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THE JOURNAL FOR R/C SOARING ENTHUSIASTS

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The Soaring Site

New Web Site for Houston Hawks

We received a message from Gary Seawright, webmaster for the Houston Hawks in Texas. They have a new domain name and web site:

http://www.houstonhawks.org

The *RCSD* web pages were updated by our web masters, B^2 but, always curious, we took a quick trip to the web site to see what the Houston Hawks had to say.

There is a 30-Day Introductory Pilot Program, which "allows any person to experience the excitement and challenge of radio-control soaring, whether they have a sailplane or not. Once registered, a person has 30 consecutive days of FREE one-on-one flight instruction with a certified AMA instructor pilot using the Houston Hawks Hangar 9 Aspire. To start your flight instruction, contact one of the instructor pilots listed below."

List of Certified AMA Instructor Pilots
Mike Kovacs
Don Cleveland
Jack Womack

The Hangar 9 Aspire has a 79-inch wingspan with a modified Selig 7037 airfoil. The Aspire uses 2 channels: one for rudder (yaw) control and another for elevator (pitch) control. The image is available for viewing from their web site.

On the Home Front

This past month, the *RCSD* Resource Listing for the U.S.A. was updated to reflect the latest contact information. It is available for downloading from the main *RCSD* web page. Should any of you note additional changes that should be made, please don't hesitate to let us know!

Effective this past month, *RCSD* no longer accepts commercial advertising. Personal advertising, club information, and special interest groups, as always, are exempt.

Gift Idea Issue

As most of you are aware, the writers and columnists volunteer their time and energy providing information on the subject of their choice, and they only share information on sailplanes and related accessories. That means that we write what we want to write about and that we think will be of interest to most of you.

This month is no exception, as this issue contains a special article, coordinated and edited by Dave Register, on the subject of Christmas or Special Occasion gift giving ideas. Our thanks to all of the folks that provided information for the article and to Dave for his coordinating efforts. *(Being an editor is not always easy, and we appreciate it, Dave!)*

And, in the midst of all this, in addition to writing his own column, Dave has some personal things happening on his own home front. For those of you that know Dave, and for those of you that enjoy reading his column, a get well message would be well received. He's at <RegDave@aol.com> or, at least, he should be there if they've let him out of the hospital and given him his laptap computer back! Get well, Dave!

Happy Flying!
Judy Slates

TABORCA

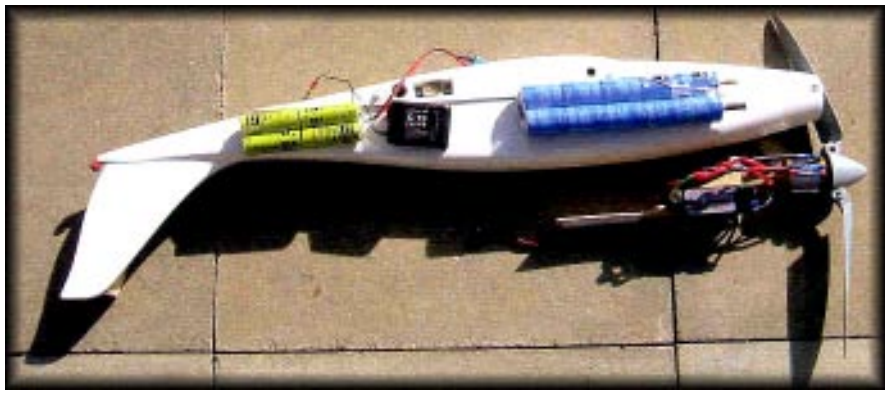
Launching Taborca at the Teck hills in southwest Germany.

Jochen Haas' Taborca is the subject of "On the 'Wing..." this month, written by Bill & Bunny Kuhlman.

on the Wing B²

P.O. Box 975
Olalla, Washington
98359-0975

bsquared@appleisp.net
http://www.b2streamlines.com



Layout of the components of the Taborca electric version.

Jochen Haas' Taborca

Our "On the 'Wing..." column in the August 2001 issue of *RC Soaring Digest* was devoted to Jochen Haas. Jochen's spreadsheet, formulated to assist in the design of swept wing tailless gliders, remains available in both Excel and AppleWorks formats. As that column was being written, Jochen was working toward getting a kit of the Taborca 3 manufactured by a major firm. This month's column is devoted to examining Taborca in detail and providing an American source for the LET Model kit!

Taborca is an exceptionally beautiful swept wing sailplane designed for slope soaring and F3J flying. The wing utilizes the MH 45 airfoil, is swept back 24 degrees, and uses what has come to be known as a "six flap" control system. There is no rudder. The winglets increase the effective aspect ratio from 12.8 to 17.

The wing sweep of 24 degrees and the size and location of the various control surfaces are coordinated so the lift distribution can be tailored for separate flight regimes. Control surface deflections are set up so the yaw, pitch and roll functions do not interact.

The included illustration shows the control surface deflections for various flight regimes.

For roll to the left, the elevon of the left wing goes up and the combi-flap of the left wing goes up to a lesser extent. On the right wing, the combi-flap goes down and the elevon goes down to a lesser extent. The idea is to eliminate any pitch change by having the control surface deflections balance each other out in the vertical dimension while at the same time eliminating adverse yaw.

For left yaw, the elevons and combi-flaps operate in opposing directions so that there is no pitch input, only an increase in drag on the left wing.

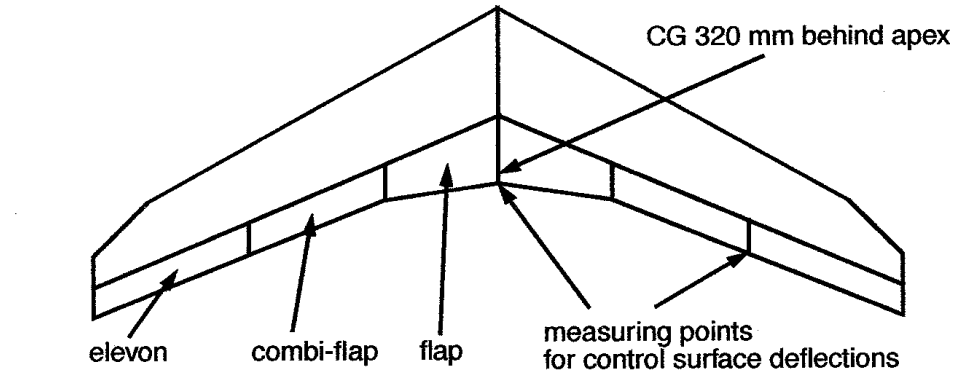
The flaps are used to assist the elevons in elevator mode.

The elevons and combi-flaps can be deflected slightly upward to increase the speed when traveling between thermals. A small amount of downward flap deflection is used to improve distance performance and thermal climb.

The flaps and elevons deflect to maintain pitch stability when the combi-flaps are deflected downward to act as air brakes. This is equivalent to "crow" on a conventional tailed aircraft, and Taborca will slow down to a crawl and land very easily.

