Take it from me—it is very difficult to switch to flying with fingers once you have learned to fly with your thumbs.

How do you handle the left/right problem? Beginners have a common problem when it comes to mastering a turn. After entering the turn, they tend to forget which way they are turning and give the wrong aileron to exit the turn (sending the airplane deeper into the turn). There are several ways to help the beginner with this problem. One is to ask them to turn their body to face the airplane's heading. If they're looking in the same direction the airplane is flying, it will help them remember which way the airplane is turning. Another is to have them repeat out loud which way they are turning. With either method, the beginner will eventually become comfortable turning and won't need the crutch. My suggestion is to get them to stand in a stationary position while flying (this is especially important if you're not using the trainer system) and get them to repeat the direction they are flying.

What throttle setting do you use? When I first begin training, I try to keep the throttle setting just high enough to keep the airplane in the air. This ensures smooth docile performance and minimizes the beginner's natural tendency to overcontrol. It also helps with level turns. However, I actually have had beginners who catch on quicker when the engine is running faster. For some people, a responsive airplane is easier to master than a docile one. Either way, keep in mind that you will eventually need to have the beginner practice all throttle settings.

How much control surface motion do you want? Again, instructors tend to disagree on this point. Since beginners have a natural tendency to overcontrol, many instructors like to set up trainers to be very docile, minimizing control surface motion (possibly with dual rates). This means the beginner must move the sticks quite a bit to cause a reaction from the airplane. My feeling is that it's better to keep the airplane responsive for three reasons. First, the beginner must eventually learn the precise control motions needed with sensitive control surfaces. Second, on windy days minimal control may not be enough to cause any response from the airplane in certain attitudes. Third, as the instructor, you need the airplane to be responsive enough to get out of precarious attitudes.

When do you teach rudder coordinated turns? I usually teach people to fly without them ever touching the rudder stick (except for steering on the ground). Most RC airplanes, and especially trainer airplanes, turn quite nicely with only a combination of aileron and elevator. While I freely admit that rudder coordinated turns are nicer looking, and rudder is helpful when landing in a crosswind, I try to keep turning as simple for beginners to master as possible. If you feel strongly about teaching rudder coordinated turns from the beginning, by all means, do it.

Final approach, one turn or two? If teaching realistic flying, the RC pilot will make two turns during the final approach. One turn will bring them 90 degrees to the runway, and the other will bring them right on the middle of the runway. To simplify this, I have beginners making one sweeping turn during final approach.

What is the wind limitation? Beginners learn better on calm days. There comes a point when the wind is blowing so hard that it is impossible for the beginner to control the airplane. For the first 10 flights or so, I recommend limiting instruction to when the wind is blowing less than eight mph. As students progress, let them fly on windier days. Your student should eventually be able fly with winds around 10 mph.

Building models ... my first love

By LARRY HANSEN

To ARF or not ARF? That is the question. No, I'm not trying to teach my dog to quote Shakespeare's soliloquy from *Hamlet*. I'm pondering my hobby and the direction it seems to be headed. I don't have an axe to grind with people who buy and fly some of the modern Almost-Ready-to-Fly (ARF) airplanes available today. Not only are they fairly well constructed, but they also offer one of the standard options desired in today's "immediate gratification" society. What I'm lamenting is the loss all of you who don't build your own models are suffering by marketing gurus whose job is to sell their merchandise.

As I sat trapped in my home from March 18-21, I spent time gluing wing ribs to spars, making tons of balsa sanding dust in my basement, and loving every minute of it. As I passed the time with my first love, model building, I wondered what my flying friends who never build their own flying machines were doing to get through the storm.

One of the real losses for those of us who don't sniff much glue is we're limited in what our hobby can give us to fill those days that don't lend themselves to flying. You can only spend so much time adjusting control surfaces and fine-tuning your radio gear. If your wardrobe doesn't contain some blue jeans with hard spots on the legs from dripping CyA glue, you just don't have the clothes that a well-dressed modeler needs.

Pride in creating an airplane that will actually fly and respond to your command is also lost. I equate it with taking a friend's well-trained hunting dog into the field for an upland game. Certainly that hound will respond to your needs while chasing an elusive quail. But think of the pride a hunter has when the dog responds as it should, knowing he has trained it.

Building your own model is a learning experience. How better to begin to understand aerodynamics and the physics involved in flight than creating what you plan to use to bore holes in the sky. Seeing how control surfaces work and how subtle changes to those working parts can change the flying capacity of you air ship are never as well learned from a book as they are in your own hands.

If you fly like I do, you need to develop another skill. All of us need this skill once in a while—to fix that beautiful flying machine when your landing is less than picture perfect. If you've never built an airplane from the ground up, how will you fix it when a mishap occurs? Now, if you happen to split a solid vertical stabilizer, you need not be a rocket scientist to hold the pieces together and squirt some CyA glue into the fracture. How to remove MonoKote, recut ribs, and rebuild a leading wing edge after your airplane grabbed a tree branch may be a horse of another color. If you built that baby, you can fix it! You'll understand how to rebalance your craft, realign it, and then recover it. In fact, I seem to fly a bit better with an airplane I've repaired at least once. The fear of that first scratch is gone, and a small ding no longer puts terror in my control fingers.

Any airplane you fly is a good one, whether you built it or someone else did. But I think of them like I think of my children. It gives me a sense of pride to watch the children we raised graduate from high school and college, get married, have their own children, and succeed in life. That must be more satisfying than saying you hired the kid your neighbor raised and guided him through the job you wanted him to do.

Don't think I don't appreciate the marvelous job of guiding those ARFs and other purchased airplanes through the sky because I do. I'm just suggesting that you are missing a wonderful part of our great hobby if you don't build an airplane once in a while. It doesn't have to be one of those beautiful contest-winning scale dreams. Just a simple little trainer airplane created by your own hands can be a thing of wonder. If you haven't done it, give it a try!

from *Hi-Flyer*
Arvada Associated Modelers
Eric Gropp, editor
Golden CO

ARF, kit, or build it from scratch?

By TOM DENNEY

With summer approaching we all should have some new airplanes ready for the flying season, right? We want to spend most of our spare time flying, not building new airplanes. We may do some repairs due to mishaps but definitely not due to pilot error.

I have spent most of the winter building new airplanes and floats. I have three airplanes ready to go for the summer—two floatplanes and one on wheels. About a week ago, I finished one I built from scratch. It took about three months to complete, and after finishing it, I told my wife that from now on, it would only be Almost-Ready-to-Fly (ARF) airplanes for me. I was sick of building.

