

the

Ampeer

May The EFO Officers 2004

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Ampeer subscriptions are \$10 a year US & Canada and \$17 a year worldwide	The Next Meeting: Date: Saturday, May 01 Time: 10:00 a.m. Place: Midwest R/C Society 5 Mi. Rd. Field	

What's In This Issue:
E-vent Announcements - March EFO Meeting - Wire and Connectors Revisited - EasyStar RTF Update - Glow to E-Power Conversion, Don't Do It! - X-250 & T3D - Japanese Industrial Standard Screwdrivers - Upcoming Mid-Am Info - Upcoming Events

New Illinois E-Fly
From Brad Evenson eflyer201@tbc.net

May 16 Kishwaukee RC Flyers Electric Fly-In. Site: club field, DeKalb, Illinois. Brad Evenson CD, email at eflyer201@tbc.net or phone 815-522-3344 (evenings after 7pm). Rain date will be May 23rd. Open flying all day from 9 am till dark, from a beautiful 600 ft grass runway.

This is a fly-in for all electric powered aircraft. AMA license is required to fly. \$10 landing fee, lunch available on site. Due to parking arrangements, no RV's please. Sponsor: Kishwaukee RC Flyers.

Boeing Electric Fly-in
Saturday & Sunday **July 24-25**, 2004
Phantom Flyers R/C Club Field
The field is just north of St. Charles, MO, not too far west of St. Louis, MO
Flying starts at 10AM
Prize for "Best of Show"
Door Prizes
No organized competition; Just fly what you brought.
AMA required. Hold harmless signature

required.
400' paved runway plus grass runway available so you can use your bungee launcher for EDF.

Contest Directors
Brad Young (Sat.) & Dan Able (Sun.)
Email at Efly04@phantomflyersrc.com

The Electric Model Flyers of Southern Ontario Present The Ontario Electric Flight Expo

August 14th and 15th 2004
At the York Airport
York, Ontario, Canada
(near Hamilton)

Two full days of casual flying
Full size paved and grass runways
Low key, brand new contests
Evening and night flying
Catered Saturday evening dinner
Live band performing
On site camping with shelter, water, and flush toilets
Full size, vintage, aircraft display

A casual weekend of flying, friends and fun

Capital Area Soaring Association Spring Sizzle

Memorial Day Weekend—Rockville, Maryland
Saturday May 29 and Sunday May 30, 2004

The 7th Annual CASA Electric Fly In:

The Spring Sizzle is a low-key, fly anything-electric event

Open flying both days—No contests—Just fun

Everything from E-powered gliders to E-powered jets

Great raffle prizes both days

CASA's Gude Drive Flying Site:

From I-270, take Route 28 West exit (Montgomery Ave.). Turn right onto Research Blvd. Turn right onto Gude Drive. Turn left directly across from Fischer Lumber. Follow gravel road to the top of the hill. The flying site is located at 600 East Gude Drive, **Rockville, MD**

Details:

Start Time 9:00 both days

AMA Card Required to Fly

Landing Fee: \$5.00 (Includes one raffle ticket) each day

Spectators Welcome

Event Coordinator: Gary Krasicky

(gkrasicky@NOSPAMerols.com)

RVF 2004

From Chuck Benner cjbenner@tznet.com

Hello Ken

Could you please post our E-meet on the Ampere events page. I would love to see some of you Michigan flyers at our meet one of these years :~)

Thanks Chuck

RVF 2004

Our Eighth Annual River Valley Flyers Electric Fun Fly and Swap Meet. The 2004 electric fun fly will be June 11-12-13. The location is between WI Rapids and Plover WI. on Hwy W, 1 mile East of Hwy F. Camping is available on site. There is no water or electricity on site but there are Port-A-Potties. There are hotels in Wisconsin Rapids, Stevens Point and Plover, WI. There will be food concessions on hand at the meet. We will again have nighttime flying available for the pilots, this has kept the flying going at the meet till midnight Fri & Sat. Hoping to have more aircraft like last year like:

Solar powered airplanes, Ornathopters, Helicopters, Warbirds, EDF Jets, Scale, Big electric's, Gliders and

more! Two beautiful Grass runways 300' X 100". We had four Venders last year. If you would like to be a vender please contact me early so you can be assigned a vender site and can be advertised on our web site. We will have more details on our RVF club web page later. <http://www.RiverValleyFlyers.org>

Looking forward to seeing you at the RVF Electric Meet.