During all flight phases the flight characteristics are very docile. The performance envelope and speed range of Taborca is very close to conventional F3J models. The minimum speed is astonishingly low, and the climb performance when thermalling is even better than conventional models.

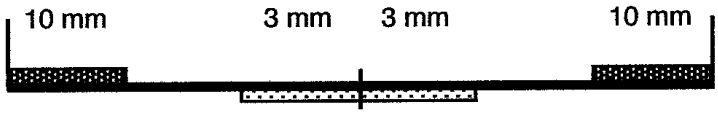
Full utilization of the six-flap control system mandates a sophisticated transmitter with a number of mixing functions. Recommended transmitters include the JR 10X and 8103.



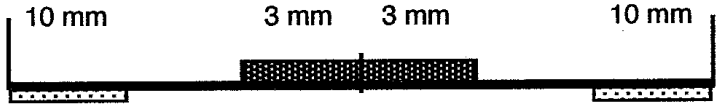
left aileron

left rudder

up elevator



down elevator

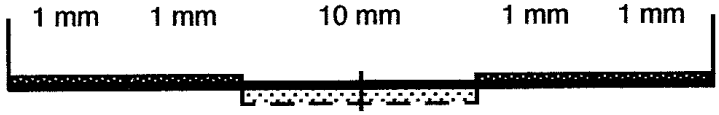


flight phase:

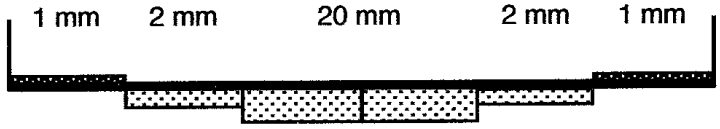
high speed flight

1 mm 1 mm 0 mm 1 mm 1 mm

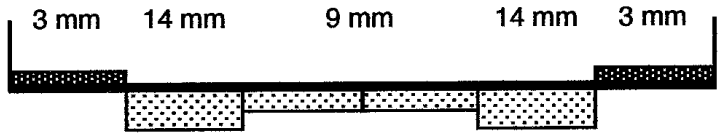
distance



slow flight — launch, thermal, landing



speed brake fully deployed



Taborca 6-flap control system

Taborca is a RTF sailplane, ready for installation of servos and other radio gear. It is obeche over foam with carbon fiber spars and Oracover which is professionally applied. The upper surface is white, the bottom surface is of contrasting color. All control surfaces are pre-hinged and servo cables are installed. The transitions and wing-fuselage junction are improved over what is shown in the included photos, and the winglets have been strengthened.

An alternative fuselage for an electric version is also going to be available. The original setup included a Torcman TM 280-20-16 with a Master 40-3P 6-16 NC opto Jeti speed control, 10 cells, and a 12.5x6 folding prop in a tractor configuration. Dieter Mahlein of ShredAir has suggested an improved motor drive system using high quality Lehner equipment: Lehner LMT Basic 5300 motor and Reisenauer Microgear 5:1 with BK/LMT Warrior 7018 controller, 70A continuous and eight CP-3300 NiMH cells, zapped, in two sticks of four cells, soldered end-to-end. This system would drive an RFM 14x10 carbon propeller with a clamp-on Norbert Meyer Lightspinner (diameter to be determined). The Lehner system offers good performance at a relatively low cost of under $400 without the battery.

There will be a molded version of Taborca in the future. There is no weight or structural advantage to a molded wing — the only real difference is in the finish. The foam and wood wing is of course more easily repaired, an important consideration.

John Derstine/Endless Mountain Models is the U.S. importer for this design via LET Model. The sailplane configuration will be priced between US$750 and US$900; no price range for the electric version as yet. You can obtain information from the Endless Mountain Models web site news page <http://www.scalesoaring.net/EMM/emm news2.htm>. If you have an interest in purchasing a Taborca kit, contact John through <Taborca@scalesoaring.net>, a special e-mail address.

The relative size of Taborca is seen in this photo.

The huge flaps are fully deflected in this photo. The sub fin drives the wing to a negative angle as soon as the aircraft touches the ground, eliminating any bouncing.

Access hatch open. The spar system does not produce any obstruction and all servos are mounted in the wings.

———

Derstine, John/Endless Mountain Models. RD#3 Box 336, Gillett PA 16925. Phone: 570-596-2392, weekday evenings 7:00 to 10:30 PM Eastern Time. Weekends any time. <johnders@npacc.net> <http://www.scalesoaring.net/>

Kuhlman, Bill and Bunny. The flying wings of Jochen Haas. RC Soaring Digest, August 2001. Available at <http://www.glide.dyndns.org/on-the-wing3/156-Jochen-Haas/156-Jochen-Haas.pdf>, software at <http://www.glide.dyndns.org/on-the-wing3/156-Jochen-Haas/Haas-software-Windows/> and <http://www.glide.dyndns.org/on-the-wing3/156-Jochen-Haas/Haas-software-Macintosh/>.

—. Six-flap control systems. RC Soaring Digest, July 1995. Available in On the 'Wing... the book, Volume 2 <http://www.glide.dyndns.org/on-the-wing2/OTW-Vol-2.pdf>, 9.9 MB.

Mahlein, Dieter/ShredAir. P.O. Box 10093 Eugene, OR 97440. 541-954-6842. <dieter@shredair.com> <http://www.shredair.com>

• • •

Al Sugar's Shuttle Last Chance, his "ideal" sailplane for the low launch environment.

The Golden Age of Model Aviation

by Alvin Sugar

A Review by Bill & Bunny Kuhlman

Although Bunny and I have dabbled with foam core vacuum bagged wings, our most enjoyable task is the construction of a flying surface using open bay construction. The resulting structure, with transparent covering and the sunset illuminated sky gleaming through, is always a source of awe for us. And we find ourselves much more satisfied being able to maintain altitude in an evening bubble of light lift than being able to speck out in turbulent lift at midday. Additionally, after being in a thermal for several minutes, we find ourselves getting bored. We find it very hard to resist the intense desire to come back upwind, land, and immediately launch again in search of a new thermal to ride. All of these tendencies contribute to our interest in Mr. Sugar's ideas as to the real definition of soaring performance.

The Golden Age of full size aircraft was the period between roughly 1925 and 1935. In that decade, man made astoundingly huge advancements in aviation with tools no more sophisticated than the slide rule. The NACA four digit airfoil series was developed, numerous aerodynamic devices were invented, engine performance improved dramatically, and control systems became more sophisticated. Aircraft performance made a gigantic leap as a result of those innovations.

In the mind of Alvin Sugar, the Golden Age of model aviation, specifically within the realm of RC soaring, was the period from about 1965 to 1975. During that ten year stretch, proportional radio control became more reliable and light enough for use in a glider, and F3B came into existence. While Ed Izzo had demonstrated foam core wing construction in 1964, open framework wings were still the norm at the end of that period. The big RC soaring leap came in the form of advanced flying skills rather than aerodynamic improvements or construction methodologies, and the ability to go out and "hunt" for thermals became a distinct advantage.