This brings up a good question: Which is best—an ARF, kit, or building from scratch?

If you are not an experienced builder, we can rule out building from scratch. I would say that most people could build an easy kit and put together an ARF. The first thing a person in this hobby should have is one or two airplanes that are flight-ready so you can decide what to build and still have something to fly while you're doing it.

Now we need to make a decision: ARF or kit, believing that our ability will let us do either.

Good points about ARFs are the wood construction is complete and they are covered. Almost everything comes with them, except the radio equipment and engine. A lot of ARFs even have the prop spinner included, and the engine mount is already installed. You also can purchase a good 60-inch wingspan ARF for around $100, and if everything goes well, in about 15 to 20 hours you are

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ARF or kit, *continued from page 5*

ready to fly. ARF airplanes do have a downside. You will need to be satisfied with the color that they come in, and if you need to repair it, good luck matching the covering. If you would like to change something like taking some of the dihedral out of the wing, making it a bolt-down wing instead of holding it on with rubber bands, or even installing individual aileron servos ... sorry, no can do.

With a kit, all of these things are possible. The best thing about building a kit is you can change everything if you want. You choose the covering color, and if you need to repair it, you should have some covering left over from when you built it. I like individual aileron servos on my airplanes for obvious reasons like mixing, air brakes, and flaperons. Some airplanes come with about 20 degrees of dihedral, which I dislike, but it makes it easy to fly. That is why most trainers have a lot of dihedral in the wing. Kit building also has a downside. It takes a long time to complete and is a lot of work. Truth be told, you would probably have as much or more in the airplane if you built it from a kit.

In summary, it doesn't make any difference which type of airplane you purchase, as long as you have one. The quality of ARFs is very good now compared to what it use to be.

I have both ARFs and kit airplanes as well as some I built from scratch, and I like them all. So the answer to the ultimate question is up to the individual. There is no right or wrong to this question. The only answer is to fly, fly, fly.

from *Pfeiffer Field R/C News*
Mount Rainier Radio Control Society
Bill Bender, editor
Puyallup WA

Thoughts on thermal flying

By PETER CARR

Last year's contest performance was disappointing so I set about looking for a fix. I'm very fortunate because my oldest son is also a contest Radio Control Sailplane pilot. When I explained things to him, it helped me organize my thoughts and work though the problem. Jeff lives in Maine where thermals are hard to find. This may have been the reason he listened to me so attentively! The first step was to localize the problem. I decided that it could be split into four groups:

- The aircraft
- The radio
- The pilot
- The air

The aircraft: There are some very good articles on the Northeast Sailplanes Web site that deal with Sailplane trimming. I read these and others dealing with the dive test and decided that not much of it agreed with my experience.

I use an angle-of-incidence meter to set the wing of the assembled Sailplane to zero degrees. Then I adjust the flying stabilizer to +1 degrees relative to the wing. The transmitter elevator trim is set to middle-throw. I balance the model to 30% of average chord, being careful to check the math for multi-taper platforms.

Once that's finished, I head to the field for some hand-chucks. The idea is to adjust nose weight for a good glide without adjusting the elevator trim.

Then it's time for the winch launch. Since hand-chucks are slow speed flights, I expect a change in trim at thermal search speeds, and there usually is one. This is very true of cambered airfoils where there is increased downward pitch of the airfoil as speed increases.

After several test flights, adding and removing nose weight, I find the best overall performance balance for my conditions and flying style. Since the stab was trimmed for +1 degree of *up,* it provides very little *up* or *down* force on the wing in level flight. This should translate into minimum wing drag as well as equal stabilizer authority in either direction. In higher speed flight, like coming back upwind, up-trim adjustment is needed to keep the nose up while slow flight wants a bit of down-trim to keep the nose level.

Since a typical flight is a series of compromises of speed and trim settings, the object is to find a stabilizer and nose weight combination that handles them all. In theory, this combination should make the aircraft fall to the ground in the slowest of conditions where there is no lift.

The radio: I enjoy rebuilding radios. The goal is to make a transmitter that is comfortable in my hands, has all the controls in positions where I can operate them with minimum effort, and is light-weight. I like to fly big Sailplanes out to the limits of vision and take particular care about TX-RX tuning and battery care for solid range. The connections from the servos to the flying surfaces take extra attention. Ailerons and flaps are easy as long as the hinges have no play. The stabilizer and rudder usually take some work both for the mechanics and throws. Pushrods must be stiff and straight and well supported through the fuselage.

Many models call for a tape hinge at the rudder. I try to use pin-type hinges because tape works loose in hot weather and gives poor centering and reduced throw. This also is true of flaps and ailerons, but I compromise and use tape while being careful to inspect these hinge points frequently.

The last item is receiver and battery installation. I've used foam rubber, white foam, and EPP foam. EPP is my favorite because it returns to original shape on impact (landing) while absorbing large amounts of energy. This helps preserve the cell and wire connections during my normally imperfect landings.

The pilot: I do just what you're doing now. I try to find every scrap of information about every aspect of soaring flight and read it. The video tapes from Radio Carbon Art are very good. Resource pages of club Web

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Thermal flying, ***continued from page 6***

sites, such as the Dayton Darts, the Downeast Soaring Society, and the Charles River Club are excellent. Unfortunately, magazines available now are generally aimed at Electric Sailplanes, but occasionally some have article paragraphs about the thermal search. There also is information available using a Yahoo or Google search for "r/c sailplane trimming" or "r/c sailplane flying."

Lastly, while it's fun to fly alone, never waiting for the winch or the pin, you can learn more in a shorter time by flying with other people. You can pick the best of their methods and techniques and add them to your own.

The air: Finding thermals should be about gathering information. There are certain fixed pieces of information such as sun angle, amount of dew or water on the ground, and degree of sky overcast. Then there are the variables. These include texture of the terrain (rocks, grass, forests, etc.), asphalt streets, parking lots shaded for part of the day by trees or buildings, and wind speed and direction. Rocks retain more heat than plowed fields, which hold more heat than grass.

However, if the sun angle doesn't shine on the rocks, they won't pop very many thermals. It's the ever-changing relationship of all these factors that make each flight such a challenge. Many times I've heard the timer ask the pilot if he has a plan. Sometimes the response is a muttered curse, and sometimes it's something like "I think I'll go left."