Chuck Benner (715)- 424-5179

cjbenner@tznet.com

River Valley Flyers

Electric Meet Coordinator

Eighth Annual Wisconsin RVF 2004 Electric Fun Fly & Swap Meet, June 11-12-13

<http://www.RiverValleyFlyers.org>

March EFO Meeting



Richard Utkan brought in the Multiplex MicroJet that he's working on. He also brought a lot of questions. It is being outfitted with a HyperSpeed 400. There was a lot of discussion about what causes reported dives on launch of this model, as reported on the Internet. It seems to have a "tuck under" effect on launch. General opinion of the members present was that it seems to be nose heavy.

Rick Sawicki brought in his just completed P-51 profile 3D type flier. It is made of Depron, which is the 6mm gray type. The kit consists of the Depron and a set of plans. It is from Flat Foam out of Florida. His plane is painted with Tamiya silver acrylic paint and has the panel lines drawn on with a Sharpie. It is powered by a GWS 350 geared 6:1 with Kokam a 1500mAh HD 3S1P LiPo pack. The average amp draw is about 4 amps for the flight of the pack. The receiver is a FMAdirect M5 and the servos are Blue

Bird from Balsa Products. Total Flying Weight 12 oz. w/battery.



Rick also shared his Freedom 3D. He said that it is perfect for electric because it is built very light. Unfortunately it may be too light in the landing gear area, so he reinforced that area. He's using a Hitec receiver with HS-85 and HS-81 servos. The motor is a Mega 22/2-/3 with a 5:1 MEC gearbox. The pack is a 10-cell GP-3000. It weighs 63 oz. ready to fly, has a 48-inch span and a wing area of 675 sq.in. It flight great. It hovers well and pulls straight up out of the hover with authority.



Wire and Connectors Revisited

Prompted by a Question from
Camille Goudeseune cog@uiuc.edu

Hi Ken,

Quoting my article on connector in the April 2004 *Ampeer* "...changing the wire and connectors can change a sort of flyable plane into a flyable plane."

I'm partial to the Graupner MG-6 connectors (6-pin gold plated, common in Graupner and Multiplex kits): low insertion force so less risk of whacking something when unplugging, and 20 amp rating is plenty for the smaller craft I fly (speed 400 and brushless, 8 to 15 amps at cruise).

I don't recall seeing any resistance numbers in Stefan Vorkoetter's article of a few months ago. Have you seen any hard numbers on the losses in various connectors? Or how would you recommend setting up an experiment—voltage drop across connector, with a microvoltmeter?

Sincerely,
Camille Goudeseune

Ken Myers' Response

Starting in 1989 and running through 1991, Mitch Poling, Bob Kopski, Ed Westbrook and I exchanged ideas on measuring motor and flight system parameters. Mitch created a motor performance predictor program in BASIC on the Mac, while Ed and I used BASIC for the Intel processor architecture to create ours.

One of the components of our programs was the wiring resistance. It included the resistance for wire length, connectors, fuse, speed control and switch.

Here is a quote from Ed Westbrook that appeared in the *Ampeer* of that time. "The wiring resistance is usually composed of a switch, fuse, the wire itself, connectors and possibly a speed control. #14 high flex wire is .0002 ohms/inch, a 30 ampere automotive fuse with spade lugs is .003 ohms, Sermos connectors are about .0004 ohms per connection, Tamiya connectors are about .0015 ohms per connections, and speed controls can range from about .0050 ohms (high rate Jomar throttle) to .0200 ohms (low cost frame rate). A toggle switch is about .0010 ohms. **Example:** wiring consisting of 18" #14 wire ($18 \times .0002 = .0036$ ohms), four Sermos connections ($4 \times .0004 = .0016$ ohms), a 30A fuse (.003 ohms), and a toggle switch (.001 ohms) will be .0092 ohms."

In his column Demystifying Electric Flight, *Sailplane & Electric Modeler*, Jan. 2000, Stephan Vorkoetter discussed Power Connectors.

He discussed resistance losses and noted, "... a 12-inch long (30 cm) piece of 14 gauge (2mm^2) wire is about 0.0025Ω . If 20A current is flowing through this wire, the loss in the wire will be $20 \times 20 \times$

0.0025, or 1W. This watt of power is dissipated by the wire as heat.”

