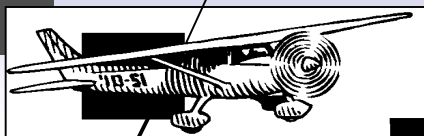


APRIL

2009



MONTHLY NEWSLETTER of the
MADISON AREA RADIO CONTROL SOCIETY
MADISON, WISCONSIN AMA CHARTER # 665

MARCS SPARKS

VOLUME 48

ISSUE 4

COME FLY WITH US...

MARCS meetings are held on the first Thursday of each month at:
MADISON LABOR TEMPLE
602-South Park St., Madison
7:00pm room #201B

Visitors are always welcome. We think we have a great 'HOBBY' and we invite you to come and see, and **CONSIDER JOINING US.**

Officers...2009:

President: **Brad Witt**.....bwitt@chorus.net
Vice Pres: **Danny Sutter**.....stodan@merr.com
Secretary: **Don Weigt**.....d_weigt@sbcglobal.net
Treasurer: **Dick Sutton**.....jdsutt@mhtc.net

Membership Information: (page-7)

Dick Sutton Phone: (608) 437-6795

Flight Instruction Coordinator:

Ozzie Johnson Phone: (608) 274-0474

Web Master:

Jeff Alexander webmaster@marcswi.org

Club Photographer:

Otto Oie ooie3@charter.net

Club Safety Officer:

Bill Brown wbrown2282@charter.net

Club Website: www.marcswi.org

(Contains links to:) About us, Flying sites, Newsletters, Calendar of events, Pictures and Videos, War Birds, Electric Flyers, other Special Interest groups, and Membership information for: **MARCS** club and **AMA**.

Newsletter Editor :

John Steen steensr@yahoo.com

Minutes of the:

MARCS General Membership meeting

March 5th, 2009

Submitted by **Don Weigt**, Secretary

The meeting was called to order at 6:17 by President **Brad Witt**, because he likes to start really, REALLY promptly. There were approximately 697 people present. All three sections of the room were needed to hold everyone.

Treasurer's Report: A printed copy of Treasurer **Dick Sutton's** report was available for viewing, at his home....

Secretary's Report: The minutes of the February meeting WERE NOT approved as published in SPARKS. The Secretary was instructed to do them over, and GET THEM RIGHT THIS TIME.

OLD BUSINESS:

Trees: **Brad** announced we have a price quote of \$3 an hour for the use of a family of beavers to chip up the trees, and also to cut down more of them.

2009 Banquet: The banquet will be April 32 at Ceasar's Palace in Las Vegas. The meal will be paid for by **MARCS**, but members must provide their own transportation. It is expected the banquet expenses will deplete the club treasury, unless the officers and Board members are really lucky at the gaming tables afterward.

NEW BUSINESS:

Field Work Day: Any money left in the Treasury will be used to begin the project of paving the entire field in May. Members

will be asked to donate funds toward completing the project this year.

Memberships: To increase membership, the Board is proposing the cost be reduced to zero. Half the budget funding will come from the Federal economic recovery plan, the other half by selling naming rights to the field. The Board feels a name such as **WalMart Madison-Kettle Field** would add a nice air of distinction.

RAFFLE WINNERS:

No raffle this month: every member present received a new DX7 radio, because there just was too much money in the treasury for Dick to keep track of it all.

SHOW AND TELL:

Harley Nelson brought in his 105% scale Grumman seaplane fire fighter. No word on what he used for power, but the plans were from a magazine picture projected onto his workshop wall from the other end of the block.

Wendell Hottman brought a 5% scale electric Gee Bee R-1 he scratchbuilt.

Dave Rush brought an even smaller Gee Bee R-1 he got as a bonus in a cereal box.

PROGRAM: The program was a preview of the annual club excursion to the Reno Air Races.

The meeting adjourned at 6:53 P.M.

APRIL FOOL! THE REAL MINUTES FOLLOW...

Minutes of the MARCS General Membership meeting, March 5, 2009

*Submitted by **Don Weigt**, Secretary*

The meeting was called to order at 7:02 P.M. by President **Brad Witt**. There were approximately 30 people present.

Treasurer's Report: A printed copy of Treasurer **Dick Sutton's** report was available for viewing.

Secretary's Report: The minutes of the February meeting were approved as published in the

MARCS SPARKS Newsletter.

