My Balsa & Glass Workshop

USAF OA-1K Skyraider II Build Description

29 January 2026

Having served 24 years in the Air Force, I tend to keep track of new USAF developments, especially when it comes to new aircraft. One that has caught my attention is the new OA-1K Skyraider II. Air Force Special Operations Command marked a new chapter with its latest aircraft on 3 April 2025 when the first Skyraider II fully modified for military use arrived at Hurlburt Field, Fl. Additional aircraft will flow from the production line to Will Rogers Air National Guard Base, Ok. Where the Skyraider II formal training unit is located.

Based on a proven aircraft platform, the Airtractor AT-802 crop duster, the OA-1K will provide airborne eyes, ears, and precision fires to support ground troops in permissive airspace, just as its namesake, the A-1 Skyraider (top right image below), did in the Korean and Vietnam Wars. Produced by Air Tractor and modified by L3Harris, the Skyraider II replaces the U-28A Draco, a small intelligence, surveillance, and reconnaissance aircraft that also operated in austere conditions. Officials have spoken of Skyraider II's ability to *"collapse the stack"* of up to 20 ISR and armed defense aircraft that are sometimes called in to support special operations missions against violent extremist organizations.

Check out a nice video titled "Introducing the new OA-1K Skyraider II Special Operations Aircraft" showing many close-up shots of the OA-1K at Hurlburt Field, FL. You can find the video @: https://www.youtube.com/watch?v=VIsNNyCXDVs.

Figures 1 thru 4 – OA-1K Skyraider II, A-1 Skyraider, and a Border Patrol OA-1K

Source of Images: https://www.airandspaceforces.com/air-force-first-skyraider-ii-arrives/, https://iomax.net/projects/at-802-border-patrol-aircraft/

For a ***Semi-Scale*** scratch build of the Skyraider II, my starting point was the Airtractor AT-802. In Internet web search for RC model plans, I was able to find a set from AerofFred (https://aerofred.com/details.php?image_id=96287&mode=search/) for a 46.5" wingspan (approx. 1/15th scale) electric-powered model designed by Chalepmpol Hamaunsa. With some additional digging around on the web, I found plans on RCGroups.com (https://www.rcgroups.com/forums/showthread.php?2334101-AirTractor-AT-802/">RCGroups.com/) for the same Chalepmpol model, but with a better set of plans, and a PDF file for all the die-cut patterns (Figure 5). What more could I ask for! This website also contains several build images which will be a great help.

