the Ampeer

March 1999 Page 1

The EFO Officers:

President:
Ken Myers
1911 Bradshaw Ct.
Walled Lake, MI 48390
phone: (248) 669-8124

Vice-President:
Richard Utkan
240 Cabinet
Milford, MI 48381
phone: (248) 685-1705

Secretary/Treasurer:
Debbie McNeely
4733 Crows Nest Ct.
Brighton, MI 48116
phone: (810) 220-2297

Board of Directors:
Jim McNeely
4733 Crows Nest Ct.
Brighton, MI 48116
phone: (810) 220-2297

Board of Directors:
Jeff Hauser
18200 Rosetta
Eastpointe, MI 48021
phone: (810) 772-2499

Ampeer Editor:
Ken Myers
1911 Bradshaw Ct.
Walled Lake, MI 48390
phone: (248) 669-8124

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The Next Meeting:
Date: Thursday, March 4 Time: 7:30
Place: Dublin Community Center on Union Lake Rd.

What's In This Issue:

Gearing Up For Spring

It is time to gear up for spring, and this issue features articles on gearing and motors. Hope you all enjoy it. Think spring! Ken

Astro Flights Gear Boxes

The Astro Flight gear boxes can't be beaten for durability and quality. There only drawback is the limited number of gear ratios, but with the introduction of the Astro Flight Super Box and the 11– and 13-tooth pinions for the 035 through 15, a wider range of gearing is possible. Bob has also reworked the "standard" box, making it firewall mountable, like the Super Box.

There is also a new planetary gearbox for the 035, so the "range" is getting wider. It appears that the planetary box is available in 3:1 and 4.4:1

ratios. These will also fit the Kyosho Magnetic Mayhem, a very popular ferrite motor. The standard and Super Boxes will work we ll on the Magnetic Mayhem reverse.

Once again, here are the ranges for the Astro Flight "standard" and Super Boxes.
31/13 = 2.38 this is std gear box
31/11 = 2.82 std gear box with optional 11T pinion
48/13 = 3.69 super box with optional 13 tooth pinion
48/11 = 4.36 this is std super box set up

Because these boxes work on the AF035, there are 1/8" bore pinions available to use on the popular Speed 500/600 motors and Kyosho motors. Using the 5/32" bore pinions, these same boxes are used with the AF05 and AF15.

Astro Flight also lets you control the

power to these geared motors. The AF217D is an excellent value for up to 16 cells. It is optically isolated and requires a Rx pack. Bob has also come out with a reasonably priced BEC (battery eliminator circuit) model called the AF215D. Its features are:

1. Surface mount for minimum size and weight.
2. Synchronous rectifier circuit for top efficiency.
3. BEC circuit eliminates need for separate receiver nicad.
4. Four MOSFET brake circuit for folding props.
5. Four SY4410 MOSFETS handle 30 amps continously.
6. Four SY4410 MOSFETS handle 40 amps for 30 second climb.
7. 8 bit Micro processor control needs no adjustments.
8. High rate 2800 hz switching frequency for best efficiency.
8. Weighs only 1/4 ounce and is 1.4 x 0.80 x 0.15 inches.

All Astro Flight products are available directly from;

Astro Flight Inc.
13311 Beach Ave.
Marina Del Rey, CA 90292
Phone: (310) 821-6242 Fax: (310) 822-6637
E-mail: info@astroflight.com
Web site: http://www.astroflight.com
Or
New Creations R/C (Kirk Massey**)**,
P.O. Box 496, Willis, TX 77378 (409) 856 - 4630
Web site: http://www.newcreations-rc.com
Or
Your favorite hobby shop or mail order supplier.

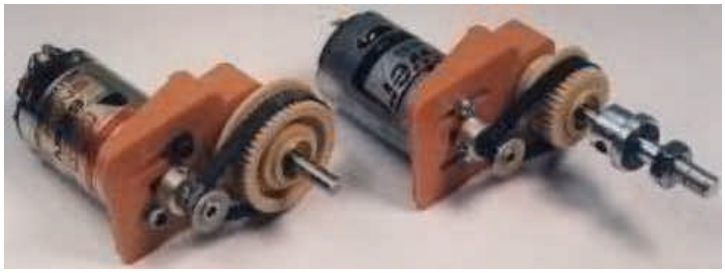
Sometimes Getting Bealted Can Be Fun!

Another very good way to "gear" is to use a belt system. From my Goldberg Eaglet 50 to Keith Shaw's huge Bearcat, belts can provide an excellent solution to getting more from less. Even though belts tend to be heavier than an equivalent gearbox, they are quiet and useful. Km

Modelair-Tech's Great Units

Tom Hunt has designed these rugged units with some really great features. His belt-drives come in four sizes to power models up to 2000 sq. in. in wing area and ranging in weight from 1 to 25 lbs. They come in many ratios and are very easy to assemble and use. They accept a HUGE variety of motors and do not require re-timing of "fixed" motors. Another advantage of belt-drives is that they don't damage as easily from foreign matter lodging in them. They feature a modular design for easy repair, when necessary. They beam mount easily. Here are the specs;

H-100 for up to 100 Watts
Available ratios: 2.57, 3.0, 3.27, 3.6:1 (low range)



3.43, 4.0, 4.36, 4.8:1 (high range)
Weight without motor 1.75 ounces
Used for Speed 400 motors (and clones) and the Kyosho AP-29 (and clones) or Speed 480
The ratios can be changed within the "range" by just swapping motor pulleys.