I had the chance to fly with Larry Jolly at the Westover AFB Nationals a while back. He said that he watches the conditions a full 20 minutes prior to launching in order to set a plan. He also mentioned that in some conditions thermals pop every 15 to 25 minutes from the same source. From his legendary success in RC Sailplanes, it's hard to argue with his comments. I build on that by checking the Accuweather.com Web site for hourly forecasts of cloud cover, wind speed and direction, and temperature on flying day. I have a thermometer on my transmitter to help spot thermals blowing through the flying field. And obviously, other Sailplanes and/or birds in lift are a pretty sure sign of good air.

There is a vast amount of information that needs to be weighed and analyzed to give the best guidance on where to find lift. Since all this information changes as it gets later in the day, it means the pilot must be focused on the mission all the time.

At contests, where pilots are called to fly in flight groups, it can be difficult to concentrate on the decision process with so much happening around you. This isn't quite so bad at contests where the contest director calls a "round-per-hour" or such. You then have the option of picking your launch time for most favorable conditions. This is also a variable that must be processed!

To wrap up: The radio is right, the airplane is right, and you made it only a "two beer" night last night. Before leaving home or the hotel, you checked the weather forecast and made notes of the highlights. Arriving at the field you swap lies with the other pilots, line up some timers, and assemble your ship. From then on, it's work, work, work. Take a walk to the landing circles, check the likely flight paths into each one and the trees, poles or wires that you will have to dodge. Then check the winches for different foot pedals, retriever lines, and line size. If possible, you should get a test launch in order to discover any surprises with the winches.

Once that's done, you need to go sit down and watch the sky. Look for insects, blowing leaves, birds, and watch the tree tops. Large fields of tall grass are excellent indicators of wind action. Survey the terrain for likely thermal generators like asphalt, buildings, and tree lines. Watch the sun angle, or try to gauge it from the weather forecast you looked at earlier. Then try to be the last of a group to launch. Every ship that launches ahead of you is a source of information about the upper air conditions. Even S ailplanes that are sinking miserably are telling you not to go near them. Get the highest launch possible since this translates into more search time. Once clear of the line, set the ship to best cruise and go get your thermal. After you've made the time and landed, its best to check over the ship for any problems before turning the transmitter back to impound.

If all is well, set the airplane aside and continue watching the changing conditions for the next round. Time spent tossing a HLG is excellent for learning to read air. Nostalgia ships fly differently than modern glass birds or HLGs. A thermal sensing telemetry system is also a great way to learn thermalling. Whatever you fly, every minute of flight time on any ship will add to your knowledge and make you a better pilot.

from the newsletter of the
Downeast Soaring Club
Mike Farnsworth, editor
Topsham ME

Two-cycle engine field emergency—dirt in carburetor

Every now and then, when you can't get an engine to run right, the culprit is dirt in the carburetor. The engine was running fine last time out, and you haven't changed the engine settings. Now it quits at full power and won't idle. What's wrong?

If you haven't been to the field in six months, *make sure you're using fresh fuel!* Fuel that's been sitting around for months, especially if it's left in the fuel tank, could be your problem. If it's not the fuel, put in a new glow plug. Check the clunk hung up in the fuel tank for clogged fuel lines. If your aircraft comes to a sudden stop, the fuel tank clunk can slide forward, getting stuck in that position.

Having eliminated these possibilities, you may have a fuel draw problem caused by dirt in the carburetor, most likely at the narrowest part where fuel is drawn through the needle valve. If backing out the needle valve doesn't allow the engine to run rich like it

continued on page 9

Eliminating the bounce in your landings

In order for a taildragger not to tip over on its nose, its wheels must be ahead of the center of gravity (CG). As it is further forward, it can tolerate rougher ground and the tail wheel can get a better grip on the ground, but the tendency to bounce is worse. But when a taildragger lands, the impact of the main wheels tends to push the nose up, increasing the angle of attack, lowering the tail, and increasing lift—and the airplane is flying again. Eventually, air speed is reduced, and it falls to the ground again, maybe harder. The nose is rotated, and the airplane becomes airborne once again. This process will continue until all flyable air speed is exhausted. The aircraft may continue bouncing due to a phenomenon known as "loping."

Loping occurs in a taildragger when the bounce of the main wheels causes the tail wheel to slam into the ground while the main wheels are still in the air. Then, the tail wheel bounces, slamming the main wheels onto the ground. This argument between the front and rear continues until momentum is lost. But the severity of the loping can increase in the interim.

Loping can occur in trike-geared aircraft as well. If the nose wheel strikes the ground before the main wheels do, the nose is pushed up severely, slamming the main wheels onto the runway. Being behind the CG, the rebound of the main wheels rotates the airplane forward so the nose wheel slams down again, maybe harder than the first time. The process repeats.

Loping in a trike airplane can start with taxiing. If the main wheels hit a bump, weight is shifted forward onto the nose gear. It rebounds, returning weight backward. This pingponging can grow, especially if the airplane is accelerating. The only way to stop it is to stop the airplane. The longer the distance between the main wheels and the nose wheel, the greater the tendency to lope. Loping also increases if the main wheels are too far aft of the CG. Stiff struts and bouncy wheels aggravate matters.

Trike gear has less potential for bounce because the main wheels can be placed closer to the CG. When the main wheels touch down, the impact lowers the nose and the angle of attack, reducing lift. Some trike-gear designs actually have negative angles of attack when sitting on all wheels. This holds the airplane on the runway. Trikes have more positive ground steering because the nose wheel makes firmer contact with the runway than a tail wheel, especially at higher speeds.

Another little-known cause of bounce is main wheels that are too far apart. This may be shocking because this practice is generally considered good for ground handling. It usually is because it improves directional stability when rolling along the ground. What happens when the airplane lands and one wheel hits the ground before the other? A lateral form of bounce occurs from one wing to the other.

One might think that soft tires and springy struts would increase bounce. Not so. More often, bounce is aggravated by the landing gear that is too stiff. *Rigidity does not absorb energy; it reflects it.* The hardness of the runway contributes to bounce for the same reason. Some early racing airplanes, such as the Howard Ike, had landing gear so rigid they could not land on concrete runways because of the uncontrollable bouncing that occurred.

Moving the main gear close to the CG reduces bounce and improves tracking. The Spitfire, for example, is quite bounce resistant, but it tips over easily on rough ground.

Moving nose and main gears closer together reduces bounce and loping, but it degrades tracking and increases the tendency to tip over on rough ground and in crosswinds.

Oleo struts help absorb impacts, but the spring tension must be just right—stiff enough to keep from bottoming out, soft enough to absorb shock. The same may be said of tires.