In the intervening years, the basic RC sailplane has evolved into a "high tech" machine capable of traveling great distances at high speed and great heights — higher-faster-farther. In the mind of Mr. Sugar, however, soaring performance has not really improved much. Rather, RC sailplanes have been designed and constructed to achieve extremely high launch heights, to the boundary between model and full size soaring and beyond.

Mr. Sugar has written this book to better explain his philosophy as to what an RC soaring machine should be, based on his statistical methodology for evaluating performance through the "low launch." The Golden Age explores how the aerodynamic principles of lift and drag, stability and control can be coordinated with mass, inertia, and other physical properties to produce the best soaring tool for the designer/flyer and his local environment. The articles within The Golden Age therefore cover a very large number of topics. As a result, this book is a 99 page collection of two dozen articles which are devoted to aerodynamics and structures, physics and flying skills, flight altitude and weather.

Al starts out with an explanation of how airplanes fly. (The Golden Age is one of the few resources which de-

(Continued on page 13)

Christmas & Gift Giving Ideas

From the *RCSD* Team
Coordinated by Dave Register

At last, the 2003 holiday season has arrived! With what this old world's been through since last year, it's really good to look forward to a little peace and family time.

Amidst all the ups and downs and turmoil in the world, there are at least a couple of constants that we can count on:

- R/C hobby folks are some of the best people you'll ever know, and
- Building and flying R/C sailplanes of any type seems like it's too much fun to be legal.

But legal it is! So to help you in your quest to drop hints around the house, your *RCSD* columnists have again put together a list of hobby items that might be worth considering by your significant other.

I would NOT suggest giving any of these as presents to your spouse/friend and then borrowing them back. Possible exception is Paula Garwood who might really want to have that new Moto drill or set of clamps. For the rest of us, that's a ploy that usually backfires so don't go there!

We've again tried to provide ideas that go from neat shop items to major projects and a bunch of things in between. Hopefully something in here fits your needs and your family budget. Enjoy and Happy Holidays from all the gang at *RCSD*.

FROM BILL AND BUNNY KUHLMAN
http://www.B2Streamlines.com

Some time ago we received a GarretWade catalog. The catalog contains some of the most beautiful tools we've ever seen.

The selection of planes includes Lie-Nielson and Stanley, plus some no-name items made in England. Prices start at under $50 and go up to several hundred dollars.

Any order from the catalog earns you a discount on some specific item(s) enumerated in the front of the catalog. We chose a set of five German made clamps. They are exceptional and cost less than $20.

Other items of interest to modelers:

Bankers' scissors - 7" from pivot to tip of blades, 3/$14.95. Great for cutting Monokote and other covering materials.

Digital "deep reach" calipers - 4" reach, $87.50 on sale for $79.95. You never know when the deep reach might come in handy.

24" vernier calipers - reads in 1/128" increments (0.05mm) with 2 3/4" jaws. Made in England. $24.95. The 24" length is a real benefit, and the price is right.

"Fast mount" shelves and tracks - tracks up to 6', brackets up to 22". Very sturdy. Sold by individual pieces, $3.50 - $9.60. Utilitarian adjustable shelves which can take a lot of weight.

Diamond burrs - 1/8" shafts for Dremel, etc. Cones, balls, points. 30 pieces in wooden box, $13.95; 50 pieces supplement set is $19.95; both sets for $26.50. Great for cutting out odd-shaped plywood bulkheads, shaping small parts, etc.

Covered metal storage tins - Three sizes from 1 3/16" x 3/4" deep to 2" x 7/8" deep. The two smaller sizes come in aluminum boxes, the large size comes in a paper box. 12 small $8.95, 12 large $9.95, 20 micro $10.49. If you ever wondered how to store replacement servo gears, small screws, or other odd items, this is it! Clear tops let you see what's inside.

Mini pliers - rubberized grips, serrated tips, interior gripping surfaces, 2 1/2" pivot. One is straight, the other curved. Both for $18.95. These are beautiful and comfortable, and the color sets them apart from others.

Precision steel ruler set - 6", 12", and 18" long. Hardened stainless steel. One side is etched in 0.5mm and 1.0mm, the other in 1/64" and 1/20" increments. $19.95. These come in individual plastic sleeves and are quite rigid. Have worked extremely well when measuring and marking balsa and plywood parts.

Razor scraper - Beautiful brass over steel with a comfortable rounded shape and rubber bound edges. Three positions, takes standard single edge blades. $4.50 each or 5/$18.30. Hold the blade at 90 degrees for fine scraping, or at shallow angle to get epoxy and CA off glass building surfaces. (Can also be used at a shallow angle to scrape burned spill-overs from glass-ceramic stove tops.)

Colorcoded miniature screwdrivers - four slot, 2 Phillips. Four inches long in plastic case. $10.95, 2/$18.60. Not the sets usually seen at Radio Shack and hardware stores.

Square set - Fixed engineer's squares 2" and 6", 4" adjustable square with regular and 45 degree bevel blade, 4" flat rule (inches and mm). Made in India to tight British standards and packed in wooden box, $49.95. Useful for setting up molds, built-up fuselages, wing ribs, etc.

GarrettWade
161 Avenue of the AmericasYork, NY 10013
1-800-221-2942
http://www.garrettwade.com

Our balsa, plywood, and music wire supplier is:

Balsa & Hobby Supply
12020 Centralia Suite G
Hawaiian Gardens CA 90716

Orders only: (800) 488-9525 7:00AM to 7:00PM Mon - Sat PST
Information: (562) 865-3220 7:00AM to 2:30PM Mon - Fri PST
FAX: (562) 860-0327
http://www.superiorbalsa.com/
e-mail: superiorbalsa@comcast.net

Superior also handles tools, dowels, epoxy, CA, bass wood, and carbon fiber, plus tools and other items. We can't praise them highly enough.

Excellent balsa and exceptional service.

We also found a shop vac which works extremely well, is small (13L x 11W x 15H with built-in handle) and easy to carry around, plus is low in cost. It's the Stinger WD2000 by Emerson Electric. We picked up ours at Home Depot. It's got a two gallon capacity and is capable of wet or dry pick-up. The hose is four feet long and 1 1/4 inch diameter, and it comes with a 1" x 2" tubular attachments. Lots of other 1 1/4" attachments are available (crevice tool $6, wands $5, etc.) and these are small enough to get into those tight places that are inaccessible to the conventional shop vac attachments. It has vacuum and blower connectors and a replaceable filter (3/$4). No wheels, but the bottom of the canister is shaped to slide easily across carpet or concrete floors. Oh yeah, it's only $27!

For fun slope soaring or slope combat…

Michael Richter has updated the Weasel (36" span) and miniWeasel (24" span) kits, $50 and $35 respectively, plus shipping. Both Weasels have been getting excellent reviews world wide.

http://www.dream-flight.com/testimonials.html

The Weasel web site URL has changed to:

http://www.dream-flight.com

The old URL which was published in the February 2003 *RCSD* will automatically transfer you to the new site. Photos, movies, and the *RCSD* review (PDF) are all on the web site.