H-500 MK II for up to 500 Watts
Available ratios: 2.4, 2.57, 2.77, 3.0, 3.27, 3.6:1

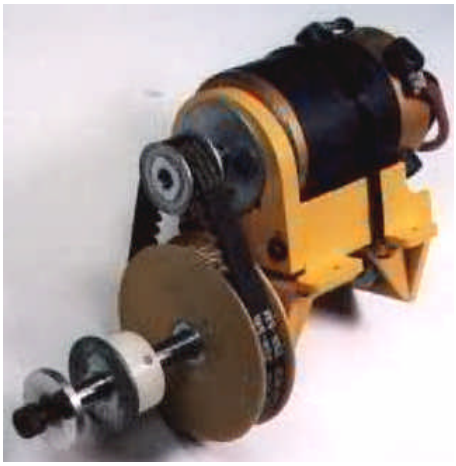
Weight without motor 2.75 ounces
It will fit many of the smaller high voltage electric motors like Speed 500/600's, Astro 035/05/15, SR Max7 and Max10, Aveox 14xx brushless motors, Ultra motors, Kyosho Magnetic Mayhem and the Tower Goldfire.
It is designed to fly 4-5 ft. wingspan models in the 4 to 6 lb. Range with 400-700 sq.in. This is what I'm using in my Goldberg Eaglet 50.

H-1000 MK III for up to 1000 Watts
Available ratios: 2.57, 3.0, 3.6:1
Weight without motor 6.0 ounces

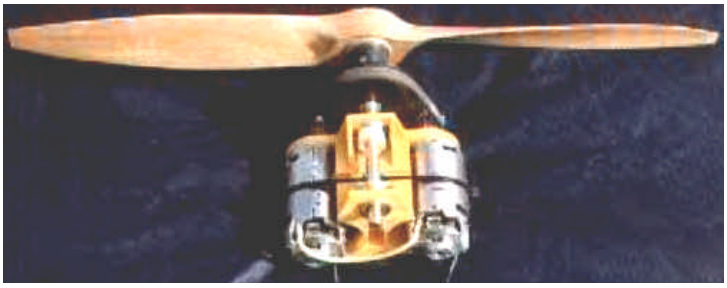
Tom designed this one to accommodate many of the intermediate electric motors like the Speed 700's, Astro

25/40, Aveox 14xx brushless motors, Ultra motors and Dewalt motors. Like the H-500, it will fly 5-7 ft span but with weights ranging from 6 to 12 lbs. and wing areas from 600-1300 sq.in. These easily fly sport and scale models in the glow 40 size and large r range.

H-1500 for up to 1500 Watts



Available ratios: 2.0 to 3.0/1
Weight without motor 9-10 ounces (depending on ratio)
It is designed to accommodate the Astro 60/90 and Aveox 18xx brushless motors. Its purpose is to fly 7-10 foot span models in the 12 to 24 lb. weight class and with wing areas of, 1400 -2000 sq.in.

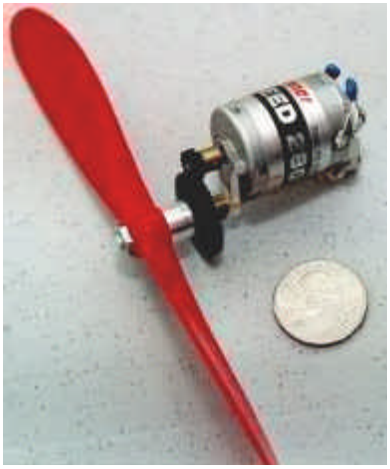


H-1000DP MK II for 1000+ Watts
Available ratios: 2.86, 3.08, 3.33, 3.6:1
Designed to accommodate twin Dewalts or Astro Flight 25s or 40s for flying 1/4 scale and larger models. It will fly 14 to 20 lb. models with wing areas of 1300 -2000 sq. in. It can swing 18 to 24 in. props.

Tom also has some small gear-drives and gear-drive motor combinations.

The **MGB-50** is a small model, motor/gearbox combination for up to 50 watts. The motor is available

in 9.6v and 7.2v versions. The motor/gearbox combo is for use with 7 to 10 cells. Props can range from 9 to12 inches in diameter. It has a 2.14:1 gearbox. The gearbox is available separately (GB-50) for any 2.3 mm shaft 400 class motor with steel pinion and spur gear. The output shaft is 1/8 inch diameter and is replaceable. It is for models from 250 to 400 sq.in. and weights between 16 and 24 ounces.



Tom imports the **GearDrive 280** from Titanic Airlines. It is for **SLOW FLYERS** and converting some of the larger rubber powered models to R/C. The ratio is 2:1 or 3:1 with the 3:1 being preferred in most applications. It uses 6 to 8 cells small cells and is complete with gearbox, Graupner Speed 280 motor, capacitors, prop adapter and 7 x 6 prop. Recommended us is for models in the 10 to 14 ounce weight range.

You might also want to control some of these systems with the Tarling ESCs (electronic speed control), which are available from Tom. The Tarling controllers are produced by Gordon Tarling, editor of UFUK (Electric Flight UK), the great newsletter of BEFA, the British Electric Flight Association.

