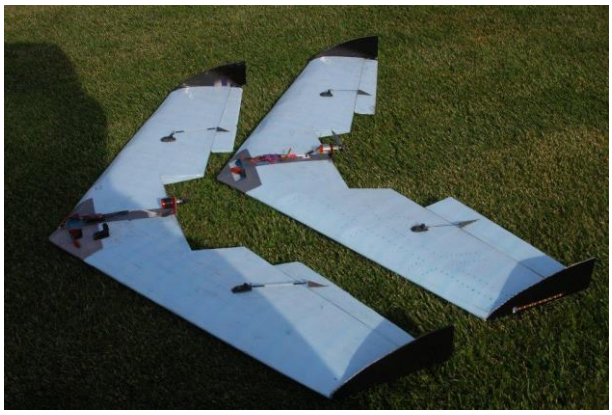
DOW BlueCor Fan-Fold and Owens Corning Pink Fan-Fold Flying Wings

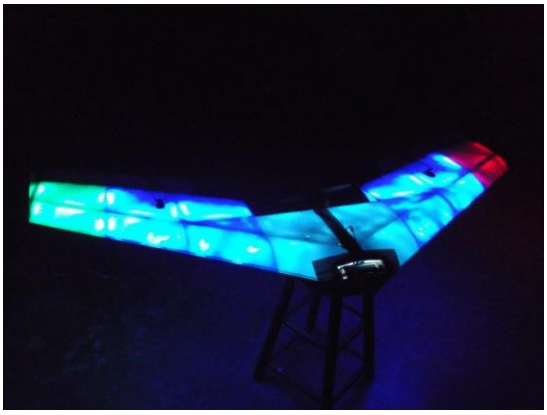
Note: I mention A LOT of items I use for the planes in this write-up; there are links to everything at the end of this document.

I have built four of these flying wings using DOW BlueCor fan-fold foam and am just starting to build a fifth flying wing using pink fan-fold. Lowes used to sell the DOW BlueCor fan-fold foam as a wall insulator, but has moved to a different type of blue fan-fold foam insulation that is not suitable for building RC airplanes. Home Depot sells Owens Corning pink fan-fold which is the same structurally as the good DOW BlueCor fan-fold, but is obviously pink.

If you go to my main RC web page at http://chrisgood.com/rcplanes/index.html, about half-way down the page, you can see construction photos of the four planes I have built, under the title “Blue Wing”.



Blue Wing #1 and #2



Blue Wing #2

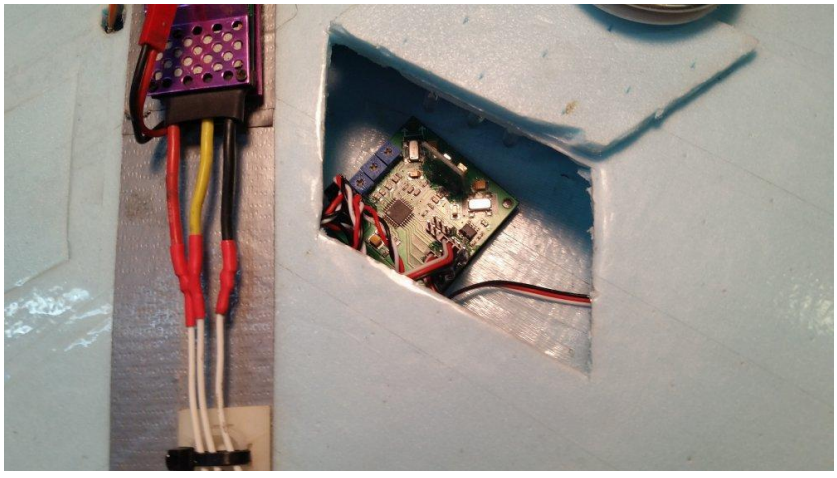
The first three wings have identical designs with 6 foot wingspans. They are powered by a 450-size outrunner motors (~450 watts), 40 amp ESC, and 2560 mah 3S lipo battery. I flew the #1 for a while to ring out the center of gravity, control throws, and low speed handling until I was happy. I then added a GoPro camera mount and a gyro on each control surface for stabilization. This is the same as a rate gyro on a helicopter’s tail servo (not in heading hold mode) – it steadies the airplane in roll and pitch against sudden gusts while airborne, but is not an autopilot that keeps the plane level. I found that with the gyros in place, the video became much steadier in all flying conditions. I have flown this Blue Wing #1 at our RCMB field, and in California, Arizona, and Utah, and have videos from many places. You can see those videos here at http://chrisgood.com/rcplanes/aerial_photos/index.html, about 2/3 of the way down the page, under the title “GoPro Hero 3”. Blue Wing #2 was built to be a night flyer, and the inside is covered with hundreds of LEDs that make the flying wing glow at night. Blue Wing #3 is identical to #1, and was built for a friend.