Michael Richter
1250 Northridge Rd.
Santa Barbara, CA 93105
phone/fax: 805 687 4435
(Calls between 9AM and 5PM PST only)
http://www.dream-flight.com
e-mail: emil23@gte.net

Editors note - Also note that a great present for those who enjoy "On the 'Wing..." is a compendium of many years of B^2 columns that's available on the B^2 web site. CD or download. A wonderful resource for understanding tail less flight.

FROM GREG SMITH
THE SLOPERS RESOURCE
http://www.slopeflyer.com

Don't forget the slopers!

The Weasel from Richter R/C is a great little package and is cheap too! It's been in *RCSD* a couple of times but it is still a super recommendation, as noted above.

http://www.dream-flight.com/

The new 60-inch foamy warbirds have stepped up the performance of foam and are durable to boot. Look for them soon at:

http://www.leadingedgegliders.com

The McLean Extreme is hands down one of the best slope planes in the world if you have the cash and can wait for one to get built:

http://www.martialartsacademy.org/extreme.htm

Finally, the Airtech Pixel is a pitcheron plane that is a blast to fly and packs really small. Caveat, I am the US importer but it is still a great plane!

http://www.slopeflyer.com/artman/publish/cat_index_63.shtml

Dave Register will add to the list a low cost EPP slope foamie that we've tried for our rugged Oklahoma slope north of Dewey, OK: The Foam-One II from MidWestSlope. A very rugged, high quality and affordable kit in the Foam-One racing format. Bounces off rocks, trees, cattle and thorn bushes. Great fun, prompt delivery and a complete hardware package.

http://www.midwestslope.com/foam-one2/

FROM DAVE GARWOOD

K-Mart Rotary Tool

Ryobi makes a motor tool that I like better than those made by Dremel. It's heavier, but it's more powerful and has ball bearings. The problem is I haven't found a place to get the Ryobi tools repaired. Walking through the sandpaper aisle at K-Mart I saw the Benchtop Pro Rotary Tool (SKU 07200078725, $24.96) that looked to me like a knock-off of my beloved Ryobi. It comes with a small (25-piece) assortment of fittings, and takes the Dremel fittings. When I got it home and tried it, the tool worked so well and I liked it so much that I went back the next day to buy another to keep as a spare. Good tool; good price.

K-Mart Neat Inexpensive Clamp Set
(I had to get Paula her own set!)

The more you use clamps, the more of them you seem to need. In K-Mart I found a lovely little assortment of six plastic clamps, two each of three configurations called Hobby Clamps (SKU 02510434540, $7.99). When I got it home and tried them, the clamps worked so well and I liked them so much that I went back the next day to buy another set. I got Paula her own set as well. She's always raiding my shop. It's nigh impossible to have too many clamps, and these inexpensive clamps work well.

Simprop SE-300 Motor Glider

Model: Simprop Electronics SE-300
Type: Polyhedral thermal duration motor sailplane
Manufacturer: Simprop Electronics http://www.simprop.de
Importer: Hobby Lobby http://www.hobby-lobby.com
Wing Span: 1865 mm
Wing Area: 29.7 dm^2
Weight: 100 grams
Wing Loading: 32.7 g/dm^2
Radio needed: 3-channel or more (Tx must have V-Tail mix)

Simprop SE-300 in flight.

A couple of New York Slope Dogs at the E-flight field in Scotia, NY. Dave Garwood holds the SE-300; Rich Loud prepares to fly for the camera. Photo by Phil Tiberio.

This is an extremely pleasant motor sailplane to both build and fly. It comes in a heavily prefabricated kit with a superbly molded fuselage, wings and tail parts built and covered, full hardware included. It can be built in a few hours as either a sailplane or a motor glider.

The builder constructs and installs the servo/battery tray and cuts off the molded nose and glues in a motor mount bulkhead. Finish up a couple little fittings like wing incidence pin and rear wing hold-down plate; install the controls and it's ready to fly.

I fitted a Simprop geared, ball bearing SP-500 motor and a Simprop folding 14x8 propeller. That prop was a little scary for us sailplane guys, but it worked great, exceeding our expectations for climb performance.

Climb it does! It gets small to see after about 10-12 seconds climb. With a thin airfoil it covers ground fast and shows surprisingly good handling for what looks like shallow polyhedral breaks. Its best tricks are inside and outside loops. On our first attempt to verify the maker's claim of "50 minute flight time" Rich Loud and I got 34 minutes with 15 climbs on a cool, cloudy, late fall day in 10 MPH wind. The SE-300 is a keeper.

Windrider BAT

I have just two flights on the Windrider Aviation BAT, a quick building, fast flying, EPP-foam "plank" flying wing. The slope sailplane builds in about three hours, and features injection-molded wing halves, with servo pockets and receiver cavity and battery pocket already molded in. It's covered with colored packing tape.

Terry Dwyer and I flew it at Lake Ontario in 25-30 MPH and it just ripped up the sky. The BAT had no problem penetrating in the windy conditions and is VERY snappy in maneuvers, pulling nearly two full rolls per second. Regarding inverted flight performance, Terry asked, "What color is it on top?" only half joking. Very little forward stick pressure is needed to hold unlimited inverted flight. Inside and outside loops are cake.

Australian flyers report the BAT is a worthy DS trainer, although some recommend installation of a full-span spar. The Aussies further report extremely wide performance from the airfoil, that the BAT excels in both full-on and light lift conditions.

The kit costs $50 from Windrider Aviation in Hong Kong, and comes with a carbon tube spar, a roll of filament tape, and two rolls of color packing tape.

Windrider Aviation:
http://www.windrider.com.hk

Airtronics VG6000

I am in love with the Airtronics VG 6000, a new-generation microprocessor transmitter WITHOUT MENUS. The software has been simplified and the LCD screen designed so that *all available functions are displayed all the time.* Think for a minute how much "no menus" on your computer radio will simplify your soaring life.
Buy it for the flying-wing delta mixing and keep it for the six-servo unlimited ship capability. Its cost is an utterly reasonable $200 or less from Tower Hobbies, depending on which of four servo and ESC combinations you choose. I wrote a full review of the VG6000 in the DEC 2003 issue of *Fly RC* magazine. It has a couple of limitations when compared to $500

Windrider BAT & Dave!

computer radios, but nothing that keeps me from flying my six-servo DAW Ka-6E with it. Detailed specs and a download manual are on the Airtronics website:

http://www.airtronics.net

FROM DAVE REGISTER
regdave@aol.com

My list is a little short this year. Many neat things have already been covered so I'll stick to what I've used this year.