Pictured is the Micro-Star 10. Here are the specs on the controllers that Tom carries;

Tarling Micro-Star 10 BEC ESC is a very good "400" sized, high frequency speed controller with BEC but no

brake. It is rated for 6 to 10 cells and 10 amps max continuous draw. No adjustments are required. The weight is only 10 grams (without leads).

Tarling Micro-Star 20 BEC ESC is similar to the Micro-Star 10 but it has a soft brake. It is rated for 6 to 8 cells and 20 amps maximum continuous draw. It weighs only 13 grams (without leads).

Tarling Micro-Star 40HV uses an automatically adjusted Micro-processor and is a high frequency ESC with softstart for 6-30 cells and up to 40 amps. It has no BEC or brake.

To measure the current draw of your new system for choosing the appropriate prop, you might want to give the **Kowalski Shunt** a try. It is an in-line heavy gage wire "resister" with Sermos connectors for measuring current in conjunction with a digital voltmeter. A millivolt scale required on DVM. This 1 mV per amp resister is accurate. It is also available with Astro Flight connectors.

MODELAIR-TECH
P.O. Box 1467
Lake Grove, N.Y. 11755-0867
Phone and Fax: 516-981-0372
E-Mail: modelairtech@rc-aero.com
Web site: http://www.modelairtech.com

Most Modelair-Tech products are also available through **New Creations R/C**

For ***Continental Europe*** and British Isle sales, please contact Gordon Tarling at gtarling@ndirect.co.uk.

For ***Australian sales***, please contact Ritzy Flying Machines, P.O. Box 161, Mount Evelyn, Victoria, 3796, E-Mail Ritzi@corplink.com.au or phone (03) 9736 2399.

All other parts of the globe may buy direct from Modelair-Tech.

Modelair-Tech accepts credit cards!

A Plethora of Choices

Hobby Lobby International, Inc. of Brentwood, TN has been at this electric thing for a LONG, LONG time and carries A LOT of gearing units and units with motors attached. It is an excellent idea to contact Hobby Lobby International, Inc. and get their latest catalog. Km

With so many choices, I've not included photos but here are the specs on the current lineup from HL.

Speed 400

Graupner Speed Gear 4:1 with either the S400 6v or 7.2v wt of gearbox 0.9 oz.
Mini Olympus belt drive 2.3:1
1700 Series Speed 400 6v with:
1.5:1, 1.85:1 and 2.33:1 ratios, only the 1.85:1 and 2.33:1 are available separately
Jastron 6:1w/Speed 400 7.2v
Ludwig CNC single axis gearboxes:
4:1, 5.25:1, 5.9:1 wt. 1.25 oz.
7.2v Race 400 with gear drives (drives not available separately), 1.86:1, 2.33:1, 3:1
1.72:1 Titanium Gearbox 1.2 oz.
2.6:1 Titanium Gearbox 1.2 oz.

Speed 480/Kyosho AP-29

Speed Gear 480 3.34:1 with Speed 480 race 7.2v
1.72:1 Titanium Gearbox 1.2 oz.

Strontium 150 or Ultra 920's

2:1 Titanium 2.5 oz., 5mm pinion
2:1 Inner-driven gearbox 2.5 oz.

Speed 500/600, AF035 or other "05" ferrite motors with 1/8" Shafts

Graupner 6:1
Olympus Belt –drive, 2.3:1
Speed Gear 2.8:1 with Speed 500 race 7.2 (7 oz.) or Speed 600BB 8.4v (8 oz.) or separately (1 oz.).
2:1 Inner-driven gearbox 2.5 oz.
6:1 axial gearbox with "05" motor
600 FG3 Motor and gear drive 3:1, gearbox available separately
1.72:1 Titanium Gearbox 1.2 oz.
Master Airscrew, 2.47:1, 2.93:1, 3.54:1 about 1 oz.
Anthem Twin Gearbox 2.1:1 for two motors
Kruse 2:1, and 2.4:1 2.25 oz.

Speed 700

2:1 Titanium gearbox 2.5 oz.
Power Gear 2:1 belt drive
Speed Gearbox 700 2.7:1 (not for BB versions of the 700)

Astro Flight 05/15

2:1 Titanium gearbox 2.5 oz.

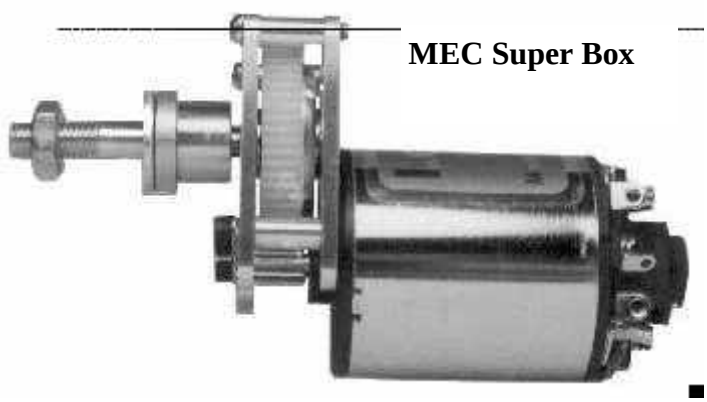
Astro Flight 25/40

2:1 Titanium gearbox 2.5 oz.