Blue Wing #4 is a scaled up version with a 9 foot wingspan. It is powered by an EFlite 32 outrunner motor (~ 750 watts), 50 amp ESC, and 5000mah 3S lipo battery. I also use two 265omah 3S lipo batteries in parallel for power. Blue Wing #4 has 6 super-bright LEDs that shine down through clear holes in the bottom of the wing that make it very visible at high altitude, along with red and green LED tip lights. The 6 super-bright LEDs, drawing almost 1 amp each, are controlled by a RC switch rated at 10 amps. I have also built hardware to flash LEDs in sequence (like the NightRider car from the 80’s TV show). There is lots more info on that here: http://chrisgood.com/rcplanes/night_flyers.html

I have also added a small camera and 5.8 Ghz video downlink to both Blue Wing #1 and #4 for FPV flying.

Blue Wing #4 (9 foot wingspan) + Blue Wing #1 (6 foot wingspan) for size comparison

At some point I swapped the two gyros on both Blue Wing #1 and #2 out for the HK V2.1 3-axis gyro stabilizer board that has the exact same function. The HK V2.1 3-axis gyro stabilization board is no longer sold by Hobby King. This is NOT the KK 2.1 board, which is the latest gyro and accelerometer flight controller used on multi-copters. The HK V 2.1 3-axis stabilizer board was originally made to stabilize multi-copters, but does not self-level, so it is not an autopilot. New software is available to allow it to work with normal planes and flying wings. I have recompiled that software with a few modifications to use on my flying wings, and I have the necessary hardware to flash that software to the board. I did this because I happened to have two of these boards sitting unused, and have included this info here in case someone else has one of these boards and wants to try this. See the picture below to see what this board looks like. There is more info on this stabilizer board here: http://chrisgood.com/rcplanes/rc_electronics.html#hk21



HK V2.1 stabilizer board installed in Blue Wing #2

Wing construction:

Blue or pink fan-fold foam is used for the bottom and top surfaces, wing spars, and wing ribs. Each 6 foot wingspan flying wing will use 4 sheets of foam. Each 9 foot wingspan flying wing will use 6-7 sheets of foam.

Blue Wing #3 (6 foot wingspan) - internal layout

Blue Wing #1 (6 foot wingspan) - folded over

Blue Wing #4 (9 foot wingspan) – internal layout

Pink Wing (wing #5) under construction

Wing #5 is 10+ feet across here; it will be cut down to 9 feet.

Last [partial] sheet of my DOW BlueCor fan-fold sitting on top of new Owens Corning pink fan-fold.

Owens Corning pink fan-fold (available at Home Depot) - $52 for 25 sheets:
http://www.homedepot.com/p/Owens-Corning-FOAMULAR-1-4-in-x-4-ft-x-50-ft-R-1-Fanfold-Insulation-Sheathing-21UM/100320301?keyword=owens+corning+fan+fold

DOW BlueCor fan fold (used to be available at Lowes) - $50 for 25 sheets:
http://building.dow.com/en-us/products/bluecor-insulation/?sc_itemid=%7B1e0988e0-893e-4732-a210-12933af71df0%7D

A buried web page at Home Depot on-line actually lists the DOW BlueCor as available by special order, but when I went into the store to order it, they were unable to find it in their system.

