NATIONAL NEWSLETTER

Academy of Model Aeronautics May 2005

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About the *National Newsletter*:

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Lightning safety outside

Each year, roughly 400 children and adults in the United States are struck by lightning while working outside, at sports events, on the beach, mountain climbing, mowing the lawn, or during other outdoor activities. About 67 people are killed and several hundred more are left to cope with permanent disabilities.

Many of these tragedies can be avoided. Finishing the game, getting a tan, or completing a work shift isn't worth death or crippling injury.

The threat of lightning

• All thunderstorms produce lightning and are dangerous. Lightning kills more people each year than tornadoes.

• Lightning often strikes as far as 10 miles away from any rainfall. Many deaths from lightning occur ahead of the storm because people try and wait to the last minute before seeking shelter.

• You are in danger from lightning if you can hear thunder. If you can hear thunder, lightning is close enough that it could strike your location at any moment.

• Lightning injuries can lead to permanent disabilities or death. On average, 10% of strike victims die; 70% of survivors suffer serious long-term effects.

• Look for dark cloud bases and increasing wind. Every flash of lightning is dangerous, even the first. Head to safety before that first flash. If you hear thunder, head to safety!

• Lightning can travel sideways for up to 10 miles. Even when the sky looks blue and clear, be cautious. If you hear thunder, take cover. At least 10% of lightning occurs without visible clouds overhead in the sky.

The single most dangerous place

Outdoors is the most dangerous place to be during a lightning storm. When lightning is seen or thunder is heard, or when dark clouds are observed, quickly move indoors or into a hard-topped vehicle and remain there until well after the lightning storm ends. Listen to forecasts and warnings through NOAA Weather Radio or your local TV and radio stations. If lightning is forecast, plan an alternate activity or know where you can take cover quickly.

The U.S. lightning season is summer but lightning can strike year round! The Fourth of July is historically one of the most deadly times of the year for lightning. In summer, more people are outside, on the beach, golf course, mountains or ball fields. Outdoor jobs such as construction and agriculture, and outdoor chores such as lawn mowing or house painting are at their peak, putting those involved in danger.

Safety rules

1. Postpone activities promptly. Don't wait for rain. Many people take shelter from the rain, but most people struck by lightning are not in the rain! Go quickly inside a completely enclosed building, not a carport, open garage or covered patio. If no enclosed building is convenient, get inside a hard-topped, all-metal vehicle. A cave is a good option outside but move as far as possible from the cave entrance.

2. Be the lowest point. Lightning hits the tallest object. In the mountains if you are above tree line, you ARE the highest object around. Quickly get below tree line and get into a grove of small trees. Don't be the second tallest object during a lightning storm! Crouch down if you are in an exposed area.

see **LIGHTNING** on page 5

from the Dayton Wingmasters, Dayton OH

Soaring on a cloudy day

by Bob McCarty

Need sunshine and calm air to soar? Nope! I've been reading about how to find and stay in thermals with model RC sailplanes. It all sounded pretty simple—three things give you stronger thermals: sunny weather, light wind, and low humidity.

The first one makes sense. Sunlight falling on plowed fields, cut grass, woods, or parking lots gives you uneven heat, which generates thermals. The second one does too, because the lighter the wind, the less damage done to beginning thermals. Never did figure out the humidity part, but understanding two out of three isn't bad!

My first sailplane flights as a novice pilot supported this theory. Everytime the weather was sunny with light wind, I hit the flying fields and practiced. Then one day, I headed out to the Wingmasters field even though the weather was not "right" for soaring.

There were storm clouds building and a steady wind at about 15 mph. I loaded the airplane up with ballast and let her rip. As soon as it flew off the high-start, I knew it was in strong lift. After only three turns in the core, the airplane was so high I could hardly see it. It was going up like a rocket. What was that about the strongest lift on calm days?

I flew for 15 minutes on that flight, and I almost lost my airplane because I could barely see it. Then in November, I went out to the RAMS field at Wright-Patterson AFB for one last flying session before winter. With a solid overcast and a dark sky, I launched toward the North. After launch, I realized that my sailplane was slowly gaining altitude.