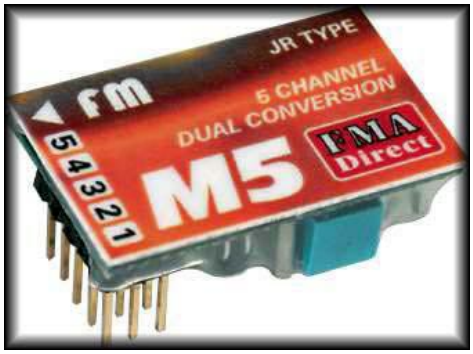
For DLG, the XP3 from Polecat Aero is definitely a winner. After several months of flying, its really dialed in very nicely and has an outstanding launch and float capability. Check Denny Maize's web site for the latest prices. Wings by Phil Barnes. Excellent articles and support on the website:

http://www.polecataero.com/

Great light weight wing servos for HLG, DLG and other small flaperon sailplanes are available from Dymond ModelSports Ltd. The Dymond D60 is a winner. Highest torque in the thinnest package for DLG that I've found. Excellent centering and low drift in a very affordable package.

http://www.rc-dymond.com/

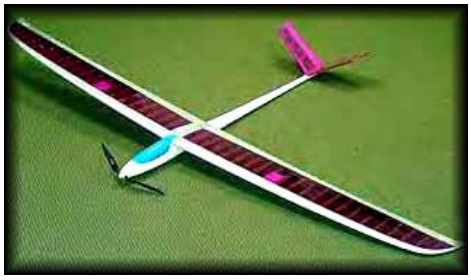
The M5 receiver from FMA has proven to be an extremely light weight, long



range and very reliable unit. It's one of the lightest full range 5 channel receivers on the market and I've had excellent results with it. Fits great in the nose of the XP3 but is equally at home in any 5 channel ship of any size:

https://www.fmadirect.com/site/home.htm

For a really great e-soar experience, I'm very partial to the Omega Sailplanes at NE Sailplane (Sal's just



updated his web site - looks great and easier to peruse!). The Omega 1.5 is my favorite for smaller fields and lots of easy fun. The 2M version looks good but I still like the simplicity of the geared Speed 400 on the 1.5. I've had excellent success with this little plane and recommend it to anyone:

http://www.nesail.com/

Well, if you're going to e-soar, you need a great place to get batteries. I'd check out Batteries America. I've ordered from them for several years now for NiCd flight packs, 7 cell Sanyo e-soar packs and most recently a mini 4-cell NiMh pack for my XP3. Good quality, excellent delivery and they'll wire up a specialty pack and connector if you need it. Also a good place for

XP-3

cordless and cell phone batteries!

http://www.batteriesamerica.com/

I love my Great Planes Laser Incidence Meter. It's a bargain at $20 and has been a really handy tool for sorting out three planes that weren't quite right. Get the incidence right, then find any warps or misalignments. Your trimming and flying challenges are a lot easier after that. Check it out at:

http://www.hobbypeople.net/gallery/701602.asp

I still think the Sirius line of chargers are the best field and bench tools for maintaining the health of your flight and transmitter packs. There are sizes

for big packs and little packs, NiCds and NiMhs. There's even a new charger for Li batteries. I highly recommend the Sirius Pro Series for any serious field kit:

http://www.siriuselectronics.com/

Finally, I've got to put in a word for Micro Mark, my favorite tool store (well, I gotta check out the B^2 reference, too). The one tool I just can't do without when working at the bench and at the field is a good set of hemostats. No, not for surgical repair of pilots. It's for grabbing and holding little screws, nuts, etc., when your hands are just too big or too cold or too sweaty to do the job. Also great for fishing wires and connectors out of strange places in your fuselage and wings. Great for popping loose nylon clevises. Also for grabbing linkages so you can put that extra half turn on the clevis to get your trims just right. Browse a little at Micro Mark. Get a couple of straight and curved hemostats (the curved ones are more useful) and start finding how easy they can make assembly and maintenance of any of your projects.

http://www.micromark.com/

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(Golden Age - Continued from page 7)

scribes the lift process correctly.) Various charts are presented to allow the reader to get a feel for design parameters and specific flight environments. From there, the importance of the low launch is explored and the low launch concept is compared to RC-HLG. Al then very nicely expands this topic to incorporate "performance," flight velocity, and turn radius, and the "soaring factor." The reader is also introduced to the various alignment errors which occur during a thermal turn, along with suggestions for proportioning which will reduce those drag producing errors.

Many of the ideas used to create stable, thermal-finding free flight models translate very well to Al's world. As an example, Dutch roll, which many sailplane designers try to stay away from, can be harnessed by a low launch design to assist in its ability to center thermals nearly automatically. The Golden Age includes a spreadsheet template to simplify the design process.

Weight and the importance of velocity regulation make up much of the latter portion of the book. Here is where Al explains how much elevator authority is really needed, why large rudders are an advantage, and how to match the vertical area to the dihedral angle.

There are many interactions within Mr. Sugar's low launch universe. The flight environment, aircraft span, area, weight, and control authority meet design, construction and piloting abilities and skills in an intense ballet which begins at the commencement of the design process and ends only when the aircraft is no longer in flyable condition.

Al's contest environment, through which he evaluates sailplane performance, is incredibly simple. The rules are included within the latter pages of the book, along with a large number of helpful hints which are sure to improve pilot performance in any TD event.

While The Golden Age is focused on taking maximum advantage of the universe surrounding Mr. Sugar's low launch methodology, it provides information and ideas of use to RC sailplane designers, builders, and flyers of all types.

PDF versions of The Golden Age can be purchased from Mr. Sugar with payment through PayPal. The single PDF file can be sent as an e-mail attachment (832K) for US$7.50, or on 3.5 inch floppy by snail mail for US$15.00. Please visit The Golden Age web site <http://www.geocities.com/simsoar> or contact Mr. Sugar directly for further information. And don't forget to mention this review when making inquiries or placing an order.