Lowes now sells this stuff in all the stores I have looked, but **it is NOT suitable to use for RC planes:**
Pactiv R1 Faced Polystyrene Foam Insulation (.25" x 4' x 50' / 25 sheets 2' wide each)
http://www.lowes.com/pd_304092-210-100000050460___

Wing strength - carbon fiber strips glued to foam spars. I have lots of these pulled from the trash of UAV construction, so I have plenty of this for many wings.

Wing tips - realty chloroplast plastic signs painted black. My wife used to be a realtor, so I have plenty of this for many wings.

Engine mount – carbon fiber sheet laminated with lite-ply. I have plenty of this for many wings.

Misc: duct tape, clear packing tape, hot melt glue, gorilla glue, servo pushrods and clevises. I have some of this, but probably not enough for lots of wings.

Electronics:

Receiver – You can bring your own receiver, or buy a new one …

- Hobby King DSM2/DSMX Rx - Spectrum / JR

http://www.hobbyking.com/hobbyking/store/__1796__1119__Radios_Receivers-DSMX_DSM2_Compatible.html

- Hobby King DSMX Rx - Spectrum / JR

http://www.hobbyking.com/hobbyking/store/__1795__1119__Radios_Receivers-DSMX_Compatible.html

- Hobby King FASST Rx – Futaba

http://www.hobbyking.com/hobbyking/store/__1799__1119__Radios_Receivers-FASST_Compatible.html

Stabilization - If you want stabilization, it can be done via a couple different methods:

- receiver with built-in 3-axis gyro stabilizer
- receiver + two gyros

I have used all both of these paths, and they all work great. I recommend a receiver with built-in 3-axis stabilizer as the easiest and best method. If you happen to have a receiver and two gyros sitting around unused, that would also be an easy method. This wing does NOT need stabilization, as it flies very well without it. If you do want to fly with a camera or VERY slow, it does help to have the stabilization.

Hobby King DSM2 stabilized receiver (6 channels)
http://www.hobbyking.com/hobbyking/store/__31586__OrangeRX_RX3S_3_Axis_Flight_Stabilizer_w_DSM2_Compatible_6CH_2_4Ghz_Receiver.html

Hobby King DMSX stabilized receiver (4 channel & 6 channel versions)
http://www.hobbyking.com/hobbyking/store/__63449__OrangeRX_MicroRX3S_3_Axis_Flight_Stabilizer_DSMX_DSM2_Compatible_4CH_2_4Ghz_Rx_w_Rem_Gain_Control.html

http://www.hobbyking.com/hobbyking/store/__65572__OrangeRX_RX3SM_Micro_3_Axis_Flight_Stabilizer_w_DSMX_Compatible_6CH_2_4Ghz.html

Hobby King FASST stabilized receiver
http://www.hobbyking.com/hobbyking/store/__76252__OrangeRx_GA7003XS_Futaba_FASST_Compatible_7ch_2_4Ghz_Receiver_with_3_Axis_Stabilizer_FS_and_SBus.html

Hobby King 401B gyros (you would need two gyros)
http://www.hobbyking.com/hobbyking/store/__10113__Hobby_King_401B_AVCS_Digital_Head_Lock_Gyro_.html

You can also go all out and use an autopilot for full self-leveling. The KK 2.1 board is a self-leveling autopilot designed for use on multi-copters, and works great for that purpose. The KK 2.1 has software built into it to control lots of aircraft types, including flying wings, but I have not done that to this plane yet, so we would be trying out something new. There are several methods to connect a receiver to the KK 2.1 board, all involving special cabling and adaptors. Please contact me if you are going this path and I can let you know what you will need.