OLD BUSINESS:

2008 MARCS Awards: Nomination forms for the four trophy awards were available at the front table. The awards are: **Smoking Hole** (most spectacular crash in front of many witnesses), **Submarine Commander** (going into the creek), **Tree Chopper** (getting caught in a tree or crashing into or through some), and **Scooter** (being friendly and helpful). The April 2 MARCS meeting will be the last chance to nominate people for the awards.

2009 Banquet: The banquet will be Wednesday, April 15, at the Maple Tree restaurant in McFarland. Registration slips for the banquet were available at the front table. **Dave Rush** was collecting forms and fees (\$13 per person) from those present so they didn't have to be mailed.

Trees: Ron's Tree Service charges \$150 an hour to chip. **Brad** is also asking for other bids. **Brad** asked for opinions on when to do it. The most likely dates are March 21 or March 28. Those with opinions were invited to talk with **Brad**.

2009 Rosters: **Dick** had new rosters available for everyone who wanted one.

NEW BUSINESS:

Gate Lock: **Brad** was told the lock was sticking. He talked with **Wayne Lanphear**, who replaced the lock. There is a spare lock in the landfill office, in case this one goes bad.

New Membership Category: **Brad** announced the Board's proposal that **MARCS** add a Park-Pilot membership level. Notice will be published in the next **SPARKS**, and the membership will vote on it at the April meeting.

Senior Citizen Membership? **Harley Nelson** asked when we might have a discounted membership for seniors. **Brad** explained that we can't, because we are having trouble meeting expenses as it is, and since most of us are seniors, the regular membership sort of is a senior membership already.

RAFFLE WINNERS:

No raffle this month, because this was the annual swap meet.

SHOW AND TELL:

No show and tell, because this was the annual swap meet.

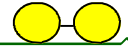
**PROGRAM:**

There was no program tonight.

Next meeting:

Will be on Thursday, April 2 at 7 P.M.

The meeting adjourned at 7:06 P.M.

ROCK & ROLL**ON A HAPPY NOTE...**

Gil Hoffman's employer, "**Mueller Implement**" has given him permission to bring the roller, (the one we had last year) and roll our field when we want, and at **NO CHARGE!** All we will have to pay for... is the fuel!

FUEL LINE PROTECTION

Hemostats are commonly used to pinch fuel lines closed before fueling. By doing this there is no chance of flooding the engine's carburetor during the fueling process. This often results, however, in a puncture to the fuel line due to the sharp teeth of the hemostat. To avoid this, use heat-shrink tubing to cover the hemostat's teeth. The heat-shrink acts as an insulator helping to protect the fuel tubing from those nasty cuts and tears.

BRODHEAD**INDOOR FLYING****Schedule and Rules**

All are Welcome. No **AMA** membership required
Every Wednesday / Start October 22

Rules are the same as last year

School-use may pre-empt gym

No PM flying on school "snow days"

Maximum weight of 6 Oz for 3D and racers and 6.5 Oz for very slow flyers and those with protected props such as the "Bug", "Mini IFO", and pushers. We will continue with all micro planes (those 3 Oz and less) flying at any time. Planes greater than 3 Oz may fly only the first ½ hour of each hour. This gives a chance for those with the tiniest planes to fly more safely.

SCHEDULE

Wednesdays pm

March 25 8:00pm~10:00pm

April, and May 13 7:00pm~10:00pm

TIP OF THE MONTH**COOLING YOUR ENGINE**

If your engine is running hotter than you would like, how can you cool it down? Most people make the mistake of thinking more is better when it comes to the air inlet at the front of the cowl. This is a common error and while it seems logical, the reverse is actually true. To properly cool your engine you need more out-let, not more inlet. You want at least 2:1... preferably 3:1 air-out to air-in ratio. Otherwise, it makes a dam and the air cannot come into the cowl because it has nowhere to go out of the cowl. If your engine is not cooling properly, try blocking off part of the air inlet or opening the belly of the cowl further. *AMA Insider*

THE BATTLE OF BRITAIN

Story by Len Deighton Summarized by Jerry Buss

Chapter-14

The morning of August 26 was one of mixed weather that made interception difficult. Kesselring's Air Fleet 2 launched attacks from across the North Sea on Fighter Command fields in the London area. One wave split for apparent attacks on Debden, to the northeast of London and on Hornchurch in London's eastern suburbs. Fearing an attack on London itself, Park scrambled seven squadrons.