If your airplane rebounds into the air after a severe impact, head off further bounce by inching up the throttle slightly. Apply down elevator if necessary to level the nose. This increases air speed, prevents a stall, and lowers the rate of descent.

from *Flare-Out*
Twin City Radio Controllers, Inc.
Jim Cook, editor
Minneapolis MN

TIP TIME

What do you need in your flight box?

What do you consider necessary for your flight box? Usually, the most important are the items needed to keep you flying while at the field. Obviously, you can't carry everything. I tried that once. I custom built my own flight box. When finished, it more or less resembled a steamer truck, and I still didn't have what I needed at times!

When you are beginning, all you can do is make your best guess at what you will need at the field. Better yet, go ask some of the veteran members what they keep in their flight boxes. Some items can be substituted for others. For instance, if you don't use a starter, a leather glove, or a chicken stick to start your model, you'll have plenty of room for band-aids, which you'll surely need eventually!

A small roll of clear packing tape can patch up those cornfield MonoKote dings and allow you to keep flying. Of course, spare glow plugs and props are always high on the list. The nice thing about all this is that among the members who are usually at the field, someone will always have what you're looking for. Don't be afraid to ask for something if you need it.

from *Flying Times*
Valley RC Flying Club
Randy Ryman, editor
Harrisburg VA

SAFETY BULLETIN: Flight box catches fire

During a flying session at a British Model Flying Association affiliated club site, a pilot and his helper noticed a flash or arcing inside the flight box.

The starter was immediately disconnected, and the 12-volt battery was removed. After this, the two noticed the bottom of the flight box was bubbling, the cause of which was not immediately apparent. After 15 seconds or so, the pilot and his helper tried to remove the flight box from the pit area, and as helper bent to pick it up, the flight box exploded in his face, throwing him approximately 30 feet and causing burns to his face and scalp, which required specialized hospital treatment.

The explosion was caused by the ignition of a half gallon of methanol-based fuel, which was stored inside the plastic flight box with a 12-volt battery and associated circuitry. Unfortunately, the flight box was so badly damaged that the inspection did not reveal a detailed cause of ignition. However, it is highly probable that an electrical fault ignited either spilt fuel, fuel vapor, or both, causing the flight box to melt and the fuel container to ignite.

Unfortunately, methanol burns with a very pale blue flame that is barely visible in daylight, resulting in the pilot and helper being unaware of the seriousness of the situation. Fortuitously, there was a source of water nearby, which was used to cool the burns until medical assistance arrived. Fuel fires of this nature are extremely rare but to mitigate against a reoccurence, the following is advised:

1) Fuel containers should be stored externally on flight boxes, away from potential sources of ignition, such as electrical equipment, lighters, and matches.

2) If you do store your fuel within the flight box, it should be within a separate compartment. Drain holes should be incorporated to disperse fuel, and the compartment should be well ventilated to disperse fuel vapors. The design of the box should prevent fuel from migrating to other flight box compartments in the event of a spill.

3) Mop up any spills immediately and dispose of materials in a safe place.

4) Don't smoke near fuel.

5) If you have or suspect you have a fire, warn your colleagues and clear the area immediately. Remember, methanol fires are not obvious in daylight so stay back if you are in doubt.

6) If the fire is small, attempt to extinguish it by using an approved fire extinguisher for fuel fires (foam or powder). If there is any danger of a large fire (i.e. the fuel container itself), do not attempt to extinguish the fire under any circumstances. Always exercise extreme caution.

7) Do not move burning material.

8) Ensure you know first aid treatment for burns and the location of your nearest water supply. The first few minutes in the treatment of burns is critical; the quicker the burn is cooled, the less damage to the underlying skin tissues. Burns can cause severe shock, which also requires treatment.

Remember, avoid putting your fuel container in an enclosed space and never adjacent to potential sources of ignition. Should a fire occur, do not take any risks; your equipment is replaceable, but you are not.

from *The Fly Paper*
South Bend RC Club News
Jack Allinger, editor
South Bend IN

Dirt in carburetor, ***continued from page 7***

should, it's time to flush the carburetor.

At home, you can disassemble the carburetor for complete cleaning. At the field, a quick fix is to back flush the carburetor with fuel. This doesn't require carburetor removal and can be done in just a few minutes.

Cleaning the carburetor

1) Check to see where the main needle valve is set. Then remove it and set it aside. Remove the fuel inlet tubing. Adapt these procedures to engines with remote needle valves.

2) Connect the fuel tubing from your fuel pump to the fuel inlet nipple. Pump fuel. It's a bit messy but only takes a second or so. Almost invariably, the culprit is a particle of dirt lodged at the point where the tip of the needle valve throttles engine fuel. The back flush blows that particle out.

3) You've probably got excess fuel in the engine. To avoid hydraulic lock damage to your engine, remove the glow plug and washer and blow the excess fuel out of the engine with your electric starter.

4) Replace the glow plug, washer, needle valve, and reconnect the fuel tank line. Adjust the needle valve to its previous setting.

5) Check your engine and fly.

Avoid getting dirt in the carburetor

In three words—*use fuel filters!* Somehow, dirt, or minute solid particles get into our fuel. In order to keep these particles out of my engines, I started using multiple fuel filters. Use one at the bottom of the fuel bottle or can. You'll soon find that once in a while, this first filter gets a bit clogged. Back flush it, and you start drawing fuel again. Use another fuel filter between the fuel pump and the aircraft fuel tank. Finally, always use a fuel filter between the aircraft fuel tank and the engine. When fueling the aircraft, disconnect the fuel line at the tank side of the engine fuel filter. This system works and eliminates the old problem of having to periodically back flush the engine to get rid of dirt. When flushing fuel filters, make sure you flush them both ways before inserting them back into the fuel lines.

from *The Beacon*
Miramar Radio Control Flyers
Dick Doucet, editor
San Diego CA

"When you're educated, you'll believe only half of what you hear. When you're intelligent, you will know which half."

Fiberglass and foam construction pattern kits

By EARL HAURY

Probably the one thing that often keeps folks from building a Pattern kit is that most are of fiberglass and foam construction. Both strike fear into the hearts of most builders who are familiar with balsa framing. They shouldn't! Glass and foam construction is for the lazy (it's easy), for the clumsy (it's durable), and for the competitor (it's precise).

Ed Izzo invented the balsa-sheeted foam wing for pattern aircraft, and they became an instant success in pattern building.