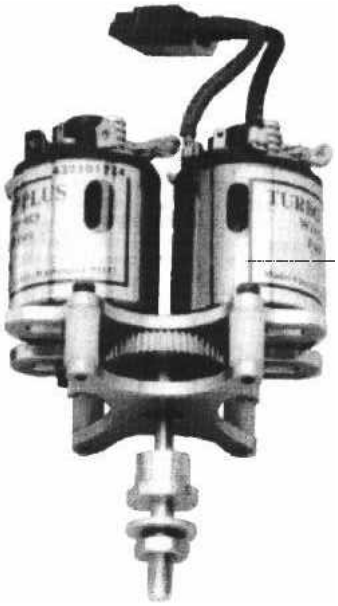
While you are checking with Hobby Lobby, you might want to check out the full line of Jeti ESCs, with 12 different versions listed in the latest catalog.

Hobby Lobby International, Inc.
5614 Franklin Pike Circle - Brentwood, TN 37027 USA
Phone: (615) 373-1444
Email: 74164.2423@compuserve.com
Web site: http://www.hobby-lobby.com (be sure to put in the – or you'll end up on the wrong site!)

Talk About Versatile!



MEC Super Box



Pete Peterson has been making his Super Box for a long time now. It offers more ratios than any other box I know of. With the addition of the Monster Box, Dual Box and Nearly-In-Line boxes there is a super-wide range of ratios available. All of the parts for the Super Box, Dual Box and Monster Box are interchangeable with the each other, except for the front and back plates. The pinions are 1/8" bore and therefore fit all the S500/600, Magnetic Mayhems, AF035, Goldfire and any other with 1/8" shaft. I'll not list the available ratios, but you can figure them out from the following. Pinion teeth – 10, 12, 13, 14, 15, 16, 18,20, 24 and 26 – Spur teeth 40, 50, 50. Remember these can be used on ALL of the boxes!

The Nearly-In-Line has only one ratio, 4:1.

There is a PIL Minibox (planetary) for the AP-29/ Speed 480 with a 4.5:1 ratio.

To compliment his boxes, he has the Turbo 10 motors, as well as the brushless 10/20 motor, as well as two versions of the AP-29, the Turbo 29BB and the Turbo 29 Plus.

Pete also offers two controllers for brushed motors; **MX-50** 1.6 oz., 33 amps continuous, 7-24 cells or 7 – 14 cells when using the built-in BEC, which can be disabled for the higher cell counts.
MX-80 1.7 oz., 44 amps continuous, 7-24 cells or 7 – 14 cells when using the built-in BEC, which can be disabled for the higher cell counts.

Tom Cimato uses many of the Super Boxes on his fantastic brushless motor, the MaxCim Nano-15.

Model Electronics Corp.
14550 20th Ave. N.E.
Seattle, WA 98155
Phone: (206) 440-5772 Fax: (206) 440-5905
Web site: http://rc-aero.com/biz/mec

MEC products are also available from New Creations R/C.

Using a 3.7:1 Planetary To Fullest Potential!

Dave and Matt at Aveox have settled on a one-size ratio fits all approach. Because the wonderful Aveox brushless motors come in many different sizes and winds, selecting the right motor for a 3.7:1 gearbox is no problem. These robbe boxes can also be used on S400, 1/4" and 5mm shaft motors.

The #4173 8-10 V Planetary geared "400" motor, #4174 10-12V Planetary Geared "400" motor, and 4185 8.4V Planetary geared '400' motor have a 3.7:1 gearbox with robbe S400-type motor attached. They also have two other 3.7:1 gearboxes for the larger motors with 1/8" or 5mm shafts.

The #4196 robbe 3.7:1 Planeta Gearboxe (Nylon) requires motor with 1/8" shaft, while the #4197 robbe 3.7:1 Planeta Gearboxe (Metal) requires a motor with 5mm shaft.

Aveox Inc., 31324 Via Colinas, Suite 103 Westlake Village, Ca 91362
Phone 818.597.8915 or Fax 818.597.0617
Web site: http://www.aveox.com

One Stop Shopping

Kirk Massey's New Creations R/C has been years in the making. Kirk entered the hobby, saw a need for modifying the famous Astro Flight motors. He started selling stock and modified AF motors and part, and then more items, and more and more. Today New Creations R/C is one of the best known suppliers for ALL electric flight supplies. Besides the Modelair-tech, Model Electronics and Astro Flight drives already mentioned, Kirk also carries;

Amp Air: Gear Box 2.1:1 , 2.5:1, 3.0:1, 3.66:1
Hobby Lobby: Single Axis Gear For 400, 5.9:1, 5.25:1, 4:1
2:1 Gear Drive, 5mm Shaft
2.4:1 Gear Drive, 5mm Shaft
HL Titanium 1.72:1Titanium GearBox for 500-600
1.72:1Titanium GearBox for 400
2.6:1Titanium GearBox for S400 27.80
1.8:1Titanium GearBox for AP-29
2:1 Titanium Gear Boxes for Speed 700's
2:1 Titanium Gear Boxes for Astro 05, 15
2:1 Titanium Gear Boxes for Astro 25, 40
Graupner: 2.3:1 Gear Box, 1.85:1 Gear Box, 2.8:1 Inline Gear Box for 500-600, 6:1 Gear Box, 6:1,w/ Adapter and 7.2v Speed motors, 6:1,w/ Adapter and 6.0v, 3:1 Gear Box
Olympus Belt-drive: 2.3: 1
Leisure:
Gear Box Short 2.5:1, 3.0:1, 3.6:1, 3.8:1
Gear Box Long 2.5:1, 3.0:1, 3.6:1,3.8:1
Gear Box Radial 2.5:1, 3.0:1, 3.8:1
Master Airscrew: 2.5:1 (2.47), 3.0:1 (2.93:1), 3.5:1 (3.54)

Kirk carries many brands of ESCs including his own house brand. To find out how to control that power to your new geared unit, call Kirk for a catalog or visit his web site.

