Composite ARF Lightning

With cash in my pocket from the sale of my first Kingcat, I was in the market for an ARF sport jet. The Lightning had previously caught my eye, and with positive reports from those who witnessed it fly at the Georgia Jets meet in early October, I decided to pull the trigger.

Since the manual is on-line at the Composite ARF web site, I won't cover the standard construction steps, but will comment on issues or changes I found during construction.

Engine: One of the first choices you will need to make is engine. The P160 is the recommended engine, but the bypass is large enough for P180 or P200 class. My Composite ARF rep warned, however, that the larger engines would bring weight penalties, not only in the engine itself but in the counterbalance required, as the engine sits approximately 16 inches behind the CG. Additional fuel will also add weight penalties and CG shifts in flight, given that the optional third fuel tank doesn't sit on the CG.

I ultimately decided to go with the Artes Rhino in my plane for several reasons. The Rhino is comparatively light at 3.7 pounds (the literature states 3.1 pounds, but I found this to be inaccurate) yet I watched the engine put out 37.4 pounds of thrust on the dyno. Additionally, I talked to several owners who report excellent reliability. Finally, the price was very attractive.

Cost: The basic kit with the gear option came in at just over $4000. The Lightning utilizes 7 8611 class servos for the primary flight controls and flaps. Add three smaller servos for brakes, retracts and nose steering. With extensions and metal servo arms, my total servo bill was approximately $1100. Brake and retract controls added $200. While not necessary, I did install a Duralite Power Box with three 4000 Mah packs for redundant receiver power and ECU at approximately $700. Add engine at approximately $3500 and another $200 for incidentals and the total all up cost was just under $10,000.

Weight: Fuse weight with three 4000 Mah Lithium Ion packs is 24.3 lbs. Wings are identical at just under 5 pounds each, and the cockpit/canopy weighs 2.5 pounds (more on this later). With 12 ounces of lead in the nose to balance, all up weight came in at just over 37 pounds. I think I could have minimally brought the plane in at 35 pounds, but can't see it lighter at the proper CG.

Wings: I made no real modifications to the wings or landing gear, and all went together well. I particularly like the hinging approach on the inner doors. It was quick and easy to set up. In addition to glue, I did use small poly ply flat head screws to hold the strut cover hinges in place.

The instructions tell you to use a ply piece to lift the retract unit up a bit to give the wheel clearance from the top of the wing when it closes. This is a close tolerance – too little and the wheel may have problems releasing from up lock or the wing skin will separate from the inboard wing rib. Too much and the strut cover will not close completely. I had to experiment some to get the right amount of spacing. It was slightly different from side to side as well.

The gear door cylinders will require patience as they are a tight fit, but the instructions are clear on how they should be mounted. Note that the mounting block should be sanded at a slight angle to match the plane of the gear door hinge – this is not mentioned in the instructions. If you don't do this, there is a fair amount of side pressure applied on the actuating rod and it may lead to leaks around the seals at some point.

The instructions don't mention how to set up the wire attachments from the strut covers to the strut collar. To do this, you will first mount the collar on the raised section in the middle of the strut. With the gear down mark the position of the collar on the strut cover. Repeat with the gear up. Mount a scrap piece of the hinge tubing exactly half way between these marks on the inside of the strut cover. I then used .047 diameter wire bent in a C shape to finish the attachment. Fine adjustments can be made by moving the collar slightly on the strut.

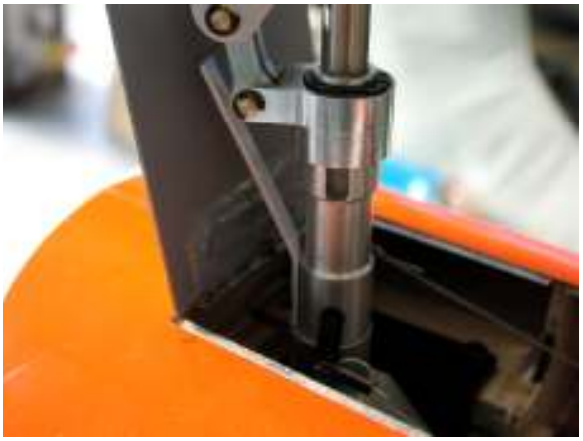
Electronics: I have attached a picture of my layout of the electronics on the component board. Electrical connections and Fuel/Gas Festo fittings are all set up to unplug close to the board so it can be disconnected and lifted out in just a minute or so.

I wanted to place the three Duralite packs as far forward as possible, without putting them out in the nose cone. I was primarily concerned about having a lot of weight in the cone in the event of hard landings. I ultimately attached the batteries to a scrap piece of plywood, which was bolted to the front former. The batteries fit perfectly, and the length of the supply leads, which I initially thought would be too long, turned out to be perfect from this position.

