SILENT ELECTRIC FLYERS SAN DIEGO

PEAK CHARGE

*Dedicated to the promotion of **electric propulsion** in all types of aeromodeling.*

SSEFSD Newsletter | June 2002 | Volume XII Issue VI

CALENDAR

JuneMeeting

7:00 pm Tuesday
June 25, 2002

Automotive Museum, Balboa Park

June RAFFLE

Come to the meeting and see the goodies

San Diego County Association of Model Clubs Presents:

The Annual

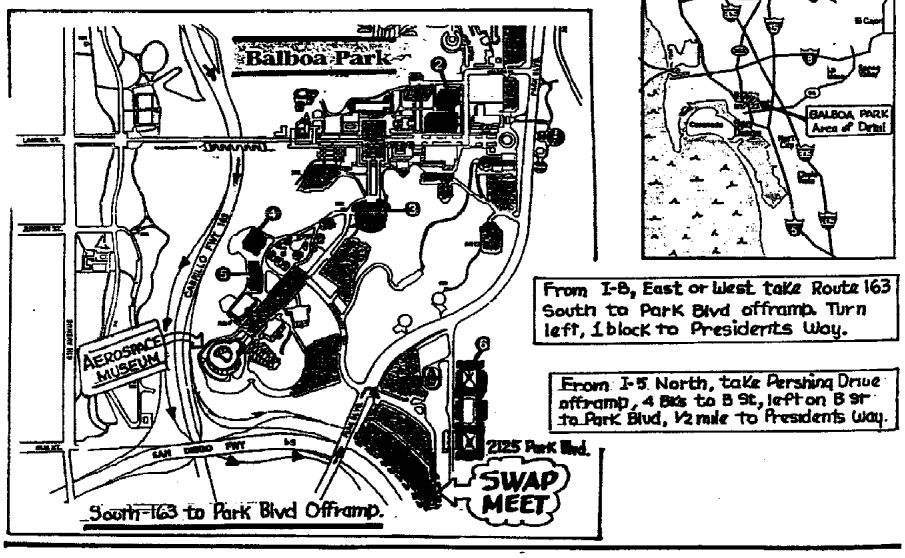
ASSOCIATION

SWAP MEET

(Our 10th Year Anniversary)

AMA **Saturday July 20, 2002**

- Site: Balboa Park, Inspiration Point Parking Lot
- Hours: 7:00 a.m. to 11:00 a.m.
- Entry gate will open at 7:00 a.m. No prior entry.
- There will be a $5.00 sellers fee to cover costs.
- For Information call: Don Madison (619) 296-1510



Silent Electric Flyers of San Diego

Club Information

Web Site: http://sefsd.org/

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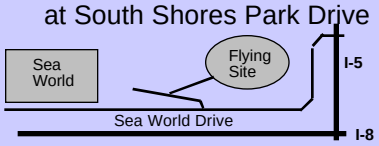

Membership or Subscription

$25 per year, $15 for subscription only. $10 for under 18 or additional family member. Mail to the Subscription Secretary: Dennis Collins, 5150 Corte Playa Catalina, San Diego, CA 92124.

Mission Statement

The objective of the Silent Electric Flyers of San Diego is to promote and further the technology of electric powered R/C aeromodeling: encourage competition in Electric Soaring, Pylon Racing, FAI-F5B/D, Scale, Old Timer, and Pattern Electric categories by hosting major Industry sponsored events and sanctioning "Fun-Fly" types of contests; provide forums for the exchange of technical information, instruction and experience; and participate in demonstrations of electric propulsion in area wide model aviation events.

PREZ SEZ

Wayne Walker never told me I had to write a clever and witty column each month!! What have I gotten myself into?!?! I've had several people approach me with tales of frequency control problems. The way I see it is like this: Either we clean up our act and use the frequency control system we have, or the club officers will initiate Draconian measures to eliminate frequency conflicts. You do not want us to do this, as it will be a real pain in the posterior for everyone. Some of these conflicts are a result of new flyers that are unaware of the process of frequency control, or there have been instances of some of our younger and less responsible pilots failing to observe frequency control protocols. It is everyone's responsibility to make certain that all flyers, especially the young and the newbies, are aware of the frequency control procedures.