The attackers had approached on a circuitous route to avoid detection and now, as they approached their targets and saw swarms of RAF fighters rising to meet them, the bomber crews were horrified to see their escorts turn for home for want of fuel. Peter Townsend, leading 85 Squadron out of Croydon, and Sammy Allard cut throttle to slow themselves down to allow more time on target as they attacked a pair of Dorniers head on.

Townsend described what it was like: "Get a bead on them right away, hold it, and never mind the streams of tracer darting overhead. Just keep on pressing on the button until you think you're going to collide - then stick hard forward. Under the shock of negative G your stomach jumps into your mouth, dust and muck jump up from the cockpit floor into your eyes, and your head cracks against the roof as you break away below."

Allard fired on his target until he saw both propellers stop and then broke away to find another Dornier directly in his path. He fired into it and saw two crewmen jump out. The pilot, wounded, spotted Rochford Airfield below and decided to crash land his disabled plane there. During his approach people on the ground watched him, fearing a bombing attack. From above, Allard was out of position and couldn't get in for a timely intercept. The bomber hit the ground hard and scraped and scratched its way all the way across the field.

A Medical Officer was one of the ground spectators and the bomber came to rest almost at his feet. He got into the plane and, with great difficulty, got the wounded pilot out and laid him on the grass. Thinking there might be others still aboard, he

looked around to see the top turret machine gun pointing straight at him and the gunner looking down the sights. The MO turned and started ministering to the wounded pilot, hoping that he might be saved by a show of good intentions. When he looked up again, the gunner was still aiming at him. He quickly ducked back and made his way along the fuselage, next to the gunner. That was when he discovered that the gunner would never fire any weapon again. As the MO looked over the wreck, he discovered what German aircrews and their ground crews were experiencing every day. The plane reeked of vomit, spilled fuel and hydraulic fluid. Blood was everywhere, spattered on the walls and running on the floor. Disks of sunlight dappled the interior of the bomber through dozens of bullet holes. The MO spent several minutes retching up his breakfast.

Meanwhile, the bombers which were now bereft of fighter protection turned for home. They hadn't been carrying any bombs, but were simply a diversion for another bomber force that was approaching the south coast from Normandy. It had been a very costly decoy effort.

The morning of August 29 was one with generally good weather, except that along the south coast there was enough cloud to serve as an impediment to interception. A small force of Heinkels and Dorniers made landfall between Beachy Head and Hastings and Park put 13 fighter squadrons in the air to deal with them. Then a mass of green blips began to appear on the ground controllers radar scopes, which on visual inspection turned out to be Emils with a further mass of BF 110s coming on behind. Immediately, Park ordered the withdrawal of his fighters. It was a trap that was intended to lure them into a fight in which they would be vastly outnumbered and he simply couldn't afford that. Thus the bombers were allowed to bomb at will. After debriefing that night, German intelligence began to conclude that the British tactics of preserving their fighter strength by fighting only battles of their own choosing was working. They were suffering heavy bomber losses, while the British fighter losses appeared to be minimal.

Theodore, "Onkel Theo," Osterkamp, the now two war ace who commanded JG 26, told

NOMINATIONs for this YEARS AWARDS

SMOKING HOLE AWARD (Best crash on the field with lots of witnesses) _____

SUBMARINE COMMANDER AWARD (Best crash in the drainage creek) _____

TREE CHOPPER AWARD (Best crash in a tree)..... _____

SCOOTER AWARD (Nice Guy or Gal)..... _____

Please fill in your choices ASAP, cut out or copy this form, and then present it to: Brad Witt or e-mail your choices to: bwitt@chorus.net

Molders and Galland that the campaign was not going well and that RAF losses and diminished strength was nothing like what Hermann Göring was telling them. He undertook to write a detailed report about the battle, but that meant he had to criticize Göring in doing so. Therefore, he gave the report to Erhardt Milch, who was delighted to get it. Milch was on a dirt gathering inspection tour of the area at the time and was enthusiastically gathering information on how the fight was going, concentrating on foul ups in supplies of fuel, spare parts and ammunition, available aircraft and morale problems. As Minister of Aviation, his days were spent visiting front line units, handing out Brazilian cigars and medals of various importance in exchange for information, hopefully critical information. When he got to KG 30, the unfortunate geschwader of Ju 88s that had been so badly beaten up on the August 15 raid from Denmark, he was especially interested in what he was told. His hatred for Ernst Udet and his pet project, the Ju 88, was reinforced with air crew complaints about tactics, the aircraft itself, poor bomb sights and defective machine guns. Oberleutnant Werner Baumbach said “Milch seemed grateful for our frank statements and said he would immediately seek a remedy. He did produce a remedy. *I Gruppe* which had borne the heat and the burden was broken up as punishment for mutiny and defeatism.”