Let's assume you have a set of foam wing cores in hand. Let's also assume the wing is one piece and no landing gear will be mounted to the wing. The cores generally are enclosed in the foam blocks from which they were cut and are marked to indicate the top of each "shuck"/core set. Make some witness marks across the edge of each set to keep from mixing them up. Draw a centerline on both the roots and tips. Always work on a core while it's sitting in one of the shucks to avoid damage.

Lay out the location of the aileron servos on the cores, making sure you're working on the bottom of the cores. (A ballpoint pen works well for marking foam.) Also, draw a line from the servo location to the root for the servo lead passage. Cut the servo cavity in the cores, using either a long knife or a long, narrow loop of 1/16-inch wire attached to a soldering gun.

Place a straight edge on the core along the servo marks. Use tape or several 1-inch wire brads to hold it in place. Make a 1/2-inch diameter loop from 1/32-inch wire and install the legs into your soldering gun. Using the straight edge as a guide and "pulsing" the gun to control the wire's heat just enough to melt the foam, cut the passage for the servo lead. Box the servo cavities with 1/16 balsa and fill the gap left from cutting the lead passages with soft 1/8-inch balsa. Glue a medium 1/16-inch balsa strip to the front of the cores (leading edge). Carefully sand the balsa parts flush with the foam. (Surrounding the sanding areas with 2-inch wide masking tape will prevent damage to the cores.) Draw a centerline the length of the leading edges. Lightly sand the cores with a long block and 220-grit paper to remove any irregularities.

Glass and foam construction is for the lazy (it's easy), the clumsy (it's durable), and the competitor (it's precise).

The next item is to prepare the skins. For glassed and painted wings, I like to use 4-pound balsa. For wings that will be film-covered, use 5- to 6-pound balsa. Be very careful when selecting wood! An extra half ounce per 4-inch wide sheet could equate to an extra half pound on a completed Pattern wing. Match the edges of sufficient balsa sheets to build four skins. Tape the edges together on one side with 1-inch masking tape. Working with one skin at a time, allow the skin to overhang your workbench so the first seam is open (sheets 90 degrees to one another). Apply a very thin bead of Pica Gluit to one edge, slide the skin back on the bench to close the glue joint, weight the joint on each side, and wipe off any excess glue. Repeat until the other three seams are glued. Mark this side as the one to face the foam core. Mark and cut the skins to fit the cores, allowing 1/4-inch excess. (I align the first sheet to the leading edge to ensure an even bending force over the most curved part of the airfoil.) Make sure to make right and left tops and bottoms and to mark the skins clearly. Remove the seam tape and sand both sides sufficiently to remove any gross irregularities.

Some reinforcement of the wing is appropriate. I have tested a variety of methods and have observed what works. Adding a 2- to 3-inch wide strip of fiberglass screening (from a home supply store) between the skin and core is adequate and inexpensive. This can be tacked in place with a couple of small spots of 5-minute epoxy.

Now we're ready to attach the skins. Don't even think about contact cement! My testing shows that the adhesion is inadequate, and there's no room for error. There are two choices: very slow cure epoxy and ProBond, a polyurethane. The latter is my choice. Both are applied to only the skin in a similar fashion.

If using ProBond, lightly mist the core with water and shake off any excess. Mix 3/4 liquid ounces of glue and pour two-thirds of it onto a skin. Spread it around until the skin is covered with a very thin coat. Most will soak into the skin. Lay the skin onto the core (don't forget the reinforcement material) and place it in the shuck. Without delay, do the same with the remaining skins. Stack both assemblies onto a sturdy, flat bench and place a board (3/4-inch ply or particleboard) on the stack. Align the shucks and cores. Weight the stack evenly to at least 300 pounds, using barbell plates, bricks, water bottles, etc. Check the centerlines to make sure the root and tip are parallel and that there are no bows in the leading and trailing edges. Shim the stack, if necessary, to ensure that the wings are straight. Let everything cure for 24 hours.

With a little practice, this can be done in one evening.

from *Notam*
Bayou City Flyers
Joe Chauffe, editor
Katy TX

Ain't it the truth?

If there is anything a pilot hates worse, it is to wake up and find his copilot asleep.

Thought for the month

"Fear less, hope more;
Whine less, breathe more;
Talk less, say more;
Hate less, love more;
And all good things are yours."
Swedish Proverb

from *The Sunny Times*
Midwest Sundowners
Rick Johnson, editor
Valparaiso IN

Searching for the perfect windy weather airplane

By CLAY RAMSKILL

All too often, on an otherwise nice but windy day, folks just don't fly. Obviously, for a beginner, that's just common sense—but for someone with experience, the wind should be another challenge to add some spice to flying.

While it's easy to see that experience level has a lot to do with how much wind is too much, it may not be quite as apparent that the type of airplane you're flying also has an effect on your ability to handle winds. Let's go through some airplane design features and see which ones have the best flying characteristics to handle winds and the resulting turbulence.

Size: In general, the larger the airplane (everything else being equal), the better it will handle winds of all kinds. They don't "flop around" as much!

Dihedral: The more dihedral in an airplane's wing, the more it is going to be affected by crosswind gusts. It is hard to keep the wings reasonably level, and therefore, lineup to the runway is difficult in a crosswind situation.

Wing loading: The higher the wing loading, the less an airplane will be affected when hit with a gust.

Aspect ratio: Lower aspect ratio (stubby) wings will be less bothered by gusts; there is less leverage for side forces to upset the airplane, and the lower aspect ratio wing has a greater tolerance to changes in angle of attack caused by gusts.

Power: It's pretty obvious that having the power to overcome the forces provided by the wind is a must. The same goes when you get into a sticky situation.

Lateral control: Ailerons are very beneficial in a crosswind, in landing, and in takeoff phases. The ability to dip a wing into a crosswind without changing heading is essential, as is the ability to rudder the airplane parallel to the runway heading while keeping the wings level with aileron during landing.

Landing gear: Tri-gear airplanes are easier to land and take off in a crosswind than taildraggers. The wider the spread on the main gear, the better.

Maneuverability: This one's a bit harder to quantify. You want an airplane with stability, yet you do need good maneuverability to cope with wind gusts. So you want an airplane that is stable, yet responsive.

Wing mounting: Generally, a low wing airplane will handle crosswinds better. This is because the center of gravity of the airplane is nearer, in a vertical sense, to the aerodynamic center of the wing. So the low wing airplane is not rolled by a side gust as easily. Also, by mounting the main landing gear on that low wing, you can spread them out wider.