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History of the Mantis

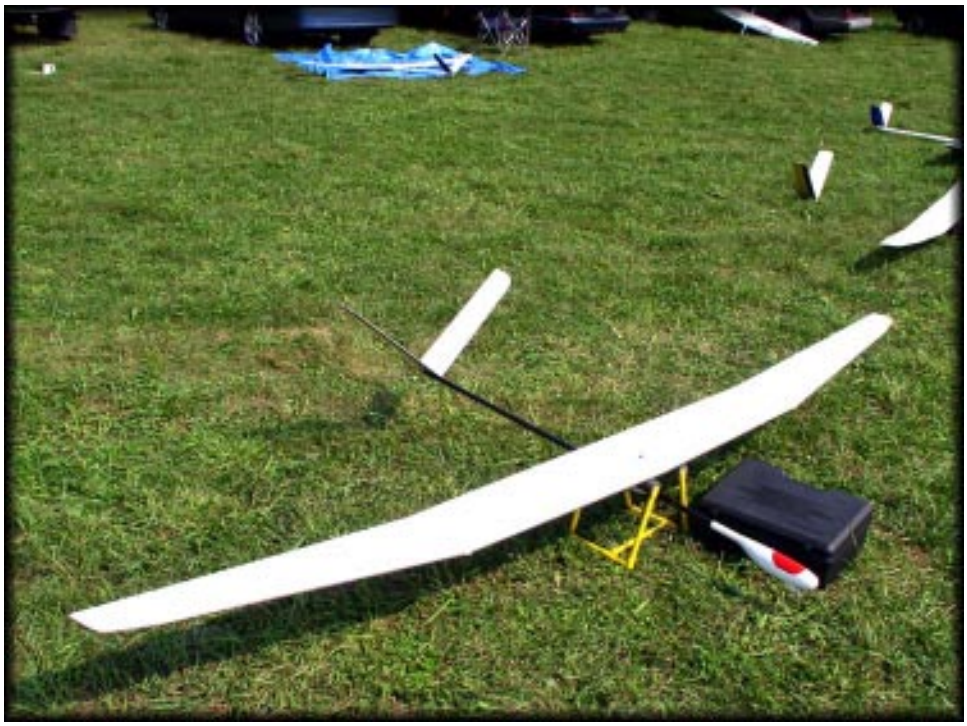
by Anker Berg-Sonne

My Luckenbach/Drela 130" Aegea Mantis.

Nobody who has seen a Mantis will argue that it is a unique glider, many call it ugly. But its uniqueness goes much further than its looks. Its evolution is also unique and has been a community effort where individuals have built their own variants and input from many flyers have influenced the design. It has been fun and rewarding, and, in my belief, has made the Mantis an awesome product.

Evolution

The designer of the Mantis is Tom Kiesling, who got involved in soaring as a teenager. He quickly proved to be a prodigy at the hobby and I remember him consistently beating his better equipped seniors with a Prophet built-up, polyhedral glider. Tom was a member of my club, Charles River Radio Controllers, and an active participant in the Eastern Soaring League. As the northern-most club in the ESL, we spend a lot of time driving to contests as far south as Virginia. To limit boredom and reduce cost, we carpool and spend a lot of time talking planes. On the ride back from the 1990 Nationals in Vincennes, there was a big discussion on model design inspired by Mike Selig's presentation at the awards banquet. Selig presented some interesting concepts on drag reduction for low Reynolds number sailplanes. The first was the "Eppler tips". This concept was intended to reduce the induced drag at the wing tip. The old Falcon 880 was one of the first models to use this concept. It apparently did reduce the drag, but more importantly it improved the handling. The second concept was to droop the fuselage before and after the wing. This was intended to reduce the drag at the fuselage/wing interface. This concept was demonstrated on Selig's Opus and Harley Michaelis' Genie. The third concept was to use a pylon mount that kept the leading and trailing edge of the wing free. On that trip back from the Nationals many different concepts for pylon designs were thought of. Most of the ideas were overly complex and dismissed.



This is an absolutely gorgeous original Mantis from Phil Barnes owned by Bob Magee from Upstate New York.

The following year Tom built his first composite sailplane. It used the SD8000 airfoil, lots of carbon, Eppler tips, and it had a pylon! It was a pod

and boom type fuselage. The pod was made using the lost foam method of construction. The wing was bolted onto the pylon using one 1/4-20 bolt. A gasket made from a bicycle inner tube was used between the wing and the pylon. This mounting method allowed the wing to pivot under hard landings or other mishaps. The pylon was tall and allowed for a one piece flap. Although the model flew well, it was very heavy (110 ounces). A two meter version was also made. It also was heavy, but flew well. After campaigning these models for several years, new lighter versions were built. The 3 meter model was just under 70 ounces and used Kevlar and glass skins. It used a similar style fuselage made using the lost foam method. However the servos were in the tail. While simple to set up the linkages, this approach required a significant amount of nose weight adding 6 or 7 ounces to the total model weight. A two meter version of this model was also made. The two-meter had the servos in the nose, and weighed 44 ounces. This was a competitive weight at the time. However, the lost foam method of construction made it difficult to achieve a low resin content and added several ounces.

Several years later, after a difficult winter of health problems, Tom decided it was time for the next generation of pylon models. Since the winter was spent recovering, Tom did not have much time for building new models. A two-meter was the first version built. A much-simplified fuselage was required due to the time constraints. A tube was made over a dowel mandrel. To hold the radio gear, a foam plug was made using a NACA 4 digit symmetrical section. The plug was glassed and attached to the front of the fuse. The pylon was made in a similar fashion. This approach with a Kevlar skinned wing made for a light two-meter at 34 ounces. This model was quickly named "Sherm" after its very sperm like appearance. The most amazing thing about this model was that it was built from concept to flight in one week.

Shortly after, a 124" version was built. This version was Tom's first attempt at a molded fuselage. Again, due to the time constraints, the fuselage had to be simple. Cutting a 1" dowel rod in half made the tube plug. The pylon and front pod were small and were cut out of a pine block. The mold was made from Hydra-Stone. Two complete models were made in two weeks from concept to flight. The first flights were at the 1996 Nationals, six years after Selig's talks. Before the model was introduced, it had to be named since the Sherm (the sperm) nick name was quickly degrading to even less appropriate commentary. So, the Mantis name was assigned. The Mantis was one of the first modern models to achieve a 55 ounce weight. This is exactly half the weight of Tom's first composite model made in 1991. At this weight the model was extremely easy to fly and even easier to land. The 7037 airfoil worked very well at this weight. With 20+ ounces of ballast, the model could be flown in fairly heavy winds with success. This is the model that Tom used to set the record for ESL wins of 13 in 1997. It was also used by Phil Barnes as the basis for his kitted Mantis.

The next iteration Mantis used a much better (actually thought out) planform and the MH-32 airfoil. The span was increased to 134 inches. The weight was 65 ounces. Luke Waters named it the Super Mantis and the name stuck. This model was first flown at the 1999 F3J team selections in Long Island, NY. Although Tom did not have much success at the team selection, the model showed promise. Improvements were made over the next several years and Tom used that same design in light air conditions to make the 2004 US F3J team.

Shortly after the Super Mantis came the Molded Mantis. Jason Werner asked Joe Wurts to design a planform for a molded wing. Joe agreed to help and with some performance requirement input from Tom and Jason, he came up with a new planform. Jason made his first set of molds with this planform and the MH-32 airfoil. He made a test wing and the results looked very promising. Terry Luckenbach ended up with the molds and has made several wings. Tom used one of these wings on one of Terry's fuselages as his primary model for the 2003 F3J team selection. Tom says that Joe did a great job with the planform and the Molded Mantis is the best launching model he has flown.

The Barnes Era

After seeing Tom fly his Mantis, many ESL members wanted one. Tom did not have interest or time to build for others, but he was willing to let others copy his design. A number of ESL members decided to build their own and at the end of the season the first home-built Manti started showing up. One was Phil Barnes, who builds kits

One of Tom Kiesling's molded Manti.

as a business. As soon as he started flying it, I and many others asked him if he would be willing to make a small run of kits for us. Finally Phil relented, and agreed to produce a limited number of kits for the ESL membership. I made sure I got on the list early and during the building season of 97 to 98 I received a box of four kits for the CRRC members who had ordered in time for the first run. The Mantis Home Page, at http://home.att.net/~CASA/Mantis/, has a 3-view, pictures of the kits and of the finished Mantis.