August 30 was the day that started a series of daily battles that took Fighter Command to the brink of destruction. It started with a raid against a north bound convoy in the Thames Estuary, but this was a diversion for the main attacks along the south coast. About 10:30 a first wave of about hundred Bf 109s crossed the coast and they were followed a half hour later by forty He 111s and thirty Do 17s. By noon, Parker had committed all of his fighters to battle and the Germans continued to come on all afternoon in

wave after wave. Again Leigh-Mallory’s cooperation with Park was sadly deficient. His fighters were assigned to cover Biggin Hill, but they permitted a staffel of Ju 88s to ravage the field. Kenley, Biggin Hill, Tangmere and Shorham were hit very hard. Then the scopes at seven radar stations went blank. A chance hit to the electrical system had knocked out power and for the rest of the day much of the channel coast was blind to incoming raids. It was a mere accidental hit, but demonstrative of what could happen if a campaign were carried out against the electrical grid.

Wing Commander Tom Gleave was much too old to be flying a fighter in combat. He was 32 and even squadron commanders should be no more than 26. Besides, with his rank he shouldn’t be flying anyway, but on this day he made a mockery of such notions and showed the rest of Fighter Command a better tactic than was used heretofore. At the beginning of the war firing was done at very long range, often 500 yards or more. Experience had taught to bring that down a couple of hundred yards, but it was still long range shooting. Pilots simply couldn’t bring themselves to close on a target for fear of ramming. On August 30 Gleave got his first taste of combat and brought down four Emils on a single sortie, all inside of four minutes. But for running out of ammo, he would likely have gotten more. All of the kills were from inside 70 yards, one, in fact, inside 40 yards. Even with his light weapons, his fire, accurate and concentrated as it was at that range, proved the worth of what other pilots would learn later - get in close. His kill claims were rejected, however. It just wasn’t possible to shoot down four fighters in four minutes, but he was offered a compromise and credited with four probables. Dissatisfied, he set out that afternoon on

CONTINUED ON PAGE ~ 7 →

SERVOS... that serve you



Servos are small, electro-mechanical devices that are mounted to your RC airplane. When connected with push rods, they move control surfaces such as elevator, rudder, and ailerons.

A typical servo consists of a motor, drive gears, output shaft and arm, a circuit board, and a potentiometer. The circuit board contains a signal amplifier and comparator circuits. These items are configured as in the following:

Position + Position
Reference Output

What differentiates one servo from another?

Primarily the motor. Then the amplifier type. Inexpensive servos contain cored motors, which are incredibly common and cheap. The core, or armature, is comprised of metal plates (poles) sandwiched around a metal shaft that's supported by bearings at both ends, and each pole is wrapped with wire.

The armature spins inside a hollow center, permanent magnet that lines the inside of a metal can (the enclosure). Power is introduced to the windings, generating an electromagnetic field, which is opposed by the permanent magnet field, thus causing the armature to rotate.

More expensive servos contain coreless motors. These motors have the armature on the outside (imagine a hole saw with an arbor attached) that's very light, and rotates around the fixed permanent magnet. Because of the larger size (diameter) of the armature, a coreless motor has a higher torque rating, and the lack of poles allows the motor to center more accurately while maintaining or holding position with increased authority.

What about the amplifier?

There are two kinds of amplifiers: analog and digital.

ANALOG:

(conventional) amps interpret commands and pulse power to the motor armature at 50 cycles per second. The space between pulses is known as the dead-band. If a signal is received from the receiver or the servo arm is deflected, the amp pulses power to either move the armature or resist the opposing force. The duration of the pulse speeds up the motor (longer pulse) or slows it down (shorter pulse).

DIGITAL:

amps interpret commands and pulse power to the armature at 300 pulses per second. The increased pulse cycles command the servo motor to react and perform with more precision. This results in faster response to control command signals, lower dead-band numbers, increased holding power, and much better resolution. Also, these digital amps are microprocessor controlled, and some can be externally programmed. Center and end-point positions, speed, dead-band, rotation, failsafe, and more are programmable.