He tested several connector types in “used” condition. For his test he passed a 5A current through the connector and measured the voltage drop. His testing yielded the following results. Remember that the results are per connection and therefore need to be doubled for pairs of connectors.

Type of Connector	Resistance per Connection Ω	Power Loss at 20A
Anderson/Sermos /LiteSpeed	0.00066	0.26W
AstroFlight		
Zero-Loss	0.00048	0.19W
Deans Ultra Plug	0.00039	0.16W
Kyosho/Tamiya	0.00652	2.61W
<i>(No, the decimal is NOT in the wrong place above. See Stefan’s comments that follow in quotes. KM)</i>		
1.2 in. (3cm) of 14 gauge wire	0.00025	0.10W

Stefan said, “When I tested these (*Kyosho/Tamiya type*), I got an extremely wide range of contact resistance results. The lowest was about 0.001 Ω , while the highest was about 0.017 Ω .”

Stefan noted several factors for their poor performance. They included; contact material that is prone to oxidation and poor contact pressure that gets worse each time the connector is disconnected and reconnected. “Eventually the pressure isn’t high enough to maintain a good connection and contact resistance increases.”

Looking for more information, I found this posted at the R/C Groups Discussion - Connectors for High Amp use – post by philmaur - Location: Melbourne, Australia

“Some tests conducted several years ago gave the following results for each connection - all plugs/sockets being new condition

- Deans ULT 0.14 mohms
- Kontronic silver 0.16 mohms
- 4mm Gold Bullet 0.32 mohms
- Sermos (Powerpole) 0.60 mohms
- 2 mm Gold Bullet 1.16 mohms
- Tamiya 2 - 3 mohms at best

I have just re-checked both the spiral and straight spring 4 mm gold bullets which gave 0.32 and 0.42 mohms respectively- still very good.

However, this is far from the whole story (I have covered some of this in an earlier thread). The Deans ULT is prone to distortion if you don't solder it

quickly and keep the red plastic cold - it can then give a contact resistance many times higher. In my experience, it will also suffer with age and use and needs to be checked / cleaned periodically - one of today's tests gave a 10mohm result for an old plug/socket which would cause heaps of trouble at 100 amps (like glowing!!)

BTW, we have seen various copies of Deans ULT in Australia - stay well clear of these for high currents - they have about six times the contact resistance, even when new

As for Gold Bullets, these probably suffer some of the same problems - the springs must be kept cool when soldering the male wire, or they will lose tension. There are quite a few different brands of GB, with different tensions, even when new.”

In that same thread, mihah from Menges, Slovenia, posted this. “My tests (mOhm) on Keithley Model 580 Micro-ohmmeter

Deans Ultra Plug -----	0.08
do 0.10	
MP Jet 3.5 mm -----	0.12
Astro Zero Loss-----	0.14
MP Jet 2.5 mm -----	0.16
Multi Contact Twisted MC 4 (4 mm) -----	0.20
Multi Contact MC 4 (4 mm) -----	0.22
Schulze pp35 oz G3.5 (3.5 mm) -----	0.26
MP Jet 1.8 mm -----	0.28
Jamara Hochstrom Stecker 50 A -----	0.30
do 0.35	
Jamara Goldkontakt 2 mm -----	0.56
Multi Contact MC 2 (2 mm) -----	0.65
MG –6 (Multiplex Hochstrom Stecker) ----	0.87
Gold Plug 4 mm (like MC4 just in electronic store) ----	3

Tamiya used -----10<”

I also wanted info on the JST/RCY connector. That is the connector used on the small Grand Wing Servo motors and often called just a JST connector or sometimes a “BEC” connector or even a “Grand Wing” connector. I found a document published by the company itself, JST, at <http://www.jst.com/cs/eRCY.pdf>. I have reprinted the pertinent data here:

- Specifications:
- Current rating: 3A AC, DC max.
 - Voltage rating: 250V AC, DC max.
 - Temperature range: -25°C to +85°C (including temperature rise in applying electrical current)
 - Contact resistance: Initial value/10m Ω max.

After environmental testing/20m Ω max.