I started flying in big circles, drifting slowly downwind. I flew to the limit of my vision and then headed back toward the point where I first caught lift. I found another thermal, and rode it down the same path the first one had followed. I landed after almost 35 minutes in the air—my longest flight to date.

So much for theory! Now I'm going to fly whenever I get the chance—forget the weather.

from the Clarence Sailplane Society's newsletter, Glenwood NY

Spring fun fly ideas

by Dick Soucy

Bomb drop: Pilot puts a bean bag in a 4-ounce cup on top of the aircraft, takes off, flies two orbits, and then goes inverted and drops the bean bag.

Score is based on how close the drop lands to target.The target is a 5-foot circle within a 15-foot circle within a runway zone that is 100 feet in length.

Bean carry: A 4-ounce paper cup is taped to the top of the aircraft right over the center of gravity. Ten beans are put into the cup.

The pilot takes off, does three loops, and lands. The beans are counted and scored. In the end, whoever has the most beans wins, with second and third place accordingly.

Modified pylon: This will need some work, but basically, a two-pole pylon course is set up.

The pilot takes off, from a start/finish line, and begins an orbit. The time begins as the aircraft passes the start/finish line (once the pilot is comfortable). The pilot then flies three circuits around the pylons and lands.

Pylon monitors will signal when the aircraft passes the pylons.

Aircraft do not actually have to circuit around the pylons, but must make the turn after passing the pylons. Time stops when the model passes the start/finish line after the third circuit. Shortest time wins.

Two-minute flight: This is a timed event. The pilot must take off, fly, and land within two minutes. Any maneuvers can be performed as long as the pilot lands in exactly two minutes. Points taken away for time over or under two minutes.

Climb and glide: Aircraft takes off and climbs for 30 seconds. Pilot shuts down the engine and verifies by opening throttle. The time begins as the aircraft glides to a landing. Longest time wins.

Figure eight: This is the same as the modified pylon event but the pilot must complete three figure eights before landing. Shortest time wins.

from the Lima Area Radio Kontrol Society, Lima OH

by Jay Scott, editor

Know noise regulations to avoid sound problems

by Bob Hoff
Andy Kane, editor

Technical note: I am completely aware that one you cannot measure noise, as you can sound, but the author was making a point that I think is very important so his article is reprinted as he wrote it.

Sound from RC models powered by internal combustion engines, along with real estate development is one of the major causes of the loss of flying fields. We lost our field because of noise complaints, even though we were not violating county noise limits. The tipping point was when pattern contestants practiced too early in the morning and flew too near housing.

The Science of Noise

Noise can range from a single tone to a complex spectrum made up of many tones or frequencies of different magnitudes. Model aircraft noise is closer to white noise than it is to a single tone, so many of the physical laws that apply to white noise can be used to reach useful conclusions about model aircraft noise.

White noise contains components at all frequencies. Noise from RC aircraft is composed of four components, engine intake, engine exhaust, airframe vibration, and propeller sound. Engine exhaust and propeller noise are the most important contributors.

The magnitude of noise is usually measured and expressed as sound pressure level (SPL) in decibels (dB) (on the A-scale of the sound meter) relative to 20 micronewtons per square meter. Meter frequency response on the A-scale approximates the human ear.

The physics and math of the situation dictates that an increase of 6 dB represents a doubling of sound pressure level. In theory knowing the SPL at one distance, the SPL at any other distance can be calculated. In practice it provides an inexact, but useful estimate.

The dominant components of exhaust and intake sound of two-cycle engines are at a fundamental frequency equal to the rpm of the engine and its harmonics or overtones (multiples of rpm). For four-cycle engines the fundamental frequency is half the engine rpm. Exhaust sound is normally reduced by using mufflers.

A research project at N.C. State University, sponsored by AMA, concluded in December 1989 that, "Noise generated by the propeller is the dominant source of model aircraft noise if reasonable efforts are made to reduce exhaust noise."