The kits were very strange. The fuselage was a stock CF tube with a kevlar pod and a nose cone made on a male mold. Building the fuselage took a lot of work. The V tails were another headache. You were supposed to cut a shaped slot in the boom for the tail and then glass it in. The major problem was alignment of the tail to the boom. Another challenge was the control horns. Most of us spent hours gluing the horns on, breaking them off and starting over again. Compared with the fuse the wings were a piece of cake. The center panel had a full-length carbon tube as the spar, and the tips had short length of tube to accommodate the straight wing joiners. The single flap went the whole length of the center panel and was controlled by a single servo.

Balancing the kit is very unusual. You insert all radio gear in the pod and gradually shorten the nose moment by cutting slices off the front of the boom until the plane balances correctly. The length of the tail boom is fixed. If you have done this right you will need no nose weight.

The end result was well worth the trouble. Most Manti came out around 60 oz and flew like a dream. I spent the 98 season getting used to my new Mantis. There were quite a few other Manti in ESL and most of us were delighted with them. And pretty soon the news groups were abuzz with chatter about the new, strange glider being flown on the east coast.

The weaknesses of this original design also became apparent. The SD7037 airfoil did not have great penetration in wind. Ballasting did not work as well as expected to improve penetration and in high winds, 15 to 20 knots,

The assembled Aegea Mantis.

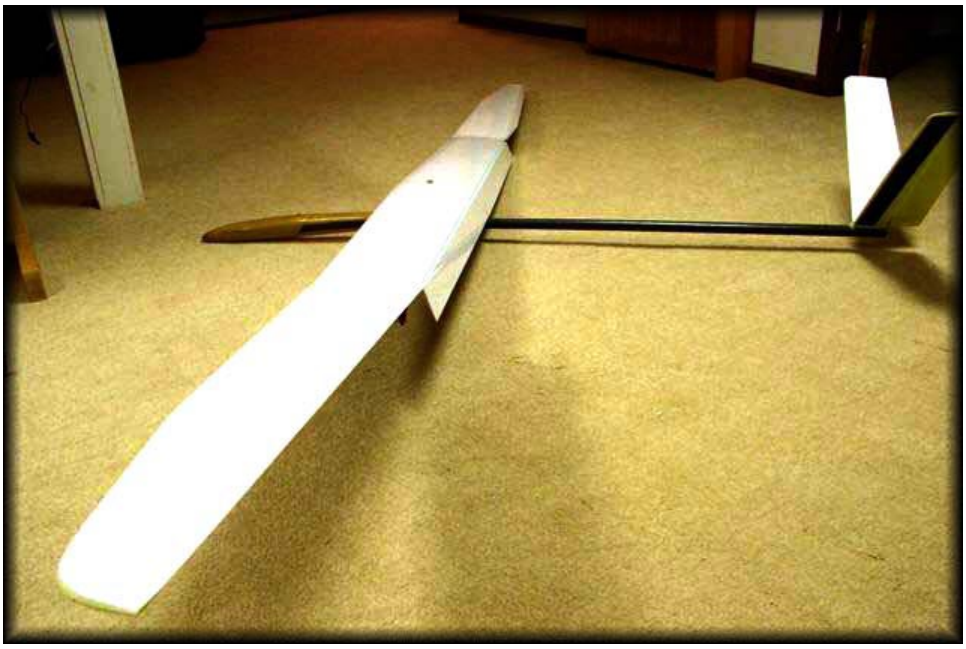
The pylon viewed from the side. The tow hook is an L hook bought at the hardware store. The tow hook is 1/3" behind the CG location. The vertical distance between the wing and the tow hook make the plane pitch hard up if thrown straight out on a winch launch. I have never had this become a problem. I have, however, learned to throw in a more upward direction, mainly to make my launches more efficient.

The airfoil at the center/tip intersection, notice the location of the flap hinge line. The flaps are actually large enough to touch the tail boom at 90 degrees. You can either cut the corners of the flaps or deploy less than 90 degrees.

The characteristic pylon and boom construction.

A close-up of the pylon from the top. Notice that the wiring comes up in the front of the pylon. The center vertical bulkhead holds the hold-down block, which I have covered with epoxy/filler to ensure that the top touches the wing when attached. At the back is a ballast compartment. A comment on the need to not leave a gap between the wing hold down block and the wing. If you do, the bolt tension pre-stresses the attachment of the hold down block to the bulkhead and pylon. This is added to the stress from the winch line under launch. I managed to pull the wing off the fuse on a hard launch earlier this season after leaving a substantial gap. Fortunately the wing was unscathed. The fuselage also appeared to be undamaged at first in spite of lawn darting into the ground at high speed. Upon further inspection at home I discovered severe delamination and broken spars in the tail feathers. I had to replace those. Having a backup ship removed temptation to perform a quick field repair, which would have led to a disaster.

The tail from the top. Notice that the hinge line is at the 50% mark.



The plane in full crow. The plane will descend vertically at moderate speed when in full crow. High speed dives are more fun, controlled descents less stressful on the plane.

The tail from the bottom. The "horns" are made from pushrods and the pushrods are attached using ball joints. The pushrods themselves are carbon fiber running in Teflon sheaths. A major area of innovation is control horns and their attachment to the tails.

The bottom of the center section. The piece of plywood sits on top of the pylon with a metal bolt holding the wing on, and a plastic alignment bolt at the back. If the wing tip impacts something the wing will rotate on the hold-down bolt and break the alignment bolt, hopefully saving the wing, and the pylon. This design feature does a lot to reduce damage on hard landings, mid-airs and inadvertent tree landings.

The Pretty Mantis fuse kit as it comes from Terry Luckenbach. Very little work is required to finish the fuse.

you had to be very brave, or stupid, or very good, to venture far downwind. Another weakness emerged during the preparations for the F3J team selections. I tried a two-man tow and my outer wing panel exploded at the top of the launch. The shortness of the tube spar in the outer panel, limited by the straight wing joiner, just didn't give it the strength needed to handle extreme launch loads. Phil was at the session, analyzed the failure in detail and immediately redesigned the tips.

An idiosyncrasy of the tube fuselage is that the fuse twists noticeably when rudder is applied. It looks strange to see the tail flopping around on a winch launch, and normally this isn't a problem. Throwing the original Mantis also was hard because the fuse was so thin. Holding the tail boom and letting go doesn't work well because a gust can easily twist the plane. The best technique is to throw the plane, holding the pylon at its thickest point. In addition to improving their launch technique, Phil and others modified their booms to improve the torsional stiffness. This was accomplished by wrapping the boom with a bias layer of carbon fiber or Kevlar.