Digital seems to be the way to go. What's the downside?

In a word, cost. While there's no inherent reason why, a digital amp couldn't be incorporated in a cored motor servo, the built-in limitations of such a servo would make the benefits very small. So, multi-pole (less than 3 poles) motors or coreless motors are used, and the cost is commensurately higher. The microprocessor cost is somewhat higher too, but that's coming down as more servos come into the marketplace.

AMA insider newsletter

RUBBER BAND STORAGE

The best way to store your rubber bands that you use to secure the wing assemble to the fuselage is to store them in a Zip-Lock bag that contains a liberal amount of Talcum powder or Corn Starch. This will soak up the exhaust oils and condition the rubber and help them last much longer... One could say it will stretch their life.

MARCS

DAWN-PATROL BREAKFAST

Thursday, April 16th @ 8:30am

(e-mail notification will be sent out)

Prime Table Restaurant

4102-Monona Drive

Monona Wisconsin

BATTLE OF BRITAIN

a personal search and located all four crashes just to the south of Maidstone, all from JG 27.

On the day, the Germans had lost 36 total aircraft to 25 RAF fighters from which 15 pilots were safe. On the other hand, the Germans had discovered how to hurt Fighter Command with relentless, well timed attacks that were pressed home against air fields with determination. Great damage was done to hangars, repair shops, communications, quarters and other infrastructure. No planes were destroyed on the ground this day, but that was sheer luck which couldn't go on indefinitely. All the Luftwaffe had to do was to keep doing what they were doing.

CONTINUED NEXT ISSUE

DEPARTURE

Hal Humphrey has taken his last flight, leaving us on Tuesday March 17th, 2009. His long battle with cancer has now ended and peace was granted. Hal has been a modeler for most of his years with us and an active MARCS club member since 1978. Friends and family members are grieving at this time and arrangements are pending.

PADLOCK - 101

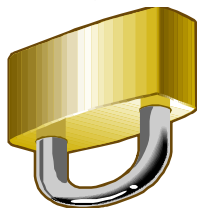
We are having reoccurring problems with our gate padlock so it's time to educate our users. When you walk away from it, please take note of its position. Never leave the base in an upward position. This allows the moisture from rain, snow, and even dew to trickle down into the works to freeze or even corrode the internal mechanism that allows us to open the lock.

Thank you

RIGHT



WRONG



TREES, BRUSH, AND TOIL

Monday and Tuesday, March 9th and 10th... Thanks to **Roger Zimmerman** for the tree cutting he did on those two days.

Friday, March 13th... Thanks to **Dave Rush** for the taking down some trees on this day and others.

Saturday, March 14th: Thanks to: **Richard Sutton, Calvin Slota, Wendell Hottmann, Bill Kinney, Tony Kremm, Todd Giesfeldt, Lindley Wolf, Chuck Backman** and whoever I missed for putting in the long hours cutting / hauling trees and brush.

Saturday, March 21st... A hearty thanks to the following members that put forth the yeoman effort in to cut / haul brush and trees. **John Granberg, Gil Hoffman, Jim Louden, Hubi Schneider, Bob Geimer, Jordon Hoffman, Lindley Wolff, Ed Buechner, Dave Rush, Wendell Hottmann, Lester Thorp, Bill Kinney, Don Weigt,** and anyone else whose name I did not get or see there.

Sunday, March 22nd: A big thanks to **Ed Buechner** and his two helpers; **Hubi Schneider** and **Lester Thorp** who were able to get most of the wood out of the ditch by using his truck and a cable.



There are plans to hit-it again on Saturday, March 28th if the weather cooperates.

By Brad Witt

M.A.R.C.S.

membership dues

- Regular membership.....\$50.00
- Junior membership.....\$20.00
- Family membership.....\$15.00
- Associate membership.....\$15.00

You must have proof of AMA membership in order to receive your MARCS membership card.

Treasure: *Dick Sutton*

If you wish to receive the club "Newsletter" by regular first class mail, rather than on the internet, please add \$5.00 to your annual fee.