For many years factory mufflers for many engines allowed levels of noise did not meet the criterion of "reasonable" efforts. Today some factory mufflers are better and after-market mufflers like the Davis Diesel Soundmaster can provide up to 6 dB reduction over a factory muffler. I had a .40-powered airplane fitted with a Davis muffler, and it was sometimes hard to tell if the engine was running when the airplane was high and at a distance.

Propeller noise can be reduced by selection of a propeller design with low noise characteristics and by keeping propeller tip speed below Mach 0.5. In his "Sound Advice" column in the February 1999 issue of *Model Aviation* Ian Maclaughlin said that keeping the product of rpm in thousands and propeller diameter in inches below 120 will keep propeller noise below 90 dBA, as measured at a distance of nine feet. At a product of 120 this is approximately Mach 0.45. A three-bladed propeller is sometimes used to provide the desired thrust while keeping tip speed down.

Airframe vibration noise depends on engine vibration, mounting, and on airframe rigidity. It can be reduced by engine shock mounting with the additional benefit that wear and tear on the airplane is reduced.

In searching the literature I find very little about levels of and suppression of engine intake noise. I suspect that one of the reasons is that it is difficult to separate it from the other sources so it can be measured. There are aftermarket intake air filters that might reduce intake noise somewhat, but this is not likely to make a noticeable improvement.

David Gierke reported in an article in the December 1995 *Model Airpane News* that, with a good muffler, he was able to determine that propeller noise was 92 dBA, engine exhaust noise was 91 dBA, and intake noise was 89 dBA. The total noise was 95.5 dBA.

You will note that the total noise is not the sum of the individual sources. If two uncorrelated sound sources are combined on an energy basis, the largest increase that can result is 3 dB in sound power. Combining two unequal noise sources will result in an increase of less than 1 dB in power. For example, a chart in the *General Radio Handbook of Noise Measurement* shows that if two sources differ in power by 6 dB, the combined level will be increased by only 1 dB above the loudest of the two. Remember this is sound power we are talking about, not sound pressure level that we measure with a sound meter. A 3 dB sound power increase results in a 6 dB sound pressure level increase.

Two noise sources are uncorrelated when the causes of the noise are unrelated. The noise from two different airplanes is uncorrelated. Propeller noise and exhaust noise generated by a single airplane are correlated because they are both a function of rpm of the same engine.

Noise limits and regulations

Chapter 31B of the Montgomery County Code specifies that noise at a receiving residential area shall not exceed 65 dBA in the daytime. DCRC Field Rules, as published in the June 2000 issue of the club's newsletter specified that, "At no time will the County's 65 dBA sound limit, as measured at the property line, be exceeded by activities at the field." Rules also state, "Models will comply with AMA sound rules for RC Aerobatics which are 96 dBA measured at three meters from the centerline of the model with the model standing on concrete or macadam, or 94 dBA when

see **NOISE** on page 4

standing on earth or short grass (with the engine running at full power).” (See Paragraph 4.2 of the section on Radio Control Aerobatics of the *AMA Competition Regulations* and its “Sound Addendum” for details of the specified measurement procedure).

Measured results on the ground are affected by the elevation of model and meter above the surface, the nature of the surface (hard, grass, etc.), the orientation of the model with respect to the meter, wind velocity and direction, nearby reflecting surfaces, and of course, engine rpm. Any noise measurement made should include a record of these conditions. The field rules contain provisions for granting exceptions for models that exceed these limits but meet property line limits. They also provide that members can have their models tested by the sound and safety officer who will issue a sticker to affix to their airplane. The *AMA Membership Manual* does not specify noise limits for sport flying, although the AMA encourages that model aircraft noise be held to a minimum.

Assessment and enforcement

When our new field opened, Walt Gallaugher, former sound and safety officer, encouraged members to submit their models for noise measurement. After accumulating considerable data, he reported in the October 2000 newsletter that the noise output of most midsize models does not exceed the limits specified for measurements on the ground and that they did not come anywhere close to exceeding the 65 dBA limit at the property line in flight.

