StealthE

While sitting at my workbench watching Redwings hockey, my idle hands found a piece of off-cut 3mm Depron foam sheet and the image of a potential aircraft started to take shape in my mind. By the end of the third period, it was almost an airplane. The wingspan and plan form were dictated by the size and shape of the off-cut, rather than through any profound mathematical, or aeronautical calculations!

I had purchased a small motor from Don Armstrong (strongrcmotors.com) the previous week and had the rest of the needed hardware in my bits-and-pieces drawers. The next evening, it was ready for a test flight but I waited for the Tuesday flying at the Ultimate Soccer Arenas in Pontiac.

The prototype flew a few flights unpainted in case changes were needed, and in fact some minor modifications were made. However it was hard to keep track of the orientation of the small, all-white plane. The model is certainly not a scale depiction of any real plane, but it does hint at the F117 stealth fighter and the illusion is enhanced by the dark gray paint used. StealthE (pronounced: "Stealthy") seemed like an appropriate name for it.

Flying:

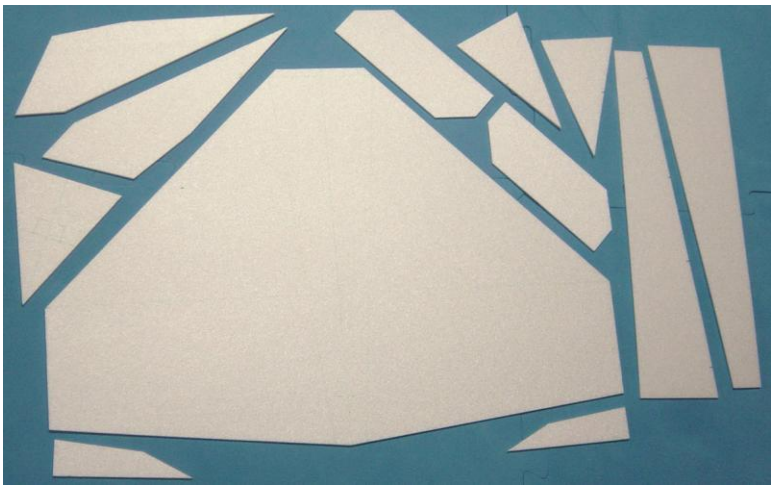
I asked Mike Pavlock to launch the StealthE for the first flight. Once trimmed, it can be launched by the pilot. I use a neck-strap for my transmitter to make self-launching easier. I hold the StealthE from the rear, with the left thumb on top between the fins and the left fingers under the wing. I reach over with my right hand and advance the throttle to about ¾, then my right hand goes back to its controls: – ready! A soft shove (into any wind) at about a 15 degree up angle augments the strong pull from the prop, and it's away.

The StealthE flies fast and because it is so small, it looks even faster. On the prototype, I chose to paint the top in a stealth-like dark gray, but left the underside white with bright yellow control surfaces. This provides good orientation identification and visibility. On the second one, I used a US Navy blue for the top. This type of light/dark contrast is highly recommended.

Specifications:	
Wing Span:	18 3/8 inches
Target Weight:	5 oz (incl battery)
Required Items:	3 mm foam sheet, scrap 1/8"lite ply & 1/32' ply; 50W power system (motor, ESC, battery); transmitter with elevon programming; 3Ch (minimum) mini receiver; 2 micro servos; push rods & rod ends; prop; hinge tape; paint
Motor used:	Strong EC20 – 2100 KV
Prop used:	GWS 5x4.7
Battery used:	3S 500mAh 20C LiPo
ESC used:	Castle Creations Thunderbird 9 With this combination, it pulls about 7 Amps static, but I measured no more than 5 Amps in the air, where the prop un-loads. StrongRCmotors suggests a 5x3 prop. Use one if the static amps are a concern.
Receiver Used:	Castle Creations Berg 4L
Servos used:	HXT500 – 5g, 0.8Kg/cm torque
Wing Programming:	Elevon (see below for Futaba programming)
Down thrust:	2 degrees
CG:	3 ¾ inches back from wing/nose break
Control throws	(measured at trailing edge) Even Lo rates are very lively!
Neutral position:	1/16 inches above center (reflex)
Up elevator:	Lo = 3/4 inches; Hi = 1 inches from neutral
Down elevator:	Lo = 5/8 inches; Hi = 3/4 inches from neutral
Up aileron:	Lo = 3/4 inches; Hi = 1 inches from neutral
Down aileron:	Lo = 5/8 inches; Hi = 3/4 inches from neutral