2009-MARCS EVENT SCHEDULE

EVENT NAME	DATE	LOCATION
FIELD-WORK DAY	March-28	Kettle Field
MARCS Banquet	April-15	McFarland
Boy Scout Fun-Fly	June-13	Kettle Field
ELECTRIC Fun-Fly	July-11/12	Kettle Field
FLOAT Fly	August-8	Lake Waubesa
Ken Kindschi SCALE Rally	August-30	Kettle Field

Dates, additions, and further information will be updated as it becomes available.....



**DON'T FORGET...
THE TIME IS NEAR...**



MARCS ANNUAL BANQUET

DATE: Wednesday April 15th TIME: Cocktails 5:30pm Dinner 6:00pm

BUFFET MEAL

Ribs ~ Chicken ~ Popcorn Shrimp

Salad Bar ~ Casseroles ~ Potatoes ~ Deserts

Coffee ~ Milk ~ Soda

Cost: \$13.00 per person (tax and tip included)

Place: **MAPLE TREE RESTAURANT** McFarland

*Cut out and mail this handy
"RESERVATION FORM"*

MARCS BANQUET RESERVATION FORM

NAME: _____ Number of people: _____ X \$13.00= \$ _____

Please complete and mail before April 8th, 2009 Make check payable to: MARCS

Send to: **DAVE RUSH, 5113 Ridge Road, McFarland, WI. 53558**

NOTICE: Roger Zimmerman's phone number is incorrect in the new Roster. Please enter this new number: **608-249-7831** (on page-5 and page-18)

Also: (pg-5) the correct e-mail address is below phone no.

PARK-PILOT MEMBERSHIP

TO BE VOTED ON IN APRIL

REPORTED BY **BRAD WITT, MARCS PRESIDENT**

The Board of Directors has passed a motion creating a Park-Pilot membership of \$20.00 per year. The requirements for Park-Pilot membership are the same as **AMA** which refers to R/C aircraft and helicopters that weigh less than 2 pounds and fly slower than 60 mph, and flying under 200 feet of altitude. Park-Pilots must be either electric or rubber powered. Proof of **AMA** Park-Pilot membership is a requirement for our Park-Pilot membership.

At our April 2nd general meeting, this agenda item will be discussed, and then voted in accordance to Article VI-(b) and Article IX of the Bylaws. If any club member has strong feelings, one way or the other, on this subject, it is suggested you voice those opinions at this meeting.

THANK YOU

BOARD of DIRECTORS

meetings

These meetings are held on the same evening as the **MARCS** General Membership meeting, (first Thursday of the month) after its adjournment.

General Membership meeting: 7:00 / 9:00 pm

Board of Directors meeting: 9:00 / 10:00pm

Both meeting are held in room: 201-B. Club members are welcome to stay and observe the Board meeting. A Club member may have the floor by being recognized by the Chairperson. Input or opinions must be brief and to the point as the overall meeting time is limited.

AGENDA: APRIL 2, 2009

**TREE TRIMMING ~ FIELD WORK DAY
TURF-ROLLING**

SCHULTZ SPORT & HOBBY

(608) 837-3498

**R/C...Airplanes kits, ARF kits, and RTF kits
Helicopters and accessories**

Electric Gas Nitro-Fuel

Hours: 8:00~5:00

Monday ~ Friday

315-South Thompson Road, Sun Prairie, WI.

ARF ASSEMBLY

The best way to succeed with your first ARF is, before you begin assembly, **read the instructions several times** and then purchase the necessary equipment and tools you'll need to complete it. This way, it takes less time and fewer trips to the hobby shop to assemble your model.

The basic tools you'll need are: Phillips head and blade end screwdrivers, (two sizes of each) common and needle nose pliers, a power drill and various size drill bits, T-pins, cloths pins, a hobby knife, and several replacement blades.

Additional supplies required are: medium and thick CA-glue (and accelerator), two-part Epoxy, mixing sticks, and medium-grit sandpaper.

When assembling your model, be sure to have a clean work area set aside that can remained un-

used by anyone else other than you. This will actually help speed the assembly time, but on the other hand... hurrying through the process can produce its share of first-flight crashes too. Understand the functions and check all servos, control rods or cables, and the control surfaces they activate. Always set the control surfaces at the lowest movement setting for the first test flight.

Read and understand the flying instructions suggested in the instruction manual. It may give you some valuable information as to the inherent characteristics of this particular airplane, perhaps on landing... which is the most important part of any RC flight.

Keep the instruction manual in good shape and in a safe place for any future reference. A gallon size zip-lock bag works well for this job.