Some midsize and large models were found to exceed the limit allowed in ground measurement. They were and will be required to take corrective action or to submit to in-flight measurements to make sure that they do not exceed the 65 dBA limit at the property line. The field rules state: “Special exceptions will be granted for models that exceed the AMA limit but do not violate the county’s 65 dBA limit. These airplanes must undergo additional in-air sound measurements made at the property lines. These airplanes must be flown alone at all times with no other models in the air.” In the light of these findings, noise measurements are not now routinely made on any size models unless requested by the owner or considered advisable by the sound and safety officer.

It should be pointed out that assessment results confirm that ground measurements give a useful indication of what can be expected in flight, but in-flight measurements are still needed in some cases because of engine unloading in flight, differences in air-frame vibration and other factors that cannot readily be taken into account during ground measurement.

So what?

As responsible RC modelers, our members should take the following steps to minimize noise and the risk that it will contribute to the loss of our flying site.

1. Measure the noise output of your models to be sure you are in compliance with the limits set by the applicable rules and regulations.

2. Use the best muffler you can afford.

3. Shock mount your engine.

4. Consider using a four-cycle engine because the lower fundamental frequency of its exhaust is less annoying.

5. Use a propeller of low noise design and keep the tip speed below Mach 0.5.

6. Fly within the boundaries established for our field.

7. Wear ear protection when starting and adjusting your engines. Noise levels during these activities can cause permanent hearing loss that occurs

from the Hampton Roads Radio Control Club, Hampton Roads VA

Trucker’s Hitch

Rick Lawrence, editor

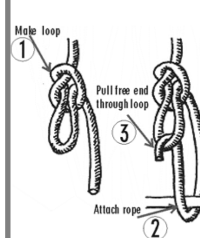
I used finishing line to make a Kevlar braid, and then the braid as a pull-pull rudder for my models. I used it on a large biplane and had good results, but on my triplane the rudder was a little big and too loose. When I flew my triplane, it fishtailed in flight.

I spoke with a friend about my problem, and I also mentioned that I had trouble tightening the lines to get the pull-pull system tight. John said that I should use a Trucker’s Hitch to make the pull-pull system. It is commonly used by fishermen to cinch lines and make them secure.

Searching Trucker’s Hitch on the Internet will give you several excellent explanations. In my *Ashley Book of Knots*, I found a couple of knots that might also work—they are a Farmer’s Loop, Harness Loop, and Lineman’s Loop. (The book indicates that the Lineman’s loop is better than the Harness Loop. It is stronger and easier to tie).

All of these knots create a bight in the line where you can make a loop for cinching the line tight. They are all finished with half-hitches to keep them from slipping. Of course, finish the job with a dab of super-glue to make sure it never gets untied or slips.

How to: Trucker’s Hitch



LIGHTNING continued from page 1

3. Keep an eye on the sky. Look for darkening skies, flashes of lightning, or increasing wind, which may be signs of an approaching thunderstorm.

4. Listen for the sound of thunder. If you can hear thunder, go to a safe shelter immediately.

5. If you see or hear a thunderstorm coming or your hair stands on end, immediately suspend your game or practice and instruct everyone to go inside a sturdy building or car. Sturdy buildings are the safest place to be.

Avoid sheds, picnic shelters, baseball dugouts, and bleachers. If no sturdy building is nearby, a hard-top vehicle with windows closed will offer some protection. The steel frame of the vehicle provides some protection if you are not touching metal.

6. Listen to NOAA Weather Radio. Coaches and other leaders should listen for a tone-alert feature during practice sessions and games.

7. If you can't get to a shelter, stay away from trees. If there is no shelter, crouch in the open, keeping twice as far away from a tree as it is tall.

8. Avoid leaning against vehicles. Get off bicycles and motorcycles.

9. Get out of the water. It's a great conductor of electricity. Stay off the beach and out of small boats or canoes. If caught in a boat, crouch down in the center of the boat away from metal hardware. Swimming, wading, snorkeling, and scuba diving are NOT safe. Lightning can strike the water and travel some distance beneath and away from its point of contact. Don't stand in puddles of water, even if wearing rubber boots.