At the suggested throws, control is lively, but I soften the twitchiness around center-stick with about 60% expo (negative on Futaba). I seldom fly at high rates. Rolls are a bit "barrely" and I might experiment with aileron differential. Looping maneuvers can be as tight or as big as you want, but I like the look of big jet-like aerobatics: Like a big, half reverse Cuban eight into a fast, low fly-by!

The prototype was designed and built with no skegs (lower fins). It flew just fine – that is until I tried a stall. A snap spin resulted, and with no spare altitude in the soccer arena, it crashed. After repair, I flew it outside, took it a bit higher and tried again. Same snap and it would not exit the spin. I cut the throttle and watched it flat-spin into the ground like a "helicopter seed". I realized that at high angles of attack, the fins are entirely blanketed by the wing. The result is no directional influence. Back in the workshop, the skegs were added under the wing and it has not spun since. So if you decide to build one, don't be tempted to leave them off. I trimmed them with tape to protect them during "flight termination" (The end of a flight for a plane without wheels is hardly a landing!)

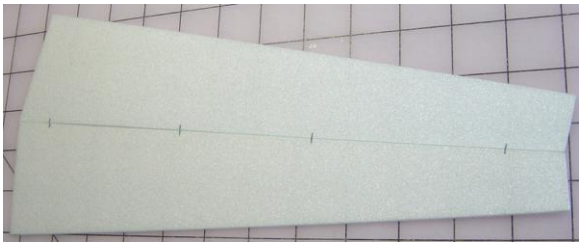


For those "flight terminations", I bring it down with two or three clicks of throttle, and nose-up, then chop the throttle just before touch-down. With a bit of wind, it can be moving fairly slowly just before impact.

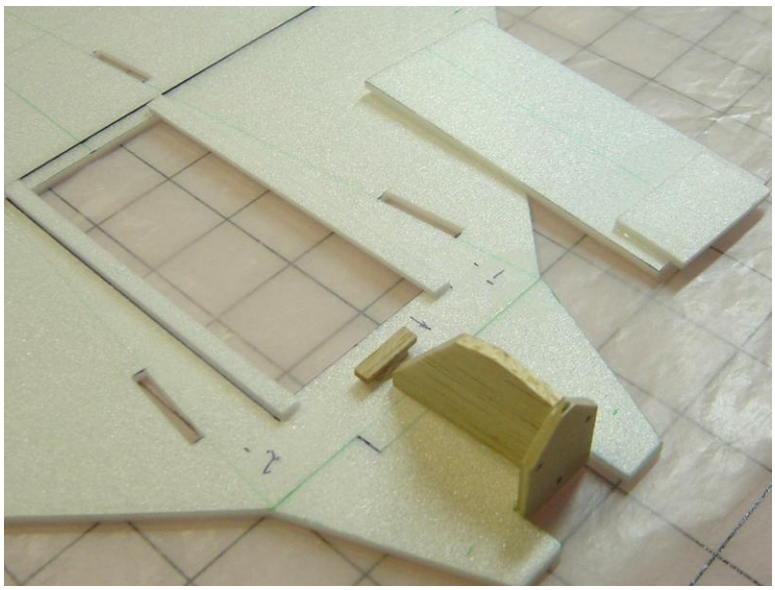
The StealthE sure packs a lot of enjoyment into its 5 oz. If you would like to build one, plans - actually a full-size parts layout sheet – are available for a $3 donation to RCCD. All parts can be cut from a single 22 inch x 14 inch piece of 3 mm foam.