http://www.hobbyking.com/hobbyking/store/RC_PRODUCT_SEARCH.asp?strSearch=kk+2.1

Additional electronics

6 foot version
- two standard servos (Futaba S-148, or similar)
http://www.hobbyking.com/hobbyking/store/__290__189__Servos_Parts-Std_Servo_31_49g.html
- servo wiring extensions
- 450 size outrunner motor (450 watts)
http://www.hobbyking.com/hobbyking/store/__1217__517__Electric_Motors-35_to_44mm.html
- 40 amp ESC - with battery eliminator circuit (BEC) for power to Rx and servos
http://www.hobbyking.com/hobbyking/store/__454__182__Speed_Controllers_ESC_-40_to_79_Amp.html
- 2650 mah 3S lipo battery
http://www.hobbyking.com/hobbyking/store/__11915__Turnigy_nano_tech_2650mah_3S_25_50C_Lipo_Pack.html

9 foot version
- two high-torque servos (JR DS841 on 6 volts, or similar)
http://www.hobbyking.com/hobbyking/store/__291__189__Servos_Parts-X_Large_Servo_50gplus.html
- servo wiring extensions (a bit longer)
- 32 size outrunner (750 watts)
http://www.hobbyking.com/hobbyking/store/__522__517__Electric_Motors-45_to_50mm.html
- 50 amp ESC – BEC not needed, so I recommend an opto-ESC that isolates the motor from the Rx
http://www.hobbyking.com/hobbyking/store/__454__182__Speed_Controllers_ESC_-40_to_79_Amp.html
- switching power supply (SBEC) – the high torque servos need a separate power supply, as an ESC with BEC cannot reliably give enough power
http://www.hobbyking.com/hobbyking/store/__10312__Turnigy_5A_8_26v_SBEC_for_Lipo.html
- 5000 mah 3S lipo battery -OR- two 2650 mah 3S lipo batteries in parallel
http://www.hobbyking.com/hobbyking/store/RC_PRODUCT_SEARCH.asp?strSearch=5000+3s

If you want lights:
- superbright LEDs – about 1 amp each, each super-bright LED also requires a heatsink
http://www.ebay.com/sch/i.html?_odkw=10pcs+golden+22x22x10mm+Aluminum+Heat+Sink+High+Quality&_osacat=0&_from=R40&_trksid=p2045573.m570.l1313.TR0.TRC0.H0.X5pc+10Watt+10W+High+Power+Bright+LED+900LM+Bulb+10W+Cool+White+20000K+Lamp+Ligh.TRS0&_nkw=5pc+10Watt+10W+High+Power+Bright+LED+900LM+Bulb+10W+Cool+White+20000K+Lamp+Light&_sacat=0
- LED heatsinks
http://www.ebay.com/sch/i.html?_from=R40&_trksid=p2047675.m570.l1313.TR0.TRC0.H0.X10pcs+golden+22x22x10mm+Aluminum+Heat+Sink+High+Quality+.TRS0&_nkw=10pcs+golden+22x22x10mm+Aluminum+Heat+Sink+High+Quality+&_sacat=0
- RC switch - 10 amp for superbright LEDs
http://www.hobbyking.com/hobbyking/store/__8833__Turnigy_Receiver_Controlled_Switch.html
- LED strips - many colors available in 1 or 5 meter lengths
http://www.ebay.com/itm/5M-3528-5050-SMD-300-600-LED-Strip-Lighting-12V-FLEXIBLE-DIY-6-Colors-Wholesale-/181435517609?var=480407303326&hash=item2a3e664aa9:m:m_bllgtqfgAOmEdxfIP93qQ

So what do I need from you if you are interested in building one of these?

What size flying wing do you want to build?
What electronics do you already have? Do you want me to buy any electronics for you? If there is enough interest, I can buy whatever is needed to make X number of planes.

Can you supply pushrods, blue or pink fan-fold foam, tape, and hot melt glue to assist with the building? I have a new pack of pink fan-fold (25 sheets), but am completely out of the blue. If there is enough interest, I can buy some more pink fan-fold.

Outside of the basic construction, there are these additional things to try:

Do you want stabilization?
Do you want lights?
Do you want to try to build a system to flash the lights in sequence or control them from the ground?
Do you want to try any FPV flying using a video downlink?