10. Avoid metal! Drop metal backpacks, stay away from clothes lines, fences, exposed sheds, and electrically conductive elevated objects. Don't hold on to metal items such golf clubs, fishing rods, tennis rackets, or tools. Large metal objects can conduct lightning. Small metal objects can cause burns.

from the Indianapolis RC South club, Indianapolis IN

Battery failure

by Doug Gifford

Robert Braham, editor

Whether you are a seasoned pilot or a new flier, we all share the risk of experiencing a crash due to battery failure—the most common RC equipment failure.

Let's face it, rechargeable batteries die, and they often don't give us much warning. If the application is critical (such as with our glow-powered model aircraft) the trick is to stay ahead of the game and detect the pending failure before your prized creation goes down.

If you are not paying attention to your batteries you will probably not see the signs of pending failure.

see **BATTERIES** on page 6

from the Pikes Peak Radio Control Club, Colorado Springs CO

Choose the right U.S. Air Force insignia for your model

by Keith Davis

Since World War I, The United States has had over eight different aircraft identification markings designed for its aircraft. Four of the insignia changes were made during World War II alone. There were many reasons for insignia changes: looks too similar to enemy markings, hard to identify at a distance, etc.

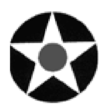
So if you are interested and have the time, check out this United States Air Force Museum Web site: www.wpafb.of.mil/museum/ (search insignia).

The Web site goes into detail about each U.S. insignia, why it was used, then changed, and how they were placed on the aircraft. Not a bad Web site. Now you'll know not to build a F-4F Wildcat with 1947 markings or design a jet with 1918 markings! And once you get this insignia thing down, you'll be able to identify a RC warbird, and almost tell what war and year that the aircraft flew in.

The evolution of insignia

Below are six of the most common Air Force insignia used from 1918 to present.

1918: red outer circle, blue middle, white center
This design was adopted for easier identification during combat.



1919: white star, red dot, black circle
The star in circle design was used prior to 1918. Its use was resumed in May of 1919.

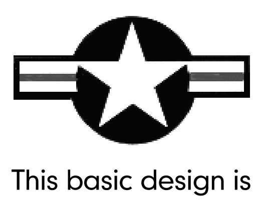
1942: white star, black circle
The red dot was removed to reduce confusion with Japanese insignia.

1943: white star, black circle, red trim

(August 1943)

white star, blue circle and trim

The first "Bars and Stars" design was easier to make out from a distance. The previous "Circle in Star" designs looked like simple circles from a distance.



1947: white star, blue circle and trim, red bars
This basic design is still in use on United States aircraft today.

Most glow aircraft use a four-cell series connected pack of AA Ni-Cd batteries to power the radio flight pack in the aircraft. The series connection of four cells gives a nominal voltage of 4.8 volts (approximately. 1.2 volts per cell), and usually can produce 600 to 700 milliamperes per hour (mAh).

Six hundred mAh means a healthy pack will supply a current flow of roughly 600 milliamperes (mA) for about one hour at near its rated voltage. Drawing an average current less then 600 mA will result in longer endurance time.

Our transmitters often use eight of the same cells in a series resulting in a nominal 9.6 volts (1.2v per cell x 8). Transmitters usually draw a constant current level of approximately 150 to 250 mA while transmitting.

Flight packs typically draw 30-60 mA when idle, but when flying the servo motors are in constant use drawing higher currents. Two standard servos can draw peaks of more than 400 mA. If a flight surface is a bit stiff, servo current draw can increase considerably.

The wall chargers supplied with typical radios do a fine job. They charge at a relatively constant current of 50-70 milliamps. This is one-tenth of the battery capacity specification.

These chargers are known as one tenth-C, or slow chargers. This is the most reliable and simple arrangement, because almost all Ni-Cds can tolerate considerable overcharge (days or even weeks) if the charge current is one tenth-C or less.