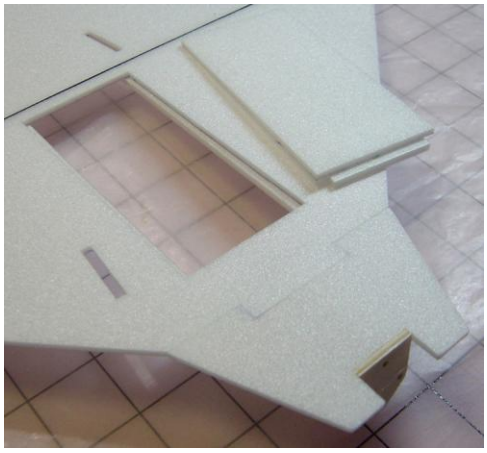
Building Notes:

The following tips and pictures should assure construction success: For adhesive, I use foam-safe CA, epoxy, canopy glue and slow hot-melt. To keep weight down when using hot melt, apply then scrape off excess while hot. Have a number of balsa scrape sticks (1/16th x 1/4th x about 2) available before you start construction.

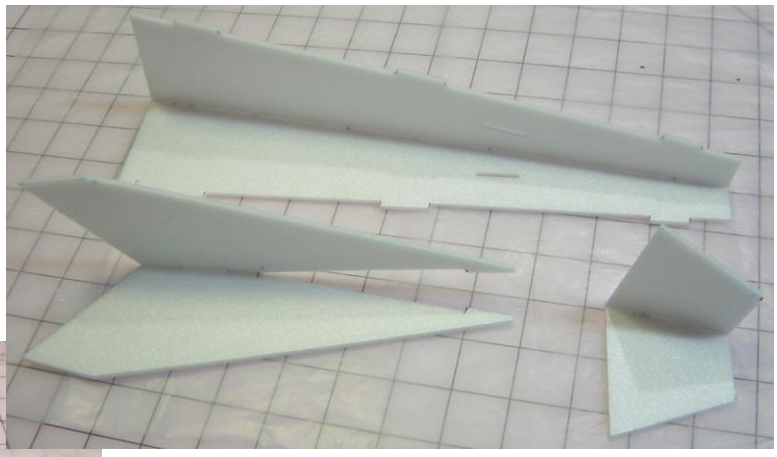


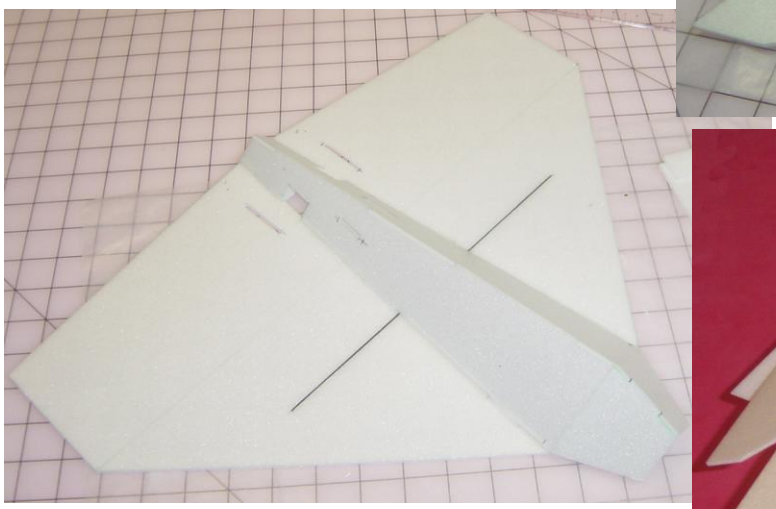
1. Cut the Depron blanks. Although not shown, also cut the hatch door.
2. For best results, mark the slots of two mating parts to each other, then cut, rather than use the plan exclusively.
3. Insert the CF wing stiffener in the slot in the wing. Weight the wing down on a flat surface.
4. Apply thin foam-safe CA to the CF stiffener and allow to wick in before applying kicker.
5. Cut the 1/8 inch lite ply firewall & balsa firewall support.
6. Drill the firewall for the motor mount
7. Epoxy or hot melt the firewall to the firewall support
8. Glue nose extension to main wing (CA)
9. Glue firewall to wing/nose assembly (hot melt)
10. Finish the hatch (while access is available). See pictures for detail. I use an elastic band to hold the hatch closed. A small magnet is another option.

