April 2016

VICE PRESIDENT'S CORNER

Duane Beck

I've been on a journey to learn about building model airplane from composites, and thought I'd share some of what I've learned. A composite structure is made by combining a resin with a fiber material, forming it into the desired shape, and allowing the resin to harden, forming a matrix which supports the fiber so that it can carry structural loads. Two popular types of resin used in building model airplanes are polyester and epoxy. Polyester is more commonly used for large scale models, and usually has a blue-green color. It is also used for auto body repair, and "Bondo" is a popular brand name which is usually a reddish-brown color. It is a catalyzed resin, which means the hardener does not combine with the resin in a specific ratio. Adding more hardener makes the reaction happen faster (and hotter) so the resin hardens quicker. Epoxy is usually a light amber color, and must be mixed with hardener at ratio specified by the manufacturer, either by volume or weight. Using more or less hardener than the specified ratio results in an incomplete reaction and a weaker matrix. Always follow the instructions for the resin you're using. Many epoxies use either a 1:1 ratio by volume, or three parts resin to one part hardener. Both resins types cure in an exothermic reaction, which means they give off heat as they harden, and the heat can speed up the cure process, creating even more heat. If you mix a lot of resin and keep it in a cup for too long instead of spreading it out, it can get hot enough to burn your skin or even ignite a fire.

Three of the most common fibers used in composites are fiberglass, carbon fiber, and aramid (such as Kevlar). All fibers are available in uni-directional and bi-directional fabrics. Some are available in tri-axial fabrics, where the fibers are arranged in three different directions. Uni-directional fiber is used for carrying bending, tension, and compression loads. It bears nearly all the load in the direction of the fibers, and has little stiffness across the fibers. Bi-directional fabrics can carry loads in both directions, along and across the material, as well as some torsion (twisting) loads. Arranging a bi-directional fabric with the threads on the bias (45°) allows it to carry more torsion load at the expense of bending stiffness.

Fiberglass has the lowest strength-to-weight ratio, but is least expensive of the three and is available in very low weights, down to ½ ounce per square yard. The most common type of fiberglass is called E-glass, but there is a newer type called S-glass that has a significantly higher strength-to-weight ratio. S-glass was originally developed for use in satellites and is usually only available in heavier fabric weights.

Carbon fiber is typically the highest strength-to-weight of the three, and is available in multiple forms. The modulus of the fiber determines how stiff it is, with the higher modulus fibers being stiffer, but generally more brittle and not as strong as intermediate or standard modulus. The threads or yarns used to weave fabric are called "tow" and can be spread so they are much wider and thinner, for making lighter fabrics. In some cases very light fabrics are made from tows spread very wide with fiber layers laid one on top of another without weaving like traditional fabrics.

Aramid fiber (of which Kevlar is a brand name) is strong in tension but weaker in compression. It is the material used in making some bullet-proof armor. Aramid is a

very tough fiber that is difficult to cut or break. This toughness can be an advantage in some circumstances, as damaged parts will usually still be held together by the fibers and can be repaired by applying more resin and allowed to cure in the original shape. Usually, special scissors are needed to cut this fabric, and sanding aramid composites tends to remove just the resin matrix and lift the fibers, leaving a fuzzy surface. Wet sanding or applying CA to the raised fibers between sanding can help reduce the fuzzing, but generally you want to cut the raw fabric to size and minimize any sanding needed.

Happy Flying,

Duane Beck

EDITOR'S NOTES – Upcoming Events
Jeff Killen

1. **Club Meeting, at the Wright Experience, 7:00 PM, 4/26/2016 (see page 3 for directions)**
2. **Fun Fly #2, at the field, 1:30 PM, 5/1/2016**
3. **CMB Buddy Box Day, at Lenn Airpark, 10:00 AM, 5/7/2016**
4. **West Potomac HS RC Mania fly-in, at the school, 9:00 AM – 2:00 PM, 5/15/2016**
5. **Spring Pattern Contest, at the field, all day, 5/21 – 22/2016**

SECRETARY'S REPORT
Jeff Killen

The March club meeting was held on March 22 at the Warrenton Community Center. Eight members were present, along with five board members. Congratulations to Keith Crabill and Les Barnett who received their hats for qualifying to fly at the field.

Old Business
There was no old business.

New Business
Nic Burhans discussed some SFRA restrictions coming on 3/31 and 4/1. These are for fields closer to Washington, DC than us, and do not affect FARM. As the elections approach, expect more of these.