It's unfortunate that almost every item above is in opposition to the characteristics of popular trainers, the main exception being the requirement for tricycle landing gear. But even with trainers, there are differences. Compare a Seniorita with the Cadet Mk2. While the Seniorita is a bit slower and easier to fly, the Cadet, with its ailerons, higher wing loading, lower aspect ratio, and lower dihedral, is a far better airplane to fly in windy conditions.

In closing, I offer Confucius' only know saying about Radio Control flying—"To learn to fly in wind, one must fly in wind."

via *Balsa Chips*
Connecticut Model Airplane Club
Ray Hinds, editor
Huntington CT

Chemical compatibility of common finishing materials

UNDER \ OVER	Polyurethane	Acrylic Enamel	Epoxy Enamel	Alkyd Enamel	Acrylic Laquer	Butyrate Dope	Nitrate Dope	Aero Gloss Dope	Dupont 305	Poly Resin	Vinyl Spackle
Vinyl Spackle	C	C	C	C	C	C	C	C	C	N	C
Poly Resin	C	C	C	C	C	C	C	C	C	C	C
Dupont 305	C	C	C	C	C	C	C	N	C	N	C
Aero Gloss Dope	C	C	C	C	C	C	N	C	C	C	C
Nitrate Dope	C	C	C	C	C	C	C	C	C	C	C
Butyrate Dope	C	C	C	C	C	C	N	N	C	N	C
Acrylic Lacquer	C	C	C	C	C	N	C	N	C	N	C
Alkyd Enamel	N	N	N	C	N	N	C	N	C	N	C
Epoxy Enamel	C	C	C	C	C	N	C	N	C	N	C
Acrylic Enamel	N	C	N	C	N	N	C	N	C	N	C
Polyurethane	C	C	C	C	C	N	C	N	C	N	C

C = compatible; N = noncompatible; Source: www.modelflight.com/chemical.gif
from *News-O-Flyin'*
Desert Hawks R/C Club
Rick Giannini, editor
Lake Havasu City AZ

Blue-slope fliers, stage fright, and the glide cone

By JOHN McGRATH

Blue-slope fliers

One of the things that has occurred to me lately is the notion that there are at least three levels of skill out there at the field. There's the highly experienced fly anything, build anything types, the freshmen, and the middle group—what I call the blue-slope fliers.

You skiers know what I mean. As a skier, when you can ski the blue slopes, you're able to safely navigate down much of the mountain without (usually) crashing by yourself or into others, you're able to handle a couple of moguls, and you look cool enough to be seen in public. In Radio Control (RC) flying, it's much the same. As a blue-slope flier, you can safely get off the ground, you can land for the most part, and you're generally not worried about flying in the company of others.

The start of this period is very interesting. It's where you make peace with engines, where your building rate finally overtakes your crashing rate, and where your confidence soars. Many of us, myself included, are happy to troll along through this middle ground indefinitely. Pretty good skills, interesting enough airplanes, and still enough repair work to keep our skills up. We are still amused by simply delivering an airplane into the air, controlling it for a bit, and safely returning it to earth. Not a bad place to be, really.

There's a dark side to the blue-slope flying though. It's called overconfidence—in your equipment and in your building. Just as the blue-slope skier will occasionally do something completely idiotic, so too will the blue-slope flier reach into a bag of tricks that's slightly too shallow for the cool move he or she's trying. It could be the altitude loop, the stretch for a dead-stick landing, or that fast taxi back into the pits. I'm told there's an equivalent phenomenon in real-life flying, where the post-solo, moderate-time pilot passes through a period where he or she is a little dangerous.

You see where I'm going with this. As you get to the stage where your wild enthusiasm for flying is slightly ahead of your skills, try to remember the fallibility of the entire system and make allowances for all of the possible points of failure: the wing joint, the hinges, the batteries, the control-surface connections, the prop itself, and most of all, the person holding the transmitter. This is the time in your RC career when you'll pass your hand through the spinning prop on the way to the plug connector. (Keep your cool, apply direct pressure, elevate the hand, get someone to drive you to the ER ...)

Stage fright

I once saw a bumper sticker that said, "If you skeerd, say you skeerd!" During a recent conversation about pilot training, I heard a very experienced, extremely skillful (black diamond!) pilot say something along the lines of "I've been flying for 30 years—I know what beginners need." Got me thinking. Sure, the older pilot certainly has a superior grasp of building, flying, theory, engines, safety, and all that good stuff, but the 30-year vet probably has forgotten something else. It's called stage fright, and it's probably crashed more airplanes than crosswinds have. Here's how to slay butterflies in your stomach:

1) Prepare your airplane the night before. Make sure everything's charged, straight, and moving the right direction.

2) Practice starting your airplane at home, if possible. Remember, the performance starts in the pits!

3) As a beginner, do your flying outside of prime time. Prime time is Saturday and Sunday mornings. If ever you *don't* need a peanut gallery, it's when you are nervous. There's some amazing flying to be had on calm Monday evenings in the summers, for instance.

4) Finally, before starting your airplane, go into one of the porta-potties, sing "The Star-Spangled Banner" as loud as you can, then punch yourself in the stomach once really hard. You think I'm kidding ...

The glide cone

I didn't invent this, but I use it all the time. It falls more under the category of training than safety, but it speaks to the notion of "variable management." Here's a good visual to use for eliminating that nasty feeling when the engine quits and you're not sure you can get back to the runway. Imagine that the ideal touchdown point on the runway is the pointy end of a huge inverted cone. That cone slopes upward in every direction at your airplane's glide angle. Tilt it a little toward the wind, and there you have it. To guarantee you can make it home, always fly above that cone. If the engine quits, who cares? No matter how far out, you'll make it back.

When I was an RC beginner, I sometimes would intentionally kill my own engine before landing, just to make my life simpler. I knew I could land a glider, but worrying whether the engine would quit at idle in addition to controlling rudder and elevator was just one variable too many. Go figure.

from the newsletter of the
Pikes Peak Radio Control Club
Bill Sanderman, editor
Colorado Springs CO

CORRECTION

The May issue of the National Newsletter published information on shortening antennas in the Hints and Tips section. This information could cost someone an airplane, says modeler Jim Breen.