NEW CREATIONS R/C
P.O. Box 496
Willis, TX 77378
Phone & FAX (409) 856-4630
Web site: http://www.newcreations-rc.com

Distributors, We Need Your Help

If you are a supplier of gear-drives or belt-drives, it would be a good idea to note the gear ratio in your advertisements. **Dymond Model Sport USA LTD.**, 500 Court Street , Park Falls,Wi 54552, 1-715-762-2710 or Fax: 1-715-762-2542 http://www.rc-dymond.com/ has some nice looking gearboxes, but there are no ratios listed.

Critter Bits / Multiplex USA, 14751 Calvert Street Van Nuys, California Phone: (818) 785-2401 or Fax (818) 785-3946 http://www.critterbits.com/ has gearboxes in the following ratios; 2.16:1, 2.33:1, 2.53:1, 3.00:1, and 3.28:1. Unfortunately, what motors they are used on isn't available. Since this company is noted for its S400-type planes, I thought that maybe they were for the S400-type motors, but by doing a little digging, it looks like 1/8" shaft motors are what it is designed for, as there are pictures of it mated with a 540 motor.

Using the Gearing Information
By Ken Myers

With all of the various motor and gearing combinations available to the modeler, how do you know what to use for what?

Follow In the Steps of Those Who've Gone Before

The easiest and highly recommended way to learn what motor/gearing/prop to use is to follow what has been shown successful by others for a similar application. The modeling magazines, electric newsletters and electric web sites are full of information on projects that work, from the tiny to the HUGE!

Follow Some General Rules of Thumb (RoT)

For years, many e-modelers have given us some great general rules of thumb to follow. Several of these are available on many of the eflight web sites and reappear again and again in the modeling press and electric flight newsletters.

Here are the ones that **I** have adopted. You should note that these general rules of thumb are not for specialized planes like old-timers, slow-flyers, low and high performance gliders, helicopters, biplanes or electric ducted fans (EDFs). These general rules of thumb apply to single and multi-motored aircraft that fly like and with the known glow model standard aircraft. They also reflect my "average" flying ability and aging vision and reflexes.

When starting a project **I**...

1.) **I** figure the acceptable wing loading.

a.) For planes under 288 sq.in. 16 – 19 oz./sq.ft. seems to be okay, but the closer to 16 oz./sq.ft or less for direct drive motors, the better for me, while towards the 19 oz./sq.ft for geared applications seems okay towards the 288 sq.in. area, since this is where gearing would be used.

b.) For planes with 288 sq.in. (2 sq.ft.) or more of wing area, a **good maximum wing loading appears to be the square root of the wing area**.

When doing a glow conversion, without extensive modification, using the square root method should give a realistic target weight as well.

I've also found that 80% of the square root of the wing area can give a good target wing loading estimate for a purpose built electric.

Note that there are three different things mentioned here; maximum wing loading, and target loadings for conversions and purpose built planes. The wing loading determines the final flying weight of the plane. The maximum wing loading and conversion target wing loading seem to be about the same. If you are converting a glow kit, without extensive modifications, use the square root equation for estimating the final weight of your plane. If you follow Keith Shaw's suggestions on building light, strong structures, the 80% of the square root formula should make a good prediction for you. (*This is a new RoT that I've recently come up with. Let me know what you think. Km*)

Example 1: *TigerShark* (purpose built electric) SQRT (square root) of 480 sq.in. = 21.9 oz./sq.ft. * 0.8 = 17.5 oz./sq.ft. – target weight = 17.5 oz. x 3.33 sq.ft. = 58.3 oz. (*The actual TS came out to 17.4 oz./sq.ft. with the real weight being 58 oz. but it should be just fine at 22 oz./sq.ft. as well. Km*)

Example 2: *Goldberg Eaglet 50* SQRT of 432 = 21 oz./sq.ft. – conversion target weight = 21 oz./sq.ft * 3 sq. ft. = 63 oz. (*The actual weight is 62 oz. It flies fine, like its glow-powered trainer counterpart. Km*)

2.) **I** figure out the required power. Keith Shaw has recommended 50 – 70 watts per pound input power for these types of planes. This yields a range of usable input power.

Example 1: *TigerShark* target wt. 58.3 oz. or 3.64 lbs. The lower end input power = 50 watts * 3.64 lbs. = 182 watts while 70 watts per pound = 255 watts.

Example 2: *Goldberg Eaglet 50* target wt. 63 oz. or 3.94 lbs., input watt range 197 to 276 watts.