Nic Burhans also provided a treasurer's report. We now have $4128 in the bank. We have 15 members who need check out. Les Broaddus is on top of this, and reports completed check outs to the rest of us.

Bill Towne reported on the mowers, which are ready to go. We need volunteers on Fridays, at 0830, to assist. We have only 4 so far. Contact John Gilbert if you can help.

Bill Towne continues to bring hats and shirts to the club meetings which are for sale.

John Hunton will do a presentation at the May club meeting on Bill Winter model designs.

The April club meeting will be held at the Wright Experience. The CMB club is also invited to attend.

Presentation
Kwang Ko did a presentation on multi rotor quads, along with some flying.

Two of the many drones presented were:
1. Anatom – a $30 basic, hand-sized model which is gyro stabilized and easy to fly
2. Inspire 1 – largest drone demonstrated, can fly 2 miles away, and return home, via a GPS system. It also has a 360 degree camera, and retracting gear.

Flying modes discussed were: Save, RC, and Agility. Some drones us a second transmitter for controlling the camera.

In the near future, we will see object avoidance drones.

All present received a $15 gift card to Hobby Hangar from Kwang. Thanks, Kwang !

Show and Tell / Tips and Tricks

Tell – Ralph Graul noted that a AF1 Constellation from the past will be taken to Bridgewater, VA, for restoration.

Tell – Hobby Hangar employee described a CNC machine they have for producing 3D objects.

50/50
Dave Rothbart won the money.

How To Get To The 26 April 2016
FARM Club Meeting At
The Wright Experience

1. From Washington DC and East:
   - Take I-66 West to exit 40 (Haymarket).
   - Turn LEFT at the light at the top of the ramp onto US-15 South (James Madison Highway).
   - Go to #2 Below.

2. From Prince William and Loudoun Counties North of I-66:
   - Take US-15 South (James Madison Highway) toward Haymarket.
   - Stay in the RIGHT lane as you cross over I-66 to the second stop light (Sheetz is on the far left corner).
   - Turn RIGHT onto State Route 55 West (John Marshall Highway).
   - Take State Route 55 West for 4.9 miles.
   - Turn LEFT onto County Road 674 (dual signed Blantyre Road [on left] Georgetown Road [on right]).
   --- Note: If you go under I-66, turn around right there and come back to County Road 674.
   - In 0.5 miles County Road 674 (Georgetown Road) turns off to the left. DO NOT TURN!
   - STAY ON 628 (Blantyre Road) straight ahead for another 5.0 miles.
   --- Note: You will go past County roads 694 [Old Bust Head Road] on the left, 695 [McRaes Road] on the right, and 672 [Blackwell Road] on the left.
   --- Note: Now start looking for the green GLENN CURTISS LANE street sign on the LEFT.
   - Turn LEFT onto Glenn Curtiss Lane (38*46.45' North, 77*47.99' West).
   - Go to # 6 below.

3. From I-81 and West (or if you missed exit 40 from the East):
   - Take I-66 East to exit 28 (Marshall)
   - Take US-17 South (Winchester Road - James Madison Highway) for 7.1 miles.
   --- Note: As you pass County Road 787 (Watery Mountain Road) on the right, get in the LEFT lane.
   - Turn LEFT onto County Road 628 (Blantyre Road).
   - Go to # 5 below.

4. From Warrenton and South:
   - Take US-17 North (James Madison Highway) toward Marshall/Winchester for 1.7 miles North of Warrenton.
   --- Note: When you pass County Road 628 (Keith Road) on the left get in the RIGHT lane.
   - After you go over the hill, turn RIGHT onto County Road 628 (Blantyre Road).
   - Go to # 5 below.

5. On County Road 628 (Blantyre Road)
   - Take County Road 628 (Blantyre Road) Northeast for 1.0 miles.
   --- Note: Start looking for the green GLENN CURTISS LANE street sign on the RIGHT.
   - Turn RIGHT onto Glenn Curtiss Lane (38*46.45' North, 77*47.99' West).
   - Go to # 6 below.

6. Follow Glenn Curtiss Lane for 0.2 miles to the parking area at the end (7099 Glenn Curtis Lane, Warrenton VA).
   - You are at the Wright Experience.
   - The FARM Club meeting will start at 7:00 pm Tuesday, 26 April 2016.
   - Background reading material available at www.wrightexperience.com
   - See you there.

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Kwang Ko flies the Inspire 1 drone at the March club meeting while Bill Towne looks on. Over at the right, your humble Secretary is fumbling around with his camera.