- Insulation resistance: 500M Ω min.
- Withstanding voltage: 1,500V AC/minute
- Applicable wire: AWG #28 to #22
0.08 to 0.33mm²

I found an interesting article, originally published in FLYRC, by Jeff Raskin on the Web at http://www.flyrc.com/articles/connectors_1.shtml. It shows many connectors with recommendations for uses, but doesn't give resistance values.

The bottom line is that connectors, as well as all the other components between your battery and motor, make a significant difference in the power available to the motor. Keep the resistance low, and the power will stay up. As with all things "electric" tradeoffs are necessary, but select the "best" components you can for the "best" possible flying model.

Definitions:

Ohm: A unit of electrical resistance equal to that of a conductor in which a current of one ampere is produced by a potential of one volt across its terminals.

Milliohm: 1/1000 of an ohm

EasyStar RTF Update

By Ken Myers

In early March I had a chance to fly this plane again. I took my stopwatch to time the flights. It was a 36-degree F day with winds about 7 mph. I used the supplied 6-cell Ni-Cad 600mAh pack and got just under nine minutes of flying time. My 6-cell Sanyo 1100AAU Ni-Cad pack gave just under 20 minutes of flying. Yes, I said 20 minutes of flight with a Ni-Cad pack. These times were achieved by low-power flying with the motor on for most of the flight. There were no thermals, and very little gliding was done.

On April 10 I meet a brand-new flier at the field. He had purchase a plane from a merchant on E-bay. After flying it, with a great deal of trouble getting it trimmed, I suggested that we use the EasyStar RTF for training. I first used the supplied pack, and he got his feet wet with RC flying. We also flew out the 2 1100mAh packs that I'd charged. He'd had more than enough training for one day, and I actually spent a lot of time flying out the end of the 1100's flights.

By the end of our session he said, "I'm going to save up my money and get an EasyStar RTF. This plane make learning fun and what it should be. It is

just what I'm looking for."

Also, while I was at the Toledo RC Expo I talked with Glen Merritt of Multiplex. He told me that the supplied chargers had all been modified in-house, and that they now charge at an appropriate current for 600mAh cells for 30 minutes.

If you know someone who wants to get into this hobby, I highly recommend that you point him or her in the direction of the EasyStar RTF. It is the best couple of hundred dollars they'll ever spend at the beginning of this hobby.

Glow to E-Power Conversion – Don't Do It!

By Ken Myers

I received the following emails.

Robert Fishwick rmfish@telus.net

Hello Ken,

I was wondering if you, or any of your many contributors, had a list of Glow Engine weights. Most kits on the market today are built for glow power and if I had a "Weight" list I could subtract the weight of a sixty from this kit and subtract the weight of a forty from that kit, etc. It would be most helpful.

Robert Fishwick,
Vancouver Canada.

Wynton Tavill, Cape Town, South Africa,
wyntav@iafrica.com

Dear Ken,

Thanks a million for the incredibly informative site you obviously maintain at enormous effort from yourself.

I am particularly interested in articles pertaining to the following points:

CONVERSION of existing i/c planes to electric (modification required, what basis is it assessed on, what motor vs specs requirement - I am looking at whatever you have already available online but I saw some articles from more than 18 months back that also seem pertinent)

WHAT BASIS does one replace an i/c power set up with an equivalent electric motor?

How are electric motors rated in terms of (approximate) power so you can say that such and such a motor is bigger/more powerful than that one? Terms such as "Speed 400" vs "regular 400" or "Race 400" abound, and then other terms are also thrown in.

My Response

Converting an i/c powered plane kit or ARF to electric power is not a project for anyone who doesn't already have a background in electrically powering R/C planes. There is no direct powering conversion, for many, many reasons. I recommend that you get into electrically powered planes using the **huge** number of planes that exist today designed specifically for electric power. When you are just beginning to use electric power, use the power systems recommended by the designer/manufacture, except for the supplier Wattage, and you should have a flyable plane. Learn the basics before attempting a conversion.

When you have the knowledge of electrically powering RC planes, and you want to try a conversion, keep in mind that the power to weight ratio is directly related to the performance of a given aircraft. You should be aware that many i/c designs use added structure (weight) to simplify construction and maintain structural integrity. To see how a strong, light airframe can and should be designed, read the "old" article "Keith Shaw's Talk to the EMFSO, 1992". It is located at <http://members.aol.com/kmyersefo/page3.htm>.