If you inadvertently "shoot down" someone's airplane, you (or your parents) will be required to pay for any damage resulting from your actions. If someone is injured, AMA may not cover the incident (for negligence on your part) and you (or your parents) will be held personally liable. Some of these airplanes can be quite dangerous, so I urge you to be thoughtful every time you pick up your transmitter, whether it be at the field or at home. Make sure your transmitter is turned off before coming to the field, make sure it is turned off when you have finished your flight.

Failure to follow our simple frequency control rules will result in expulsion from the club. Don't go there.

The newsletter has been looking a little thin lately. If there are there any aspiring young (or old) writers that would like to contribute something to this publication, let Charlie White know. There is always room for opinions and comments in the newsletter. I have been toying with the idea of a column entitled "Ask Doctor Jet" wherein the readers ask questions and the Good Doctor will answer them, sometimes with a serious and legitimate answer too! Send your questions to stinkbugworks@hotmail.com and be the first one printed in this column. Any question will be answered. Good questions will get good answers. Lame questions will getÉÉÉ. Well, I think you get the idea.

Until next month, fly safe, have fun, and build a jet for Jet Day at the Bay, Part Deux!

May 2002 SEFSD Minutes

by Michal Blott

6/28/02 minutes

meeting to order 7 pm

There will be a planning session to field frequency pin ideas.

Jet Day at the bay gathered about 10-15 jets
Will keep it to about Ω day next year as there were complaints that people could not fly.
Urana Greene is the grand keeper of the videos. Submit your ideas for videos to her.

Reminder that approaching aircraft have the right of way at the approaching end of runway.

Do not remove anyone elses pin. It may result in removal from the club.
Do not leave your pin on the board if you are not flying. (exception when there are few flyers)

There will be a review of model history on the History Channel june 20th

Considering aerobatic contest 2nd weekend in August.

Steve Belknap showed new 2400 mah and 2600 mah NiHD cells weigh the same as 1300 mah and 1700 mah NiCd cells respectfully.

Glen Merritt showed some new Hitec items. Hitec donated $1000 to the club.
$60 Dual conversion 6 channel receiver 18 grams
$40 4-16 cell field charger for NiCds and NiHd.
$50 wing servo 10mm thick 49 oz torque digital version 150 oz torque
5245 Metal gear digital servo 78 oz torque

Fred showed his 100 mwatt 2.4 ghz setup he uses for in plane video. He had video to show also.

Mike Blott is the test pilot for the GWS Beaver to arrive in stores late June. Built it complete stock. Suggested using epoxy on stress points. Flies well on 6 cells.

Tim Attaway showed his B50 hacker powered Lazer 3D

Mike Morgan showed his plattenberg powered E3D by Gary Wright. Mike will cut vinyl for graphics for other flyers. He also showed a demo board he made to show the action of retracts.

Bill Knoll gave a short demonstration of the internal component of electric jets,

This article was publiched Sept 2001 by Ezone magazine.

Controlling Interest - September 2001

By **Bernard Cawley**
17-Sep-2001

This leads to this column's topic: sensorless vs. sensor-equipped brushless motor controllers - what is the difference and why might I choose one over the other.

Quick Refresher on Brushless Motors

Before we can get into that, a quick review of motor operation is in order. In any motor we use in our models, the force that turns the output shaft is magnetic repulsion between two or more permanent magnets and three or more electromagnets which are switched on and off in sequence in order to create a rotating magnetic field. In a conventional brushed motor, this switching is done by the brushes and the commutator. The motor's electromagnets are attached to the rotating output shaft. Timing is the relationship between the moment when the electromagnets on the armature are energized, and the fields of the permanent magnets. This is controlled by the physical angle between the brushes and the permanent magnets in the motor case. To change the timing, you rotate the motor end bell containing the brushes or the case containing the magnets relative to one another.
A brushless motor normally has the permanent magnets attached to the output shaft and the electromagnets fixed to the case, with the exception of the Köhler/Aeronaut Actro motors. Instead of a mechanical switch formed by the brushes and the commutator, the commutation function is performed by the electronic speed control in addition to the throttle function. With no mechanical linkage between the electromagnet switching and rotation of the rotor, there has to be some other means for the controller to "know" when to energize each of those three electromagnets to start the motor turning and keep it going in the right direction.