3.) **I** figure out what "size" motor to use by setting the what I call "take off power" (TOP). Later, I also use a maximum amp draw, which is my don't go over static draw (MSD) for <u>motor longevity</u> and the <u>length of flight</u> I like from today's ni-cads.

a.) S400 type motor at 10 amps (TOP) 11 amps (MSD)

b.) AP-29/Speed 480 motor at 16 amps (TOP) 18 amps (MSD)

c.) Speed 500 or larger motor at 25 amps (TOP) 28 amps (MSD)

It must be remembered that the TOP provides what I like to call "take off power" and is reduced in flight with an ESC and prop unloading to get decently long flights.

Since both planes fall in the same "range", I'll use 180 watts input at the low end and 275 watts input at the upper end for both examples. To find the following numbers, divided the "needed watts" by the TOP amps.

a.) 10 amps – 18 to 28 cells

b.) 16 amps – 12 to 17 cells

c.) 25 amps – 8 to 11 cells

4.) **I** figure the maximum weight of the power system

Using the rule of thumb that the power system should be about 50% of the weight. With a maximum weight of 63 oz., the power system could weigh up to 1/2 of that, or 31.5 oz.

5.) **I** figure how figure out which cells to use.

I do not use 500AR cells, unless I really want to do the plane and can't get the weight down any other way. An example would be a Speed 400 racer. 28 800AR cells for use with a Speed 400 motor would weigh 34 ounces, which is too heavy.

18 800ARs would weigh about 22 oz. and would work with the AP-29/S480 motor type because the amp draw would be low enough to have a decent flight time, but the motor terminal voltage would be very high and that would mean that a very high gear ratio would have to be used. Remember that the more cells that are used on these little motors, the higher the gear ratio must be.

Eleven RC-2000s would be about 23 ounces, leaving about 8.4 ounces for the motor. This is doable, but limits the range of motors and gearing combinations a bit. It will be "fun" to investigate this in the future!

I chose ten RC-2000s, as it is close to the maximum number of cells and would weigh about 21 oz. leaving about 10 ounces for the motor and gearing. (*For the Eaglet 50 the Magnetic Mayhem with the Modelair-Tech belt-drive was chosen and weighs 9.75 ounces. The TS uses the AF035 and with gearing weighs 8 ounces. Km*)

I now know that the power system could use 11 cells, while I chose 10. I know that with an 8 oz. motor or motor/gearing combo 11 cells would be possible, while with 10 cells, I can use a motor or motor/gearing comb

weighing about 10 ounces.

6.) **I** figure out the desired prop diameter using the formula: Diameter = (SQRT(plane wt. in oz. * 1. 25) / Pi)) * 2

This gives a good starting point, but sometimes has to be modified for ground clearance.

I also figure the minimum prop diameter, that I would use as; Diameter = (SQRT(plane wt. in oz.) / Pi)) * 2

Using 63 ounces as the weight:

Desired = 63 x 1.25 = 78.75; 78.75 / Pi = 25.066904; SQRT 25.0066904 = 5.0066859 * 2 = 10.013372 or 10 inches.

Smallest = 63 / Pi = 20.05352 SQRT 20.05352 = 4.478116 * 2 = 8.956232 or 9 inches.

7.) **I** figure the prop pitch using 75% of the diameter, which has proven to be good for this application. While draggy planes can use 50% of the diameter and racing planes 80%, 90% or even higher, the 75% figure seems to be a good starting point for most planes.

10-inch prop = 10 * 0.75 or 7.5 inches (*Here a judgment call must be made as a 10 x 7.5 is not too common of a prop. Both the 10 x 7 and 10 x 8 can be tried. Km*) For this example I'll use the 7 inch pitch.

9-inch prop = 9 * .075 = 6.75 or 7 inches

8.) **I** figure the stall speed. First I calculate the stall speed using Stall Speed = 3.7 * SQRT of the wing loading.

Example 1: *TigerShark;* SQRT of 17.5 oz./sq.ft = 4.18 * 3.7 = 15.5 mph

Example 2: *Goldberg Eaglet 50;* SQRT of 21 oz./ sq.ft. = 4.58 * 3.7 = 16.95 mph

9.) **I** figure the required mph. Keith Shaw has stated that good aerobatics range from 3 times the stall speed for nice loops and low power maneuvers to 4 times the stall speed or better for some of the really exciting stuff.

Example 1: *TigerShark;* 15.5 mph * 3 = 46.5 mph to 62 mph

Example 2: *Goldberg Eaglet 50;* 16.7 * 3 = 50.1 mph to 66.8 MPH

10.) **I** figure the motor's required power out. This is different from the power in used to estimate the number of cells to use. I like my sport and sport scale planes to fly with 45+ watts per pound of power out.

Example 1: *TigerShark* 3.64 lbs. * 45 = 163.8 watts power out

Example 2: *Goldberg Eaglet 50* 3.94 lbs. * 45 = 177.3 watts power out

These numbers are also used later to verify if the "chosen" motor is acceptable or not.

11.) I figure the maximum resistance of the motor (Rm) that can be used to get the required power out from the estimated power in. Since there is a loss of amps, I use amps times 0.9 for the amp loss, or 22.5 amps for my estimating 25 amps. The voltage is estimated at 1 volt per cell under this kind of load.

Example 1: *TigerShark* 164 watts out minimum required.