Keeping this in mind, you can use sites like Tower Hobbies (<http://www.towerhobbies.com>) to get a rough estimate of the completed airframe weight by subtracting the engine, airborne radio system weight and a "little more", say 2% or 3 % from a given plane. The "little more" would include things like the fuel tank and heavy wheels often recommended with these planes.

You need experience with electric power systems for powering RC planes because there is no standard in motor naming nomenclature. While some motor manufacturers use numbers that give you some information about the motor, most just use a name, with many names "inspired" by the sales department – i.e. Turbo 450. While one of my favorite small motors, the name means absolutely nothing!

Speed 400 is a name used by Graupner, of Germany, for 380 Mabuchi motors with various winds. The manufacture voltage recommendations for the most commonly used motor versions are 4.8v, 6v and 7.2v. "Speed 400" has also evolved into a generic name for other suppliers, who may or may not be using the same motor. Adding a word like "race" generally infers a possibly higher Kv (rpm/volt) than their "standard" motor. The voltage

recommendations are not that useful as well. For example, it is not that unusual to find a recommendation to use a Speed 400 7.2v with a gear-drive and 10 cells – 12 volts.

To get the experience you need for selecting power systems, select a system that has been used in a similar plane to the one you have in mind. You can find articles in most of the world's RC magazines that tell you what was used in a given airframe and what type of performance to expect. You can also find a lot of "what works" information at <http://www.ezonemag.com> and at the RC Groups forum, <http://www.rcgroups.com/forums/index.php>.

While a bit "long in the tooth", the planes rating page at the EFO site has other useful information on "what works." <http://members.aol.com/kmyersefo/page38.htm> will get you there.

Motocalc (<http://www.motocalc.com>) and ElectriCalc (<http://www.slkelectronics.com/ecalc/>) can be useful tools, when you learn how to use them, for determining the performance of specific power systems and matching the power system to the airframe and the type of performance desired.

A very good basic motor book is the Astro Flight Motor Handbook (<http://www.astroflight.com>). While covering Astro Flight motors, the basics are the same, and apply to brushed and brushless motors.

I strongly advise that you learn as much about the growing hobby of electrically powering RC planes before even attempting a conversion for a glow plane. Once you really some research into this aspect of the hobby, you'll probably find that converting is not really an attractive option. Should the airframe you just have to have exist only as an i/c kit, use the experience you've gained to modify the airframe to make it lighter and stronger and power it to match the performance you expect.

Use the manufactures and suppliers page at the EFO Web site to lead you to some great airframes designed for electric power.

(<http://members.aol.com/kmyersefo/mfg.htm>)

If you are new to electrically powering RC planes, don't even consider starting off with a glow conversion. There are many choices for almost any type of RC aircraft available that are already designed for electric power. Don't get ahead of the "learning curve." You must crawl before you learn to walk.

E-flight Site

From: Geof geof@smoothair.ca

I was hoping to suggest my website and/or exchange links: Smooth Air <http://www.smoothair.ca>

Electric Flight Website for Electric RC Airplanes including Reviews, Articles, Videos, Discussion Forum and More.

Thanks!!!

I've added it to the EFO site
<http://members.aol.com/kmyersefo/page9.htm>

Supplier Site

From Barry Kennedy
BMKennedy@Volt-telecom.com

Ken,

Please add a link to our Web site at www.kennedycomposites.com. We carry the Graphite, Organic and AVAe electric powered sailplanes. The AVA e won the NATS and world F5J soaring events last year.

Thanks

Barry Kennedy
Kennedy Composites

X-250 & T3D

From Doc docra@modempool.com

Hello Ken;

I have received the April Ampeer in Adobe Acrobat Format. It came through just great, very readable. Thank you so very much for your so very prompt efforts. I have read it prior to sending the Thank You Note. My Momma tried to learn me more gooder, but the temptation was just too great.

As a point of (??), I have been flying a SR-X250 (really it is a small Kaos) for three plus years just as recommended by SR. Their 10-cell Nicad pack, stock 400 motor and prop have done fine in my case. The only problem that I have had is trying to hand launch the low wing airframe due to tall grass. I launched it in a swing over into a vertical down line (:-(. It was an easy repair in that only the fuselage and motor mount suffered damage.