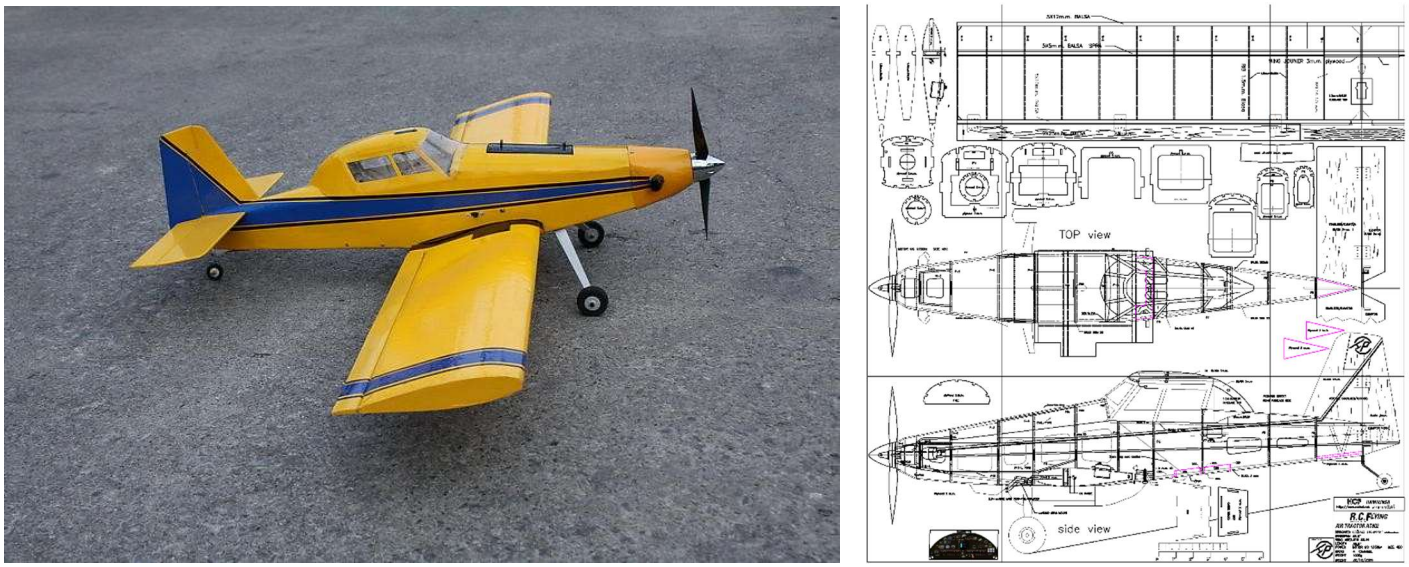


Figure 5 – 1/15th Scale AT-802 and RC Flying Plans

Source of Images: https://www.rcgroups.com/forums/showthread.php?2334101-AirTractor-AT-802/

One of many modifications needed to the AT-802 plans is wing/fuselage hardpoints for all the external stores. The two-seat OA-1K Skyraider II wing and fuselage hard points can be armed with a wide range of weapon systems, including dual .50 cal. GAU-19/A three-barrel gatling guns, AGM-114 Hellfire missiles, dual M260 seven-tube rocket launchers, Advanced Precision Kill Weapon System II (APKWS II) laser-guided 70mm rockets, and GBU-38 JDAM. The hard points can be increased to 15 to carry additional armament. The weaponry also includes FN Herstal gun pod, Dillon-Aero .50 caliber gun, GBU-12 Paveway II laser guided bomb, Raytheon MTS-A multi-spectral targeting system, and 2.75-inch precision guided rocket.

L3Harris has put forward GBU-39/B Small Diameter Bombs (SDB) and GBU-53/B Storm Breakers, also known as Small Diameter Bombs II (SDB II), as potential future armament options for the OA-1K. The GBU-39/B and GBU-53/B both offer a degree of standoff capability, and the ability to engage static and moving targets over dozens of miles. Modeling some of these external stores could be a major task.

The first step in planning for my scratch build was to take the 1/15th scale AT-802 plan PDF file and convert all the pages into SVG files. I then import the SVG files into my "Back To The Drawing Board" 2D CAD program (https://drawingboardapp.com/) The original plan PDF file has 13 pages, with 12 of them being full-scale plans. I took each of the full-scale drawing pages and imported them into the CAD program to produce the total full-scale plan sheet as seen in Figure 6 below.