Max. Rm = (10v – (164 watts / 22.5 amps)) / 22.5 amps = .120 ohms

Example 2: *Goldberg Eaglet 50;* 177 watts out minimum required.

Max. Rm = (10v – (177 watts / 22.5 amps)) / 22.5 amps = .095 ohms

I now know that I should consider motors and motor gearing combinations that are 10 ounces. Since both of my examples are close to each other in their power requirements, I'll use same power system in each one. Allowing for the heavier *Eaglet* 50, the Rm should not exceed 0.095 ohms. These are the motors that I know of that meet that criteria.

AVEOX 1409/1Y Rm .005, Kv 3775, Io 7, wt. 8.7
AVEOX 1406/1Y Rm .006, Kv 5800, Io 10.8, wt. 6.9
Astro FAI035 #604 Rm .017, Kv 4285, Io 5, wt. 4.5
AVEOX 1406/2Y Rm .018, Kv 3000, Io 2.7, 6.9
AVEOX 1409/2Y Rm .020, Kv 2000, Io 2.3 wt. 8.7
Astro FAI05#608 Rm .021, Kv 3214, Io 5, wt. 5.5
MaxCim MaxNEO-13D Rm .022, Kv 2400, Io 1.9, wt. 7.5
MEC Turbo 10 Plus Rm .022, Kv 4840, Io 3.4, wt. 7?
CEM CM0506 Rm .028, Kv 1791, Io 4.8, wt. ?
MEC Turbo 10 GT Rm .030, Kv 3400, Io 2.3, wt. 7?
Kress KR-3, Rm .035, Kv 3440, Io 2, wt. ?
AVEOX 1406/3Y Rm .037, Kv 2000, Io 1.7, wt. 6.9
Graupner S500BB 8.4V Race Rm .038, Kv 2398, Io 1.6, wt. 6
Astro C035 #603 Rm .040, Kv 2765, Io 2.5, wt. 6.5
AVEOX 1114/4Y Rm .040, Kv 2643, Io 2.5, wt. 3
AVEOX 1409/3Y Rm .040, Kv 1333, Io 1.6, wt. 8.7
CEM CM2008 Rm .041, Kv 1214, Io 4.5, wt. ?
SR Max7 Rm .045, Kv 2700, Io 4.2, wt. 6.6
Kress KR-5 Rm .057, Kv 2303, Io 1.5, wt. ?
Kyosho Procar Rm .058, Kv 2858, Io 1.6, wt. 7?
MaxCim MaxNEO-13Y Rm .058, Kv 1400, Io 0.9, wt. 7.5
AVEOX 1406/4Y Rm .060, Kv 1500, Io 1.2, wt. 6.9
Graupner S500 BB 7.2V #3305 Rm .064, Kv 3100, Io 1.4, wt. 6
Tower 14-turn Rm .064, Kv 4520, Io 2.8, wt. 7?
Kyosho Magnetic Mayhem Rm .067, Kv 2188, Io 1.4, wt. 7

AVEOX 1409/4Y Rm .069, Kv 1000, Io 0.8, wt. 8.7
Graupner RX540BBVZ 7.2 V #1740 Rm .070, Kv 2740, Io 1.7
Graupner S500 BB 8.4V#3317 Rm .070, Kv 3050, Io 2.7, wt. 6
Graupner S500 RACE 7.2V #1789 Rm .075, Kv 2850, Io 2, wt. 6
Graupner S600 Race 8.4 V #6312 Rm .075, Kv 2574, Io 1.5, wt. 8
Velkom Strontium 150 Rm .075, Kv 2000, Io 2.5, wt. ?
Kress KR-8 Rm .078, Kv 2846, Io 2, wt. ?
Graupner S500 BB 8.4V #3315 Rm .080, Kv 2750, Io 1.7, wt. 6
Goldberg Turbo 550 Rm .085, Kv 2528, Io 2, wt. 7.4
Graupner S600 7.2V #1793 Rm .085, Kv 2526, Io 2.8, wt. 8
Goldfire Rm .085, Kv 2528, Io 2, wt. 7.6
Kress KR-6 Rm .089, Kv 1576, Io 2.4, wt. ?
Graupner S600 BB 7.2V #1787 Rm .096, Kv 2638, Io 2.8, wt. 8

These are not all of the motors that meet the criteria, but as you can see, the choice is still huge!

12.) **I** next start a trial and error process looking for a motor that will work.

How do I pick the right motor? I might pick a motor because I have it, or I might pick one just to try it. I already know that the AF035, AF05 and Magnetic Mayhem work in this application because I have used them, therefore I might just use them again, but what if I want to try something new?

I'll work through a couple of examples:

Graupner Speed 600 7.2v (Kv 2526 Rm 0.085 Io 2.8)

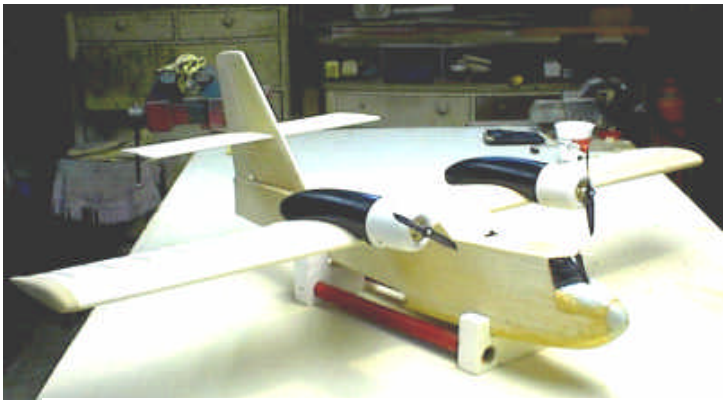
Lots of folks have this motor. Will it work?
At 10v and 25 amps this motor's power out would be;
Po = (10v – (25 amps * 0.085 ohms) * (25 amps – 2.8 amps) = 175 watts out, which is right at the bottom of the power range. I would only use this as a last res ort.