What are these "sensors" and why do we have them?

Until fairly recently, the only way brushless controllers "knew" the rotor's position was by using three Hall effect sensors in one end bell of the motor. A Hall effect sensor gives off a pulse of electricity as a magnetic field changes around it. A small magnet attached to the brushless motor's rotor triggers this pulse as it passes the sensor. For a more precise and detailed explanation of Hall effect sensors, go to the following link Micronas -Sensor overview.
With one of these sensor-magnet pairs for each of the electromagnets in the motor, it is possible for the rotor position to be precisely passed to the ESC and this information used by the ESC's software to energize each of the field electromagnets at the proper time and in the proper order. A typical Hall effect sensor has three leads: one for power, one for ground, and one for the sensor signal, much like a servo. Consequently, five wires are required to carry this information back to the controller, one each for the three sensors' position signals, with all three sensors tied to the same power (+ve) and ground/earth (-ve) leads. Therefore, a sensor-equipped brushless motor has eight wires running between the controller and the motor: three power leads, one for each of the three electromagnets, and five much smaller gauge wires for the Hall effect sensors.
To alter the timing of a sensor-equipped brushless motor, you simply change the physical relationship between the fixed electromagnets and the Hall effect sensors in the same way as the brush-to-field relationship in a conventional brushed motor, by physically rotating one in relationship to the other.

If you do away with the Hall effect sensors or just do not connect them, then the controller has two more tasks levied upon it. It has to figure out the rotor's position some other way than using the sensor signals, AND it has to be responsible for motor timing. To figure out the rotor's position, a sensorless controller effectively uses the one un-energized coil of the motor as the position sensor while the motor is running. It "looks" for changes in that winding while applying power to the other two windings, then when switching which windings are powered it also switches which winding it looks at for a position signal. The motor's timing also has to be calculated from this information, as there are no mechanical references like sensor positions or brush positions to use.
This means that the controller has to be more closely tailored to the characteristics of the motors it will be running, limiting its application to particular families' motors. Otherwise, it has to have some means through more software to have multiple sets of timing information and startup characteristics. However, it also means that the controller-motor combination can more easily change the timing to tailor it to the load or other running conditions. However, I do not know which, if any current controllers actually do this.
A sensorless controller must also "figure out" where the rotor is when the motor isn't turning so it will know how to start it turning! This is what leads to a little bit or sometimes more than a little bit of the prop or fan rotor wiggling back and forth when you first command a sensorless brushless controller to start its motor. It sends a small amount of current to each of the windings to induce the initial position signal. In some cases, the controller cannot figure it out at all and simply stops trying to start the motor at all.
Consequently, a sensorless controller has to have rather more complex software than one that has Hall effect sensor signals available to it, never mind a brushed motor controller which basically "just" has to switch the power to the motor off and on in varying proportions based on the incoming throttle signal from the receiver.

Sensors vs. Sensorless: Pros and Cons

So, how do you choose between the brushless controllers? First, if you have a sensorless brushless motor, which includes just about all brushless motors currently in production in Europe such as Hacker, Jeti, Kontronik, Plettenberg, as well as the little Astro Flight 010, then you have no option to choose a sensor-equipped controller. If those five little Hall effect sensor wires are not coming out of the motor, you must use a sensorless controller. The choice then becomes which one. I hope that will be the subject of a future column where I will take a comparative look at as many different types as I can get my hands on. So far, I have only sampled schulze and Jeti sensorless controllers.
However, if the motor is sensor-equipped, such as all Aveox motors that I know of, Astro Flight except the 010, MaxCim motors, and earlier Kontroniks or Plettenbergs, then the option is open.
Here are some pros and cons of the two types based on my own limited experience and input I have received from motor and controller makers, as well as modelers who are more experienced with brushless systems than I am.