"In order to work efficiently, an antenna system must be tuned to an electrical 1/2 wavelength long," Jim wrote. "At our Radio Control frequencies, that would be over 1.5 meters, and our receiver antennas are obviously not that long. Transmitter antennas are. Receiver designers compensate by adding circuitry to the receiver's input, which fools the receiver into thinking it is looking at a 1/2 wavelength-long antenna, so it is happy with the shortened wire common to our hardware. Shortening the antenna by wrapping it around a plastic form creates a coil that adds inductance to the antenna, thus increasing its electrical length while decreasing its overall mechanical length."

THEORY OF GLIDER FLIGHT: Undesired side effects

By BRET WILLAT

In turning a glider, the pilot must counteract five undesired side effects. During student training, the development of habit patterns to overcome these side effects is perhaps the largest single factor in learning to fly. Success will be much easier when the student understands the causes behind these vexations.

Adverse yaw

The first side effect is adverse yaw and is encountered when banking into or out of a turn. Adverse yaw is the drag on the wing that is raised. This is due to the increase of the angle of attack by the lowered aileron. (Remember when you increase the angle of attack, you lower the airspeed, increasing the lift and induced drag.) To roll into a left turn, for example, the pilot moves the stick to the left. This raises the left aileron and depresses the right one. Since the down aileron produces more drag than the other, an undesirable yawing to the right (against the direction of the turn) takes place, generating unwanted drag as the fuselage moves sideways through the air. To balance out this adverse yaw and streamline the fuselage, the pilot applies left rudder with the left aileron. This action is called "coordinating stick and rudder," and the result is a properly coordinated turn when the yaw string and the slip-skid ball are centered.

Adverse yaw is mild at low angles of attack but becomes severe when the wing is nearly stalled. For example, in a tight turn that is close to an accelerated stall, the application of full aileron to roll out can stall the low wingtip. The severe drag on this wing yaws the glider into a dive. If the pilot now makes the understandable error of trying to raise the glider's nose by pulling the stick even farther back, the result will be a sudden spin. To recover from such a tight spin, the angle of attack must first be reduced by moving the stick forward, followed by use of the rudder. Once you have a lowered angle of attack, use aileron/rudder to level the wings. A normal rollout occurs.

Diving tendency

This is the second "I wish it wouldn't happen" in a turn. When the glider is banked, some of the wing's lift is transferred from supporting to pulling the glider around the turn, as previously explained. Consequently, the rate of sink increases and stabilizing action causes the glider's nose to drop as the airspeed increases. If the pilot does not oppose this reaction of the glider by moving the stick back, the airspeed will soon stabilize at a higher level than before. To maintain the same speed in the turn as in straight flight, the pilot must use the elevator to keep the nose at such a position as to hold that speed. The steeper the bank, the more back pressure that is needed.

STALLING SPEED INCREASE WITH ANGLE OF BANK

Angle of bank	Load	% increase in stall speed	Trainer stalling speed	High-performance stalling speed
0°	1.0	0	31	46
30°	1.18	8	33.5	50
45°	1.4	18	36.5	54
60°	2.0	40	43.5	64.5
75°	4.0	100	62	92
90°	A "properly executed turn" is impossible			

Overbanking tendency

Having established the desired angle of bank, the pilot finds that he or she has to hold top aileron (against the angle of bank) to keep the bank from steepening. In a glider, this is true in all but the shallowest banks because of the long span and normally small radius of turn. The outer wingtip moves faster than the inner one, so it has more lift, causing a steeper bank.

Yaw against direction of turn

The fourth unwanted side effect—a yaw against the direction of an established turn—appears because the faster-moving outer wing has more drag. Rudder in the direction of the turn is needed to balance the wing's yawing force, the amount indicated by the yaw string or slip-skid ball. If these are centered, the turn is correctly coordinated, even though the controls are "crossed," which means rudder is applied on one side and aileron on the other.

It should be noted that the same undesired side effects of a turn are in powered aircraft, but most are noticed when in slow flight or steep turns. Most of these effects are more noticeable in the Sailplane because of the long wings and slower speeds. Power pilots, please note that a glider is flown so the fuselage slips through the air with minimum drag, the ball/yaw string in the center, and whatever position of the controls is required to accomplish this is used. The same should be true in an airplane.

Increase in stalling speed

The fifth and last (thank goodness) side effect of turning is the increase in stalling speed. As previously explained, during a turn, the pilot applies back pressure on the stick to increase the angle of attack. Thus, the glider is closer to a stalled angle than in a level glide at the same speed. Another way to look at the situation is that the load of centrifugal force is added to the weight of the glider; the higher total load on the wing raises the stalling speed. The thermalling pilot soon learns the he or she must increase airspeed to steepen the bank in order to keep from stalling. Note that the increase in stalling speed is caused by the increased wing loading rather than by the angle of bank. During aerobatic maneuvers such as a wingover, the bank may be vertical, and the stick is not brought back; there is no turning and no centrifugal force, and the glider's wing is not stalled even though the glider is momentarily hanging almost motionless in a vertical bank.

For more about the theory of glider flight visit www.skysailing.com/pages/theory.htm.

from *Gullwings*
Torrey Pines Gulls Radio Control Soaring Society
Cody Barnes, editor
San Diego CA

Hints & Tips

Information you can use

Trimming MonoKote

Do you have the same problem I had—wondering how to trim off the excess MonoKote from your airplane? It is especially hard to trim around those corners. Here's an idea that's as simple as 1, 2, 3. Take a piece of scrap plywood and cut it into strips about 1 1/2-inch wide and four inches long. Next, place a single-edge razor blade at a 30 degree angle on each side of the piece of plywood. Put one drop of medium CyA in the center of the razor blade (there is a small hole in the center of the blade). Now you can trim off your excess MonoKote and have a clean cut line. You also can determine your trim size by the thickness of the plywood you use.

from the newsletter of the
Skagit R/C Club
Pat Goffin, editor
Burlington WA

Convenient clean up

Want a nice, neat, convenient way to clean up that airplane? Use baby wipes, those soft wipe tissues that come under various brand names and are packaged in handy plastic boxes. The wipes must contain some kind of cleaning agent because they remove oil very well, and the lanolin in them acts like a polish.

Paint tips

1) Drill a small hole in the ferrule of your new paint brushes and drop some CyA in it. You won't lose as many bristles.

2) After doping, rinse the paint brush in thinner or epoxy paint remover. Squeeze dry with paper towel and wash in soap and water. Place the brush in a jar, handle down. You'll find that when it dries, your brush will be soft, with no paint or thinner hardening the bristles.

3) When painting or doping, apply the paint moving your arm from the elbow, without wrist movement. The dope will be applied more evenly.