Graupner Speed 500 Race 7.2v (Kv 2850 Rm 0.075 Io 2.0)
At 10v and 25 amps this motor's power out would be;
Po = (10v – (25 amps * 0.075 ohms) * (25 amps – 2.0 amps) = 187 watts, which looks useful. It would be economical. Next I ask, what would a 10x7 prop be turning at 187 watts?
Prop RPM = ((187 watts / ((10/12)^4*(7/12)*1.31)) $^{.333}$) *1000 = 7960 RPM then translate to mph = 7.960 * 7 = 55.72 mph. It looks usable as the minimum required was around 50 mph (see step 9). To find an approximate gear ratio.
Motor RPM = Kv * (10v – (25 amps * 0.075 ohms) = 2850 * 8.125 = 23156 RPM
Gear ratio = 23156 (motor's RPM)/ 7960 (prop's RPM) = 2.9

This indicates that gearbox with about a 3:1 ratio should work, but this motor needs to be reversed and the timing reset to use with a gear-drive because this is not a neutrally timed motor. At this high power, running at "reversed" timing will fry this motor almost immediately. (Don't ask. Km) It is not just a matter of switching the leads to the motor. The end bell must be rotated 180 degrees and the timing reset to use this motor correctly with a gearbox. If you find this intimidating, you should consider using it with a Modelair-Tech H-500 belt-drive. While the belt-drive is heavier and bulkier, it is easier for a novice to use. The 3:1 gearing puts this motor into the usable range such that trying different 10-inch props will put the amp draw near the desired 25 amps static. If a gearbox is desired, but you don't want to reverse and retime the motor, use a reverse-pitched (pusher prop) with the motor gearbox combo.

MaxCim MaxNeo 13-D (Kv 2400 Rm 0.022 Io 1.9)
At 10v and 25 amps this motor's power out would be;
Po = (10v – (25 amps * 0.022 ohms) * (25 amps – 21.9 amps) = 218 watts. A 10x7 prop at 218 watts yields 8377 RPM which is about 58.6 mph
Gear Ratio
Motor RPM = Kv * (10v – (25 amps * 0.022 ohms) = 2400 * 9.45 = 22680
Gear ratio = 22680 / 8377 = 2.71

With just a little work on your part, you can come close to a system that will provide some satisfying electric flying. One caveat before closing this time. The closer you are to the higher end of the Rm range, the more problem the system might have in delivering the desired power. When a gearing is added, the apparent Rm goes up, which causes the RPM to drop. There will be a lot more on this in upcoming *Ampeers*.



A Nice Project
See last page for details.

A Nice Project

From: Lee Richter email: LRich84542@aol.com

I'm sending you a shot of my new project. It's a Canidair 215 with 480 motors and gear boxes. There will be 3-blade props put on when I get them. The plane measures: span 50" W/ 346 Sq. in. Wt. 48 oz .

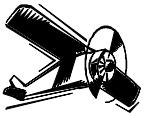
Setting Astro Lash

For years we've set the lash on straight cut Astro Flight gearboxes with 20-pound bond paper. The new gearboxes require a different method. According to AstroBob, they only need 0.002, and Clay Howe recommends using a piece of MonoKote without the backing to set this. Thanks gentlemen.

E-Flight Events 1999

March 13 The Southwest Florida Aeromodelers host their 1st Electric fly in, **Fort Myers, Lee County, Florida**. Private field, large flat grass runway, well maintained. All types of electric aircraft welcome for a noncompetitive fly in. This is an AMA santioned event #90062. Contact Chris at Mzettel@aol.com.

North Carolina Meets - 1999 Two Winston-Salem clubs, the Winston-Salem Radio Control Club (WSRC) and the Riverside Aeromodelers (RAMS) are planning on an electric weekend for **May 1 and 2, 1999**. .
The WSRC will host the **May 1** contest because their field has better access to motels.
The RAMS will host the **May 2nd** contest.
For more information contact: Dr. Colin McKinley (336) 924-5890 or Dr. John Mountjoy (336) 772-7609
May 8 OR May 9 (not both) - *Dave Strathman Memorial Electric Fly* - Springfield, OH - 2nd Annual electric meet - contact Azarr at Azarr@WPAFB.AF.MIL or phone: 255-5039 ext 340 The date will be May 8th, with rain date May 9th. The field will be open for flying on the 9th if anyone desires to stay over. I may be able to arrange a behind the scene tour of the USAF Museum if there is enough interest, we could combine it with a breakfast or something.



The Ampeer
Ken Myers
1911 Bradshaw Ct.
Walled Lake, MI 48390

Next Meeting: Thursday, March 4
7:30 - Dublin Community Center
Just north of the village of Union Lake on Union Lake Rd.