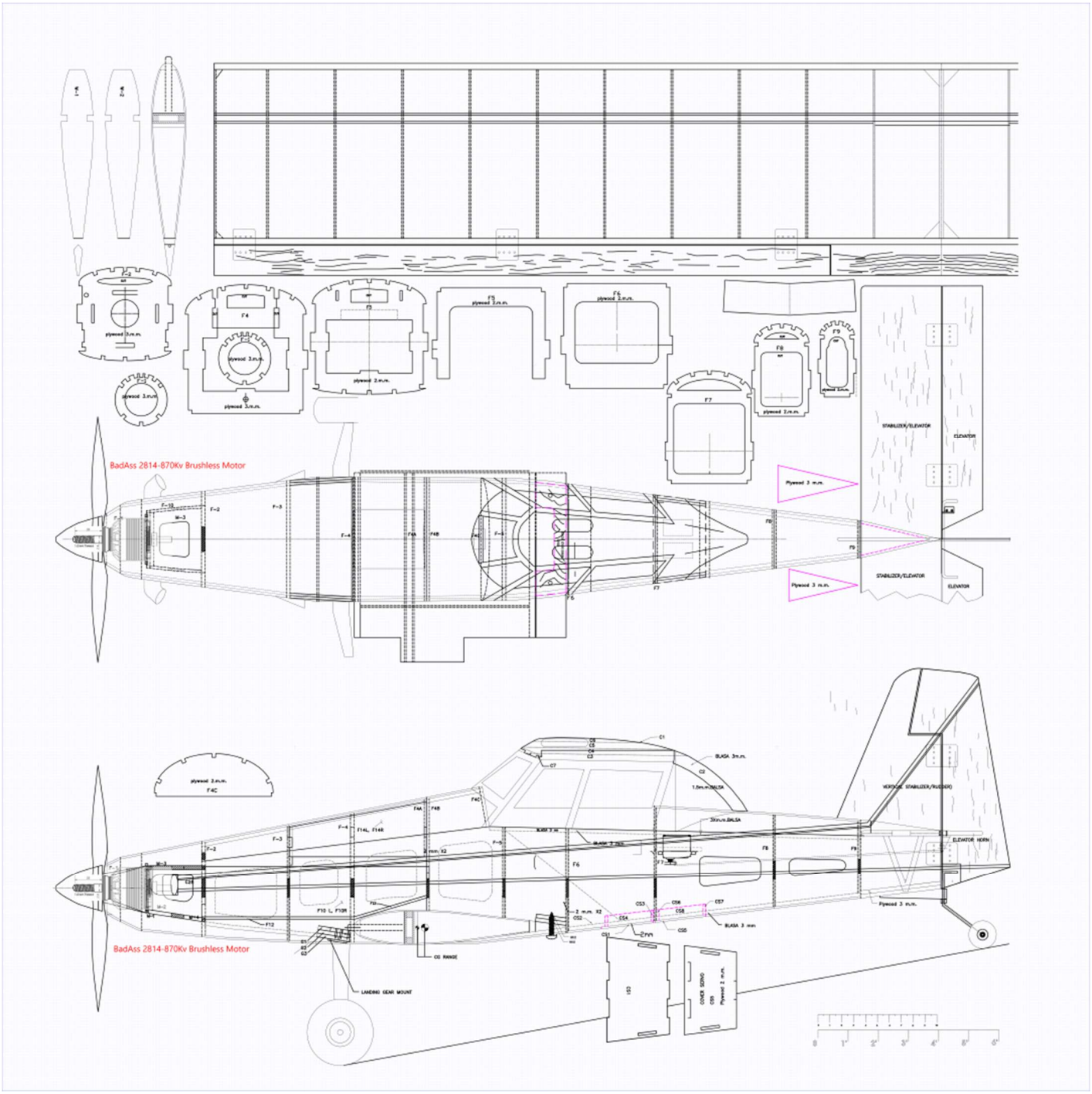
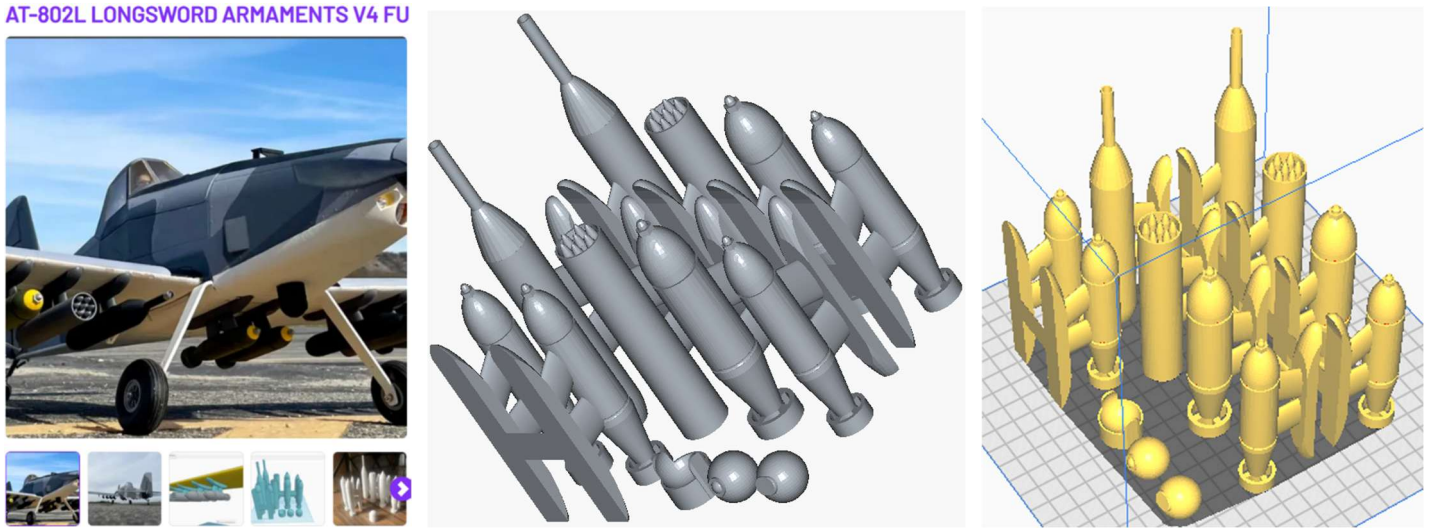