Higher charging schemes need charge-end detection and automatic shutdown in order to prevent overcharge damage.

Sounds complex? It's not so bad. There is much you can do to enhance your reliability without spending money on extra equipment. For starters, here is a list of good practice items:

1. Protect the battery pack from excessive vibration by wrapping a layer of foam around it.

2. Make sure you have a good charge before flying—a full 10-12 hours. If you know your batteries are low give them a full 18-24 hours.

3. Avoid using a wall socket controlled by a switch. It might get turned off. Confirm charging by making sure the LEDs are lit.

4. Batteries self-discharge slowly over time. Batteries can differ in this area, and older batteries can lose charge more quickly. If you charged your batteries immediately after last week's flights, and you plan on flying tomorrow—charge them again. You want them at their best.

5. Keep connections clean and in good shape.

6. Typical transmitters have a battery meter, display, or LEDs to help monitor the transmitter. Learn how yours reacts when batteries are new. What does a normal full charge look like? How about after a half hour of use? If it begins to behave differently, have it checked out.

7. Batteries that are in their third flying season deserve more attention. With fourth and fifth season batteries you can almost expect a failure.

Typically it will be a single-cell failing, but do not trust the other cells unless the pack is new. Individual cells can be replaced, but it's typically not worthwhile. A four-year-old pack with one bad cell replaced will probably give trouble again very soon.

8. With a full charge, how do the servos act? Are they responsive and quick? If you ever develop a sluggish servo get it checked out.

9. Consider four to five flights maximum if you don't have a way to check the batteries, and be sure to turn your equipment off between flights.

10. If for any reason you think you might have a problem, ask another flier for assistance. Many experienced fliers have battery checking and field-charging equipment onhand and would be happy to help.

If you are thinking about purchasing extra equipment, I would recommend buying a digital voltmeter with an internal load specifically designed for RC use (I use a Hobbico. It cost about $25).

Before digital became popular, there were analog Ni-Cd checkers. Expanded Scale Voltmeters (Hobbico still makes these at around $12) provide a scale expansion that allows more accurate reading around the voltages of battery packs (the 4.8 and 9.6 volts).

Why expanded scale or digital? NiCads (and also Nickel-Metal Hydrides - NiMH) are known to have a relatively flat voltage-discharge curve. In other words, as they progress from fully charged to fully discharged, the voltage decreases very little.

For this reason it is difficult to measure the battery's charge state without an accurate meter where you can see the small differences between the two. You also must have some knowledge of what the battery usually measures to see the change.

The load feature puts a brief 75 to 200 mA load on the battery. Always measure battery voltage under some load in order to see how voltage holds under typical discharge load.

The best defense against the battery failure, and/or the inadvertent "fly until discharged" crash, is frequent checking under load with an accurate voltmeter.

You will hear fliers talk of cyclers that test and exercise batteries. These are good, but not necessary.

A cycler will discharge a battery and count how many milliamperes per unit time (milliamperehours) the battery will supply while maintaining voltage above a certain voltage (typically 1.1 volts per cell).

I use a cycler sometimes, but it basically is detecting early loss of voltage during discharge. Occasionally checking batteries under load with a simple voltmeter essentially accomplishes the same thing.

Know your battery's voltage history. Know that they are fully charged for the start of your session.

Check the voltage before your first flight, maybe after the third, and any other subsequent flights.

You will be doing the most you can to avoid the third most common cause of pilot error—the error of not paying proper attention to your equipment.

from the District of Columbia Radio Control Club, Washington DC

Flying radio control helicopters: One man's story

by Julio Cesar de la Yncera
Andy Kane, editor

Have you ever thought about flying RC helicopters? Do you think you need to learn to fly airplanes before you fly an RC helicopter? What model and radio should I use? If you have questions about how to learn to fly RC helicopters then read on.

I am a beginning helicopter flyer with no experience in RC flying. Before i started flying, I would come to the flying field to admire the airplanes and helicopters.