4) When doping silk, especially for the first four or five coats, paint over the same spot with very thin coats two or three times until all of the bubbles disappear. This will release the air and dope fumes. You also will have fewer paint runs and a smoother finish.

from *The Monocle*
Barons Model Club
Spokane WA

Drilling engine mounts

When using those black plastic engine mounts, it's difficult to mark where you should drill for the engine mounting bolts/screws, still having all the holes aligned and getting the engine right where you want it. One good way to do this is to have the engine on the mount, in the airplane, aligned just how you want it. Then, chuck a piece of music wire, about 3/32 inches and four or five inches long, in your drill, with a rough-cut end out. Use this to mark your holes. With a little pressure, the rough end of the wire will make a visible mark, and will even chew a small depression in the plastic, giving you "center punched" marks and ensuring proper alignment for drilling.

Wing servo mounting

One way to mount a servo on a foam wing is to mount flush. This is especially advantageous for racing airplanes or gliders, where drag reduction is important. Make a hole in the wing (hot cut, razor, or router), line with a 3/32-inch balsa on the sides, and put in plywood corner pieces to accept the screws for the cover.

The cover is made of 1/16-inch ply, to fit flush with 1/16-inch wing skin. Mount the servo onto pine or plywood blocks, glued to the cover (or use servo mounting tape). Cut a slot for the servo arm, and you're set. This type of mounting is strong, light, and allows for easy access to the servo.

Marking dark MonoKote

Putting any kind of decent marks on MonoKote is difficult, especially if the MonoKote is a dark color. This becomes a hassle for you when trying to accurately place control horns or mount a switch to a surface that's already covered.

Try putting down a piece of masking tape in the approximate location. Then line up the horn or switch plate and make your marks on the tape. The marks are visible, and you can cut or drill right through the tape. You can pull off the tape easily by pulling it sideways over itself (i.e. don't pull straight up or you may lift off the covering).

from *RC Prop Wash*
Ocala Flying Model Club
Dick Smith, editor
Ocala FL

Starting your engine

Having trouble getting that engine started? Don't know what's missing? I once read an article by a famous engine guru. He stated, "If it (the engine) has fuel, air, and fire, it will run!" Of course, that's the simplified version. What he left out is that those three

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Hints and tips, *continued from page 14*

items have to meet at the right place, at the right time, and in the right proportions. If you get a new engine, read the starting instructions thoroughly and understand how it should be started and tuned. After all, the people who wrote those instructions designed and built the engine. Many things are common from engine to engine, but some have subtle differences, and not knowing these differences can make for much frustration. Get to know your engine. Take care of it, and it will take care of you and your airplane.

from *Flying Times*
Valley RC Flying Club
Randy Ryman, editor
Harrisburg VA

Pin organizer

Make a handy building pin holder. Start with a simple block of Styrofoam that is molded into a horseshoe shape. Glue it onto a scrap of plywood with two plastic tubes glued on each end to hold the cleaner. Then, put acetone in a jar so when CyA gets on the pins, they can be tossed into the jar for cleaning. You also can use a magnet on the outside of the bottles to bring the pins back to the jar. Next, divide the foam block into three sections—one for each of the three sizes of pins. This is a simple concept, but it keeps the pins close, clean, and out of your fingertips.

There are several ways to modify this design. For example, in our kitchen, I put up a new paper towel dispenser. The frame is made of Plexiglass, and the part that holds the paper towels is a 1-inch dowel that is about 12 inches long. A piece of 1-inch foam pipe insulation fits nicely over the bar, creating a pin holder that could be mounted on the wall next to your building area. It's off the surface so the pins are always easy to find and reach.

Removing bearings

Here's one way to remove bearings from your engine. First, disassemble the engine down to the point of removing the crankshaft. Now look from the rear of the engine to the front, through the inside. You should be able to see the back of the front bearing. Place a small diameter brass or aluminum drift against the outer edge of the bearing and tap lightly with a hammer. Work your way around the circumference of the bearing until it pops out the front.

Now for the rear bearing. If you have a welding torch or powerful propane torch, heat the crankcase on the outside, getting the area around the rear bearing fairly hot (not red hot). Then, pick up the case and whack it straight down on a piece of wood and the rear bearing will fall out. On most engines, the cylinder head is large enough to extend past the back of the crankcase, so make sure you only hit the back of the crankcase squarely on the wood. Use an oven mitt so you don't burn your hand. If you don't have a torch, put the case in the oven at 350 degrees for three to five minutes. Remember: never try to dig out bearings with a screwdriver.

from *News-O-Flyin'*
Desert Hawks R/C Club
Rick Giannini, editor
Lake Havasu AZ

Safety for new pilots

Get rid of that plastic spinner that came with your Almost-Ready-to-Fly. Yes, I know you all think they look so cool, but they are really a safety hazard. I realized this a few years ago. One Sunday, when I was instructing, three propellers came flying off three different students' airplanes. They all had spinners. Now, I always insist that the student remove the spinner, and we check the prop nut before the first flight of each day. It's a real nuisance. Make it easy on yourself and get an aluminum nut. Also, don't use wooden props. If you nick them, they can split and become a safety hazard. The best props for new pilots are the black, Master Airscrew props. Paint the tips white so you can see them when they are spinning.

from *Smoke Signals*
Meroke Radio Control Club
Joe Di Prima, editor
Franklin Square NY

Academy of Model Aeronautics History Program
Charles Alphonse Penaud
1850 - 1880

AMA History Program

"The future generations of modelers need our experience, our knowledge, and our example to follow—just as we followed in the steps of our modeling heroes," says AMA Historian Norm Rosenstock.

The AMA History Program is an effort by the National Model Aviation Museum to preserve the history of model aviation. The goal of the program is to compile and record the biographies of individual members and industry associates as well as histories of AMA chartered clubs. The records are available to anyone who is interested and copies are placed in the museum's Lee Renaud Memorial Library.

If you are interested in submitting a biography, an outline is available on how to write one. There also is a form for those who prefer not to write the actual biography.

Another form is available if you would like to submit information about your club. Feel free to include photographs, newspaper or magazine clippings, or any other pertinent information along with your written club history.

To obtain a form or more information, contact Assistant Historian Stacey Shannon at (765) 287-1256, Ext. 511, fax to (765) 281-7904, E-mail staceys@modelaircraft.org, or send mail to 5151 E. Memorial Drive, Muncie IN 47302. Information also is available at www.modelaircraft.org.

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Muncie, Indiana 47302

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