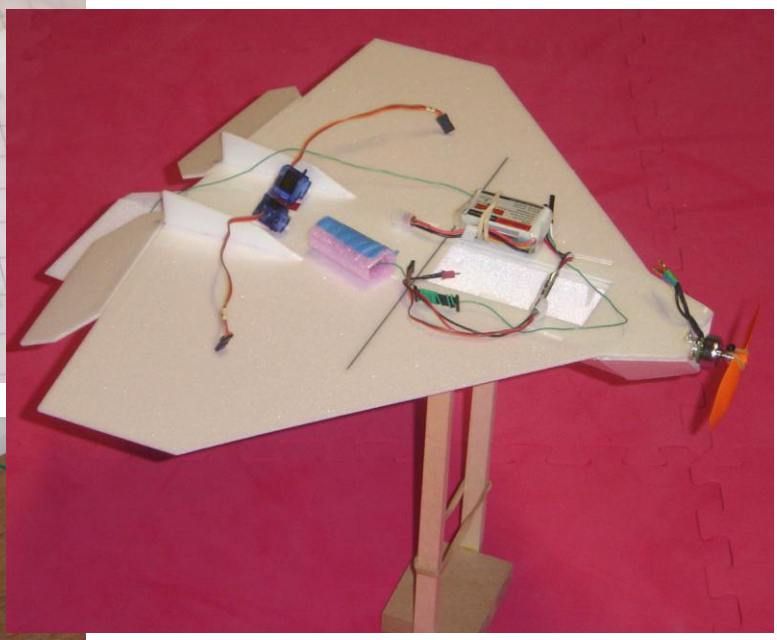


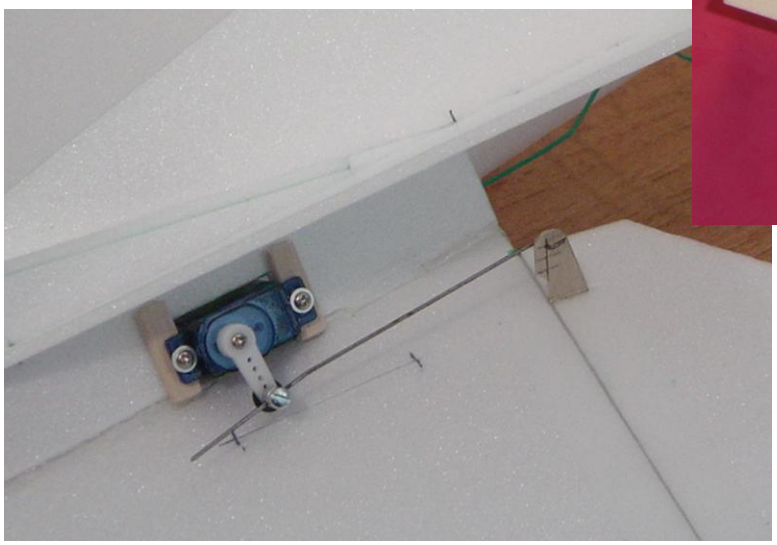


11. Bevel the control surfaces then install them to wing using Dubro hinge tape.
12. Glue fuselage sides together (CA), ensuring 90 deg.
13. Glue fins together (CA), ensuring 90 deg.
14. Glue nose upper together (CA), ensuring 90 deg.
15. Fit fuselage sides to wing, then hot-melt to wing. The hot melt fills the gap.
16. Fit nose uppers in place and glue (CA, hot melt, or canopy glue. Hot melt to firewall)