That winter Phil made two redesigns. He modified the outer panel design to lengthen the tube spar, moved the servo wells further out on the panels, and started kitting bent joiner rods. He also started bagging MH32 airfoils in addition to the original SD7037. Both of these modifications were major improvements. The modified outer panel is now strong enough to handle any launch, and the MH32 airfoil penetrates better and ballasts better than the SD7037 at a small cost in minimum sink.

The Luckenbach Influence

The 2000 season also delivered a much simpler fuselage for the Mantis with Terry Luckenbach's fuse. Terry's fuses are works of art, always perfect. They are also much easier to build because the nose and pylon are finished with only internal ply building required. Terry's tail boom is thicker than the tube Phil used and the tail wagging effect has been eliminated. Terry's new fuse is now the standard for the Mantis.

I built a Luckenbach MH32 Mantis as soon as the components became

available and relegated my original Mantis to backup ship status. I have since given it to a fellow club member who needed a backup ship.

Early in 2001 I acquired a Sharon moldie. Because of its bigger wing span and greater weight it penetrated better and had much better L/D than my Mantis. It became my main contest ship during the 2001 and 2002 seasons until I blew it up on launch in the middle of 2002.

The Drela Revolution

The Sharon prompted me to start lobbying for a larger Mantis that would have some of the characteristics of the Sharon. Dr. Mark Drela's airfoils are optimized for the light wing loading of the Mantis and when I asked him if he was willing to design a wing for the Mantis he responded in less than a week with a complete design. He continued to be super responsive when asked to increase the span of his design to 130". Quoting Mark Drela on the design, "Unlike the previous Mantis wing which had the same 8.7% MH32 airfoil along the span, the Aegea wing uses four different airfoils AG40d..AG43d along the span. Their thickness decreases from 8.0% at the root to 6.5% at the tip, making each spanwise location well-matched to the decreasing local Reynolds number. These airfoils borrow heavily from the latest DLG airfoil technology, and respond very well to camber and reflex. One other unusual feature is a slight amount of washout twist over the middle panel of the 3-panel planform, which best mitigates tip stall tendencies at slow thermalling speeds."

Design in hand and after buying several hundred dollars of spyder foam, carbon spars, kevlar cloth and all the other required supplies, Fritz Bien, Jan Kansky and I started building Mark's wing. Only Fritz completed his wing, and then he left it leaning against a space heater! Fritz was able to make the wing flyable and it does fly great in spite of the wrinkly skin. The amount of work required to build an Aegea wing from scratch overwhelmed me and Jan, so we started looking for alternative approaches. Phil Barnes was an obvious lobbying target.

Phil Barnes to the rescue again

Using his tried and true construction methods, Phil bagged a set of prototype wings to Mark Drela's design and asked John Hauff from LISF to stress test them last winter. Except for some minor buckling of the skins over the flap servo wells, the wings handled the worst John could throw at them. The extreme thinness of the Aegea airfoils make it very hard to build them strong enough, and it wasn't until Phil used two carbon tube spars in the center section that it proved strong enough. Even then, you need to strengthen the skin over the servo wells to prevent buckling of the top skin. All control surfaces are very large and, to avoid flap flutter from extreme launches, the cutouts should be faced with fiberglass to stiffen them.

Building Phil's Aegea wing and Terry's fuse was a breeze, especially after I had developed a few shortcuts, and learned where the most common mistakes were made. I had mine ready for the start of the season and am close to finishing a second plane. For the first time I'll have the luxury of owning identical primary and backup ships.

The wing delivers what it promises. It has great penetration and, after trying to ballast it, I prefer to fly it unballasted in moderate winds and with just 5 oz of ballast in strong winds. It weighs less than 70 oz and the generous wing area makes it a great floater. Landings will require some practice. The pitch characteristics of the Aegea airfoil, as flaps are applied, are unusual. Initial flap causes large amounts of pitch. More flap increases pitch, but at a much lower rate. You either need a radio that can feed flap to elevator compensation on a curve, or you need to apply manual elevator to control pitch.

The evolution of the design in just 7 years has been amazing. Every change has been a dramatic improvement and there is room for much more. In spite of this, a Mantis today is an unmistakable descendant of Tom's original design.

One strength of the Mantis is that it is both a competitive ship and very easy to fly. The Mantis is a reasonable plane to move up to from a trainer, and the beginner will have a plane that will be easy enough to fly to learn the true skills of soaring, finding lift, staying in it, and finding new lift when the thermal dies.

What next?

There are several very interesting developments underway. One club member is mating an AVA (Eastern European ARF version of the Bubble Dancer) fuselage with the Aegea wing. This combination will be quite a bit lighter. Also, much work is being done on F3B and F3B derivatives of the Mantis. This work is bound to influence the TD version. Finally, there are *rumors* of a molded Mantis from Eastern Europe.

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Elastic Modulus Of Common Foams

Mark Drela last revision: 5 May 03

Elastic Modulus of Common Foams

measurement via 3-point bending test

foam type	ρ (lb/ft^3)	E11 (psi)	E22 (psi)	E33 (psi)	E33/ρ (in/10^6)	data source
Spyder foam	2.30		4000	6900	5.18	Mark Drela
Spyder foam	2.36	1218	3358	7027	5.14	Phil Barnes
Hi Load 60	2.25	1100	3400	6000	4.61	Mark Drela
Hi Load 60a	2.30	1229	2819	6212	4.67	Phil Barnes
Hi Load 60b	2.30	1412	2888	6412	4.82	Phil Barnes
Dow Blue	1.75	2000	640	2500	2.47	Mark Drela
Foamular 250a	1.63	2317	1899	2372	2.51	Phil Barnes
Foamular 250b	1.63	2430	1972	2476	2.62	Phil Barnes
Foamular 400a	1.98	2788	2946	2941	2.54	Phil Barnes
Foamular 400b	1.98	2920	3088	3087	2.67	Phil Barnes
Foamular 600a	3.04	4927	4927	5108	2.90	Phil Barnes
Foamular 600b	3.04	4716	4807	5251	2.98	Phil Barnes
Grey Foam a	1.54	2894	1054	640	0.72	Phil Barnes
Grey Foam b	1.54	2845	1105	588	0.66	Phil Barnes
Stylite a	1.93	1877	2906	3489	3.12	Phil Barnes
Stylite b	1.93	1847	2854	3416	3.06	Phil Barnes
Rohacell 31	1.90	5120	5120	5120	4.66	CST
Rohacell 51	3.10	9950	9950	9950	5.55	CST
4.7lb balsa	4.70	160000				Mark Drela

Definitions: ρ = density, E11 = modulus along sheet (8' dimension), E22 = modulus across sheet (2' dimension), E33 = modulus across thickness, E/ρ = specific modulus

Different numbers for the same foam is most likely due to variation between foam batches, and to measurement uncertainty. For composite foam core applications, the relevant modulus is E33. The larger this number, the greater the resistance to buckling failure of the compression-side skin. E33 also indicates resistance to dents. For bare foam wings (slow fliers, etc.), the relevant modulus is either E11 (span is along foam sheet), or E22 (span is across foam sheet). The larger this number, the greater the bending stiffness of the wing.