When I decided I wanted to try to fly, I went to the helicopter flying area and asked the members what they recommended for a newcomer. They told me to get the Great Planes Simulator, version two. They advised me to learn how to hover first.

I immediately went and bought the flight simulator at Hobby Works. After installing the program on my computer, my next step was figuring out how the controls sticks on the simulator box functioned. It took a while to learn what each of the controls was for.

I found that when you are learning to fly RC helicopters, it is best to fly with the tail pointing toward you at first. That way the control maneuvers correspond with the movements of the helicopter.

Once I had the controls figured out, I learned how to hover. Hovering is the most important maneuver to master for helicopter flight. Most maneuvers begin and end in a hover; while others end with a crash!

After having some fun and learning the basics with the simulator, I decided it was time for the real thing.

I bought a Raptor 50 V2 with O.S. 50 engine, a Futaba H9C FM computer radio transmitter and receiver, and a Gyro GY401.

I spend about two weekends setting up my helicopter; meanwhile I still practiced with the simulator for about an hour each day.

Once my helicopter was setup, I asked someone to check it for me. I also asked him to do a test fly, just to make sure that it was set up correctly.

see **HELICOPTERS** on page 8

from the Jayhawk Squadron, Johnson County KS

Signs that you have grown up

contributed by Jim Kennedy

- 6:00 a.m. is when you get up, not go to bed.
- You hear your favorite song on the elevator.
- You watch the Weather Channel.
- You go from 130 days of vacation to 14.
- Jeans and a sweater no longer qualify as dressed up.
- You're the one calling the police because the kids next door won't turn down their music.
- You car insurance payment goes down, but your car payment goes up.
- A $4 bottle of wine is no longer pretty good stuff.

from the Ocala Flying Model Club, Ocala FL

Guidelines for a good spotter

by Jim Malek
Don Zepp, editor

A good model aircraft spotter does not have to be a flier. They can be a spouse, boyfriend, girlfriend, or an interested friend. They should, however, have some training that goes along with their responsibility.

Good spotters:

1. Begin their duties as they approach the pilot's aircraft. They observe the fueling ports for security, backed out screws, hatch security, proper frequency pin etc. and alert the pilot to anything out of the ordinary. They also observe the type and number of aircraft flying in the pattern.

2. Spotters should get a good grasp on the aircraft, even if there is a mechanical restraint. Proper hearing protection may be required. They clear downwind of the propeller prop wash, and warn any people standing in the propeller arc to stand back. They observe the position of the throttle stick on the transmitter—always keep their eyes on the pilots left thumb, and watch for a fast full throttle.

3. After the aircraft is started, they observe the functional check on the control surfaces for proper deflections. Is the antenna extended, etc.?

4. They check the runway, departure end, crosswind, downwind, and base legs for traffic prior to calling taxing out and takeoff.

5. After take off the pilot will feed them information on their intentions, i.e., do a loop, roll, stall turn etc. The spotters will stay ahead of the aircraft, feeding the pilot traffic information.

6. Before landing, they call out "landing," and make sure the runway is clear. After landing the spotters' job is not done. They check the final leg as the pilot taxis off or is on the field recovering his/her airplane, alerting other pilots of landing aircraft or aircraft taxing out.

7. From the time the spotters are on the flightline until the engine is shut down and the aircraft is removed from the flight line, the spotters must have situational awareness to their surroundings.

from the Simi Valley Flyers, Simi Valley CA

How to prevent crooked takeoffs

by Ron Scott
Alan Hoff, editor

In airplanes with tricycle landing gears it's fairly easy to control the straightness of take off with the front wheel and rudder. During takeoff, you guide the airplane with the front wheel down the runway until the speed gets to about 10-20 mph, and then the rudder takes over and guides the airplane the rest of the way—hopefully straight down the runway to a smooth takeoff. Other factors that affect takeoffs are obviously the pilot, wind direction, and model dynamics.

Toe-in is when the front wheels are slightly angled inward. Typically 1 or 2° of toe-in will do the trick.