Sensor-equipped controllers:

Pros:

* Instant startup under any loading conditions, from no prop to light direct drive props to big props on soft belt drives.
* Very low minimum running speeds so a low "idle" speed can be set to facilitate landings and smooth operation across the full RPM range of the motor.

Simpler software in the controller.

Cons:

* One motor per controller, increasing the cost of multi-motor installations.
* Controller from one manufacturer may or may not work properly with another manufacturer's motor.
* Potentially higher motor costs to include the sensors.
* More difficult installations as eight wires must be accommodated and the Hall effect sensor wires are often relatively fragile.
* Reversing motor rotation must be handled by provisions in the controller and may require physical retiming of the motor.

Requires a sensor-equipped motor.

Sensorless controllers:

Pros:

Motor timing is handled by controller software with no mechanical adjustments needed at the motor and may be tailored to motor and/or intended application

* Reversing rotation is done by simply exchanging any two of the three motor connections.
* Simpler installation since there is no Hall effect sensor wiring.
* Possible to run two motors from one controller. I have not tried this, but have heard of successful installations.
* Potential for lower cost motors.

Can run motors whether equipped with sensors or not.

Cons:

* Not all controllers will successfully start all motors and startup may be slow and/or rough.
* Startup also sensitive to motor load – some combinations of props/reductions won't start reliably.
* Higher minimum motor running speed may make it difficult to land a scale or sport type plane with the motor running (though this has been improving).
* More complex software.

One conclusion I draw in all of this from my non-competition minded perspective is that right now there is a bit more care required in matching brushless motors and controllers than for their brushed counterparts. It is probably impossible to know in advance whether a particular controller/motor/ gearbox/prop/cell count combination is going to work smoothly or not, especially when mixing components from different manufacturers. You CAN pretty well expect that a Jeti controller is going to run a Jeti motor, or a Kontronik controller is going to run a Kontronik motor just fine. However, start mixing them up or using sensorless controllers with sensor-equipped motors and some care is required. Controller makers are continuously improving their software so that as time goes on this becomes less of an issue.

For example, schulze has recently released new software in the future series that they call the "super high performance algorithm" or shpa. In my own limited tests there is a huge improvement in the startup smoothness of my Aveox 1114/4Y on the H-500 belt-drive in my LT-25.

By the way, this sort of combination, a big load with soft coupling to the motor, is particularly challenging for a sensorless controller to get the right feedback from the motor when attempting to start. Another challenging load, I am told, is to attempt start up with little or no load at all.
In addition, the motor must be turning at some minimum speed for a sensorless controller to be able to keep track of the motor rotors' position. This minimum speed has been too high for sport and scale models in the past. The shpa software in the latest schulze futures lowered the minimum power level at which the motor could be run a great deal from over 11% of full power to less than 2%. Now I can land the LT-25 with the prop ticking over slowly to act as a brake just as I can with a sensor-controller or a brushed motor in the airplane. With an earlier software revision, I had to shut the motor off to land the plane since 11% power was enough to keep it flying. Jeti brushless controllers have a higher minimum power level than the latest schulze futures at about 5%. However, that is low enough to allow me to land all three planes in which I have flown Jeti brushless controllers with the motor running.
Even with these concerns, I like using sensorless controllers because of their easier installation, easy motor reversing, and in the case of the Jeti controllers, their lower price. Certainly, the European market is going firmly in the sensorless controller direction, while US makers are still generally in the sensored camp.
From the sport flyer's perspective, either one can do the job very well. For now, as far as I can tell, choosing one over the other will depend as much on cost and availability as on whether they are sensor-equipped or not. The recent advent of the Jeti Phasor motors and their companion controllers has lowered the cost of a brushless system as low as or lower than a comparable quality brushed motor-controller system. However, I do not know whether the fact that these are sensorless systems has anything to do with the overall lower costs.
I also don't know whether the world-championship performance of the Hacker and Kontronik motors and schulze controllers has anything to do with their being sensorless. It certainly must not hurt, or they would be using sensored motors and controllers in those very high performance applications.
In any event, sensorless brushless controllers are clearly here to stay as a viable alternative to sensor-equipped brushless controllers. Which ever ones you use, enjoy quiet powered flying!