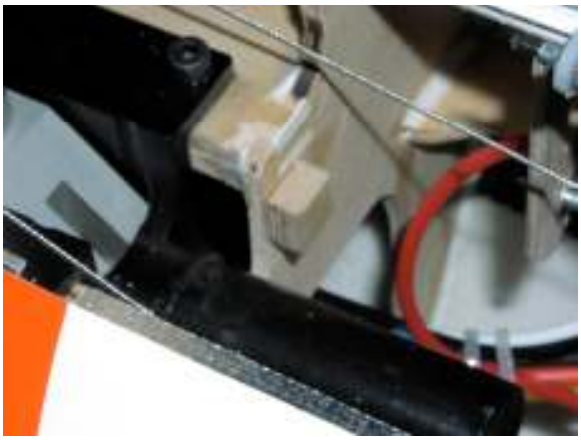
Rear Stab: The only steps here are installing servos and linkages. The servos are tucked away in the bowels of the stab,

however, and I couldn't easily get a screwdriver on the supplied screws due to the angles involved. I ended up using Dubro cap head screws and a balldriver. Make sure you use a size large enough for the pre-drilled holes.

Nose Gear: The instruction manual offers options for a one piece or two piece door. I elected the two piece door, since door sequencing would be needed for the main doors anyhow, and I wanted to keep debris off the component board that sits immediately behind the nose gear door. In Kingcat fashion, the nose gear door can be hinged at the front and air pressure will close it in flight. The strut will force the cover open when the gear is put down. Unfortunately, I found out when installing the nose gear strut that the door would hang up on the trailing link mechanism. To solve this problem, I made a small brass rail for the door to ride on, and simply drilled and tapped the strut for two 4-40 bolts to hold it in place.



The nose gear does not come with a particularly good mechanism for holding the gear centered when retracted. I solved this problem by gluing small ply blocks to the firewall, positioned such that the steering arms sit on them when the gear is up. This effectively locks the gear in place.



Cockpit: Some time ago, I picked up a Blue Box F-15 cockpit on eBay, with the intention of fitting it to my Kingcat. As I started to play with measurements, it became clear that the width, depth and height of the BB kit were almost an exact match for the canopy space in the Lightning.

The one concern I had was weight, as the BB kit is very heavy. I ended up discarding the sides, glare shield, lighting system, battery box and cut off the cockpit tub in front of the control panel. Weight of the canopy without the cockpit kit was 1 pound 2 ounces. Nose weight required to balance the model in this configuration was 1 pound 4 ounces. With the BB kit in place, the canopy now weighs 2 pounds 8 ounces (including pilot figure), but nose weight is down to 12 ounces. Net weight gain in using the kit was therefore only 14 ounces, which I decided to live with.

Other BB cockpit mods included shortening the instrument panel slightly, removing the HUD from the glare shield and gluing it to the top of the instrument panel and also taking about an inch off the bottom of the ejection seat. I attached the BB kit to the top of the canopy rails just behind the forward alignment tabs. In this position, the stock kit glare shield fits perfectly over the BB instrument panel. I then modified the aft deck piece supplied with the kit to fit behind the BB tub. In this configuration, nothing is left behind when you remove the canopy to interfere with access to the fuel systems or component board.

Tail Cone: I was very pleased with the quality of the paint and seam work on the stock kit. The only "cheesy" component was the tail cone. I had never worked with Flite Metal before, so I thought this would be a good opportunity. With a little airbrushing of burnt metal and flat black, the result was a step up. The Flite Metal seems to be holding up to the heat of the exhaust so far.

While I am on this topic, I found loose bolts that secure the inner and outer pipes. I tightened all these all down and secured with glue.

CG: If you have version 1.0 of the instruction manual, it is missing some very important words that were added to version 1.1: determine CG with the wings off the plane. The balancing method in the new manual suggests rolling the plane on the wing spar to find balance point, and that worked quite well.

Other Mods: I did replace the Festo tubing that came with the kit with BVM color-coded airlines. I also used two large BV air tanks for the main gear supply and a third for brakes, which are on separate systems. The tanks were a good fit into the nose cone.

I added a BV UAT to the fuel system, and used soft Tygon fuel tubing for the tank pickups so they would more easily flex to the bottom of the tanks. Make sure to leak check the tanks before installation.

First Flights: The first flight confirmed what I had heard about the excellent flight characteristics of the plane. I set up control throws as suggested in the manual and they proved to be good, if not a little too sensitive for me. The plane was very linear in handling and did not seem to lose a lot of lift in the turns. It was also incredibly easy to see in the air.

The Rhino flew the plane with authority. I needed 19 clicks of throttle to hold a level pattern with full flaps at a reasonably slow speed. I bled this down to 5 clicks on short final. It doesn't appear that the plane has a tendency to float or bounce. It sits slightly nose down so once the nose is lowered lift is killed quickly. While I only have a couple of landings under my belt, I didn't notice any bad habits.

I found only one bug on the initial test flight, and that was the nose gear axle bolt. The front wheel sits between two forks with spacers on either side. The axle bolt tightened up during the ground run, squeezing down on the forks and inhibiting the free play in the wheel. Stronger Loctite or a drop of CA will fix the problem.

Bottom Line: A very large jet, easy to build, excellent flight characteristics, well executed at a reasonable price.