Tail-dragger airplanes are slightly different animals and require a little toe-in in order to guide the airplane down the runway as straight as possible during takeoff and landing. Front wheel toe-in plays a very important role, much more so than in an airplane with tricycle landing gear.

An airplane with tricycle gear's center of gravity (CG) is in front of the main gear. This helps straighten out an airplane that has developed a yaw angle between where it is pointed and where it is actually going.

A tail dragger's CG is behind the main gear, and a slight yaw angle is not automatically corrected but is made worse and can result in ground looping.

Toe-in of the wheels can help both types of airplane. A model rolling straight ahead has equal drag from each of the wheels. When the airplane takes an unwanted turn to the left, the drag from the left wheel is reduced to near zero, while the drag at the right wheel increases. The net effect is an unbalanced drag on the wheels. This exerts a retarding force and tends to turn the airplane back to the desired direction. This wouldn't happen without toe-in.

A slight toe-in on float models also works well for maintaining a straight takeoff into the wind. The most important thing I've learned about float flying is to keep the airplane directed straight into the wind during takeoff and landing.

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The first time I flew my real helicopter I was a bit nervous. It was different from the simulator. You can crash many times on the simulation and it will not cost you a penny, but this was the real thing.

Very slowly I increase power to the engine. As the main rotor started rotating, I could hear my heartbeat matching its speed—thump, thump, thump. After getting it light on its skids—about one inch of the ground—I landed it again to make sure I knew how to turn it off. After that, I proceeded to practice hovering on my helicopter.

After I gained some confidence and was comfortable hovering, I practicing flying forward, left, right, and in circles on the simulator. The simulator gives you confidence and allows you to perfect your timing on the control sticks. You can also see if something goes wrong, what actions to take as to avoid danger.

In conclusion, learning to fly helicopters is a lot of fun, and it is easy to learn. The helicopter pilots in my club were also very helpful.

So yes, you can learn to fly helicopters before you learn to fly an airplane.

from the Western New York Free Flight Society, Fairport NY

Covering with tissue: Tips and techniques

by Bob Clemens
Mark C. Rzadca, editor

1. Carefully shape the entire framework, and sand it to a smooth finish with #400 sandpaper.

2. Apply a coat of clear dope to the framework where the tissue will touch. Use either Sig Lite Coat or nitrate.

3. Lightly sand the doped areas of framework with #400 sandpaper to remove "fuzz" raised by the dope.

4. Apply another coat of dope to the framework. Lightly sand again if needed.

5. Place an oversized piece of tissue over the framework. Using a brush, apply acetone to tissue where it touches the doped framework. The acetone penetrates the tissue and causes the dope to become sticky, adhering the tissue to the framework. Work from side to side. Keep the tissue snug as you go. Pull out wrinkles, and re-apply acetone if needed. Work slowly and carefully. Be patient.

Note: Be sure the tissue grain runs horizontal on wings and tail pieces. This will prevent undue sagging between ribs. You can determine grain direction by tearing the tissue. If it tears straight that's the grain direction. If it tears jagged you're going across the grain.

6. Shrink the tissue by applying rubbing alcohol or water. If necessary, pin the structure down to avoid warping as tissue shrinks.

7. Trim the tissue using a sharp razor blade. Allow a slight wrap-around at edges. Seal edges with clear dope. Give the finished piece two coats of clear dope thinned 50/50 to seal and protect it. Do not use butyrate clear dope. It shrinks badly and will cause serious warps. Sig Lite Coat is butyrate, but with plasticizer added to prevent shrinkage.

For very light wing and tail structures, I pre-shrink the tissue by laying the pieces on a framed window screen. I then spray them with water. As they dry they wrinkle, so I iron them flat with a medium-temperature iron. The tissue will still have a texture to it, but that will not affect flying quality. Once this process is complete, apply like explained above.

Wheel pants can be covered with wet tissue. Using a shallow pan of water, submerge the piece of tissue, remove and blot it with a paper towel, and apply as above. With some practice you will learn that wet tissue conforms to curved surfaces much better than dry tissue does.