Used without permission.

SomeBasic Flying Rules:

1. Try to stay in the middle of the air.
2. Do not go near the edges of it.
3. The edges of the air can be recognized by the appearance of ground, buildings, sea, trees and interstellar space. It is much more difficult to fly there.

ARE WE HAVE FUN ?

SEFSD Book and Video List:
As of June 1, 2002

Book Title:
Electric Motor Handbook
Entering Electrics
Foam Wings
The Quiet Revolution

Video Title:
1994 KRC Electric Fly
1996 KRC Electric Fly
1997 KRC Electric Fly
1996 London Bridge Seaplane Classic
1996 NATS Highlights
2000 San Diego Midwinter Electrics
Advanced Kit Conversions
Airborne R/C Video (Fred Harris)
Airplane (Joe Wurts)
Airforce Top Gun
A Celebration of Eagles
Basic Construction for Beginners
Building with Foam
Byron Originals show season 1985
Desert Storm/ Tornado
Double Eagle
Electric Jet Factory
Electric Flight (Building & Flying)
Electric Flight & Schneider Cup
Electrifying the FANTASY (Vol. III)
F-16 Falcon
Float Flying – John Sullivan
Gas to Electric Conversions
Learn How to Build a Power Airplane
Let's Get Serious About Electric Flight
Mini-Max Power Gliders
Monokote I
Monokote A
Neat 2001+
Power for Performance Electric Flight
Schneider Sport Electric
T-Birds
U.S. Air Core Basic Building Tips
Vacuum Bagging tips
Warbirds over Schenectady
Wring it Out (Vol. 1)
Wring it Out (Vol. 2)

Missing Videos:
Basic Flight Training for Beginners
Cutting Foam Cores
Getting Started in Electric Flight
Polyspan Covering Instructions
QSAA Fly-In 1994 (Vol. 1)
QSAA Fly-In 1994 (Vol. 2)
RC Flying
Speedy Bee / Lazy Bee – Clancy Aviation

Members, please check your video library for these!

Listed videos are available from Uranna Greene who usually attends the club meetings and is down at the electric field either Saturday or Sunday of every weekend. Phone no.: (858) 543-4249 or email: ugreene@san.rr.com

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San Diego Electroglide
The "Former" Monthly SEFSD Contest

The Club has spoken!
For the last three months there have been no contestants for the monthly Electroglides. So it appears to me the the San Diego Electroglide is a concept whose time has past. Of course, I'm sorry to see this happen, and those of you who have participated in past Electroglides have had a lot of fun with it and are perhaps sorry to see it go.
I will still be flying my Pulsar and Systole and having a grand time enjoying what some pundits call "snoring", but I like it....and.....I still have the rules, the paperwork, and the drive to get the Electroglide going again if and when there is enough interest.
So.....if any of you want to see the Electroglide again (or possibly an Elexico event or modifications of the San Diego Electroglide) I am ready to talk about it.

Don Wemple

SEFSD c/o Charlie White
4420 Ladera Street
San Diego CA 92107

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AMA NUMBER: _____ Dues Paid _____

Date of birth _____ Date _____

Note: AMA Membership ***Required***

Flying membership $25, Newsletter only membership $15. Join after July $10. Bring to club meeting or mail with copy of AMA card and check to **Subscription Secretary: Dennis Collins, 5150 Corte Playa Catalina, San Diego, CA 92124. Do not** mail your application or subscription