Actually, I've found mine quite easy to hand launch grasping it just behind the wing with a couple of fingers under the center of the fuselage. KM

I had my T3D at the Mid-Am 2003 so that Tom Hunt could see it, but being unflown and with the

crosswind I passed on Saturday and could not make it back for Sunday. After many flights I now wish that I had put a servo on each aileron. The airplane was more of a prototype as Tom sent me the plans and some of the wood because the kit was NOT as yet in production. I am very glad that he did because it is one fine flying aircraft that never fails to shock the glow fuel flyers.

Thank you very much again Ken,

Doc

X-250 at <http://www.srbatteries.com>

Modelair-Tech T3D at <http://www.modelairtech.com>

Japanese Industrial Standard Screwdrivers

From Ross Jones RossWJones@Comcast.net

Ken,

Hi, I had heard of your newsletter from Joe Rubinstein, one of our growing number of members who are into electric. I'm almost there – and with some twin projects I have in mind over the next 18 months, they may be suited for electric.

At any rate, the reason I am writing now is to introduce a product you may be interested in. Japanese Industrial Standard (JIS) screwdrivers. If you ever wondered why your Phillips driver didn't 'quite' fit some 'phillips' screws, it is invariably because your fastener doesn't follow the ANSI Phillips standard – but follows the JIS standard. I know – it's always something!

I would like to advertise in your newsletter if at all possible.

On RC Universe, I offer them for \$16.00 per set of four SHIPPED.

Best Personal Regards,
Ross D. Wegryn-Jones
RJR Machine Tools, LLC
6028 Meadowgreene Drive
Waterford, MI 48327
Ph/Fx (877) 230-2085
RJRMachineTools@Net-Link.Net
www.RJRMachineTools.com

Okay folks, you now know a good place to get these handy tools. KM

Upcoming Mid-Am Info

Flyer: <http://members.aol.com/kmyersefo/flyer-04.pdf>

Hotels & Map:

<http://members.aol.com/kmyersefo/hotel-04.pdf>

Upcoming E-vents

May 16 Kishwaukee RC Flyers Electric Fly-In. Site: club field, DeKalb, Illinois. Brad Evenson CD, email at eflyer201@tbc.net or phone 815-522-3344 (evenings after 7pm). Rain date will be May 23rd. Open flying all day from 9am till dark, from a beautiful 600ft grass runway. This is a fly-in for all electric powered aircraft. \$10 landing fee, lunch available on site. Due to parking arrangements, no RV's please. Sponsor: Kishwaukee RC Flyers.

May 29-30 CASA "Spring Sizzle," Rockville, MD, USA This is the East Coast's Season Starting E-Fly, a no-contest, two-day event. CASA Sizzle Event Coordinator is Gary Krasicky. They have a website (<http://users.rcn.com/gkrasicky>) that has Gary's email address (gkrasicky@erols.com) listed.

June 11-12-13 Eighth Annual River Valley Flyers Electric Fun Fly and Swap Meet. The location is between WI Rapids and Plover WI. on Hwy W, 1 mile

East of Hwy F. Camping is available on site. Web site <http://www.RiverValleyFlyers.org> Chuck Benner (715)- 424-5179 cjbemmer@tznnet.com

June 17-20, 2004 Southeast Electric Flight Festival 2004 - Flying from sunrise to dark and beyond if you have lights, Here's a link to the event website. www.koolflightsystems.com/seff.htm

June 19 Burlington County RC Club Electric Meet, contact: Bob Afflerback, 123 Harrinton Cr., Willingboro, NJ 08046 - phone: 609.871.8777, Low-key, friendly gathering established in the late 1980's.

July 10 – 11 Mid-Am in Michigan see info in this issue

July 17 Jersey Coast Sport Fliers Electric Fly-in, contact Rob Kallok - rob.kollok@comcast.net, large grass strip at Dorbrook Par in Colts Neck, New Jersey - July 18 is rain date - details at jcsportfliers.org



The Ampeer/Ken Myers

1911 Bradshaw Ct.

Walled Lake, MI 48390

<http://members.aol.com/kmyersefo>

The Next Meeting:

Date: Saturday, May 01 **Time:** 10:00 a.m.

Place: Midwest R/C Society 5 Mi. Rd. Field

Everyone interested is welcome

Must have AMA CARD WITH YOU TO FLY!