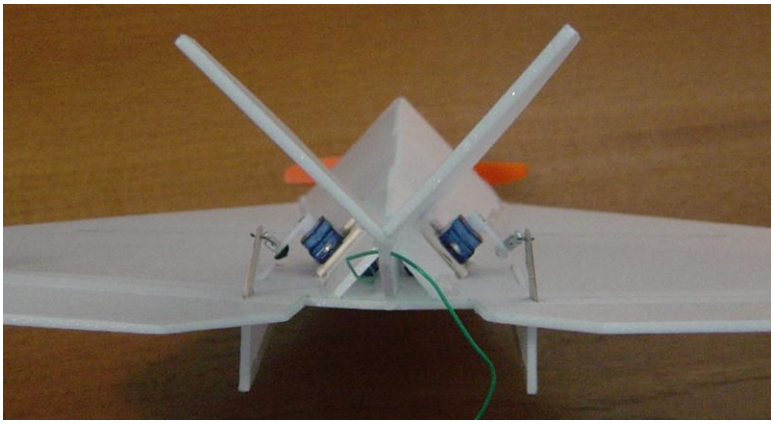






17. Temporarily place fins, skegs, radio components, and battery and adjust their positions to obtain CG.
18. Install servos where indicated by the previous step, but make sure they will have clearance.
19. Add control horns to the control surfaces. Control horns must be at least as long as servo arms.

20. Center the servos, install control arms and pushrods.
21. Fit fin assembly to fuselage (check 45 deg alignment to wing) and glue (CA, hot melt, or canopy glue)
22. Glue fin tail support (hot melt) to fins and wing
23. Fit and glue skegs (hot melt)
24. Glue scrap foam as a battery tray if required and add a Velcro patch.
25. Install the motor, ESC and receiver.
26. Set the control throws. Note there is some reflex (up elevator) at their neutral position.
27. Recheck the CG and move the battery as required.



Here is the programming for a Futaba 7C and 9C. Note the throttle disable is optional.

Futaba 7C programming	**Futaba 9C programming**
Dual Rates: Lo 60%, Hi 100% Expo: Lo -60%; Hi -60% Reverse: 1. AIL NOR 2. ELE NOR 3. THR REV ELEVON ON AIL > +100% ELE > - 75% DIFF > 0% _____ To use switch A as a throttle disable: P-MIX 1 > ON MAS > CH3 SLV > CH3 SW > A ^ RT > -100% > +100% OFS > SET With the cursor on OFFSET and the throttle stick closed, press and hold the dial/press control on the transmitter until it beeps. (You may have to place the throttle stich one click about closed)	Dual Rates: Lo 60%, Hi 100% Expo: Lo -60%; Hi -60% Reverse: 1. AIL NOR 2. ELE NOR 3. THR REV ELEVON: ACT (L) (R) RATE AIL 1 +100% +100% AIL 2 +100% +100% ELE 2 +100% ELE 1 -100% _____ To use switch A as a throttle disable: PROG. MIX 1 MIX > ON MAS > THRO SLV > THRO TRIM > OFF SW > A POSI > DOWN RATE > -100% -100% OFFSET > ON With the cursor on OFFSET and the throttle stick closed, press and hold the dial/press control on the transmitter until it beeps.

Before the first flight, check each of the following (with elevons, strange combinations are possible!):

- With the battery installed confirm the CG at 3 ¾" behind the nose/wing break (see plans).
- When aileron stick is moved right → the right elevon goes up (left goes down).
- When aileron stick is moved left → the left elevon goes up (right goes down).
- When elevator stick is moved up → both elevons go up.
- When elevator stick is moved down → both elevons go down.
- Now find an assistant and have him confirm EACH of the above again.
- And then have him launch the StealthE, so you have both hands on the controls – ready!
- Once safely airborne, cut the throttle to 1/3 to ½ to trim, and get used to your StealthE.

Have Fun

Noel Hunt

Build what I fly & fly what I build

njh 0901