Figure 6 – 2D CAD of AT-802 Plans

I accomplish the same steps for all the pages in the AT-802 Die-Cut Patterns PDF file. From here, I started making the modifications to the design that were needed to try and model a **Semi-Scale** OA-1K Skyraider II.

Latest update on a potential avenue for the external stores. I found a source for an STL file of AT-802L Longsword Armament on the Cults3d Website (https://cults3d.com/en/3d-model/various/at-802l-longsword-armaments-v4-full/). While these are 1/12th scale to fit on the 1.5m E-flight Airtractor (https://www.e-fliterc.com/product/air-tractor-1.5m-bnf-basic-with-as3x-and-safe-select/EFL16450.html/), I researched as to how these could be re-sized to 1/15th scale using a 3D CAD program called SelfCAD (https://www.selfcad.com/). The middle image below is the STL file loaded into

SelfCAD, and the image on the right is the same STL file loaded into UltiMaker Cura (https://ultimaker.com/software/ultimaker-cura/) but reduced to obtain the required 1/15th scale armament models. Yes, I'm now venturing into the world of 3D modeling and 3D printing. ***As I keep saying, you can always teach an old dog new tricks!***



Figures 7 thru 9 – AT-802L Armaments and Related STL File Images

Source of Left Image: https://cults3d.com/en/3d-model/various/at-802l-longsword-armaments-v4-full/

Initial Power System Selection

Ok, enough with the external store's discussions for now. How about we see what power system we will need for this little beast. Given there are going to be some additions made to the wing internal structure, the ordnance loads, a SATCOM communications tower aft of the cockpit canopy, and I hope to use the same LiPo battery packs I use in my Stagger Bee (BadAss 45C 3,300mah 3S), I'm going to make an initial assumption that the total weight (ready to fly) of my OA-1K Skyraider II will come out in the range of 1,500 – 1,800 grams (53-64 oz.). With this model being somewhere between a sport flyer and warbird flyer, I'm going to use another initial assumption that the power system will need to produce 125-150 watts/lb., or somewhere around 475 watts total.

I like using the performance data charts that can be found on the Innov8tive Design Website (https://innov8tivedesigns.com/). Using that and needing 475 watts of power, that puts the power system somewhere in the range of a .25 glow engine, or the BadAss 2814 Series of motors. I wanted to try and use a 5-blade prop, as used on the OA-1K, but found I would not be able to find a spinner with the required diameter to match my OA-1K. The BadAss 2814-980Kv specifications state a Max Continuous Power (4-cell Li-Po) of 680 watts at Maximum Continuous Current of 46 amps. The motors performance data chart lists data for a Master Air Screw (MAS) 9x7 3-blade prop using a 4S battery pulling 33.5 amps and producing 1,893 grams (66.8 oz.) of thrust at 11,170 RPM. So, my initial BadAss Power System is comprised of the following components: - Motor: BadAss 2814-980Kv Brushless; ESC: BadAss Rebel V2 Series Brushless ESC, 50A; Battery: BadAss 45C 2,600mah 4S LiPo; Prop: MAS 9x7 3-Blade Prop. This will provide a power ratio of approx. 1:1 for my Skyraider II.

Modifications for OA-1K Plan Drawings

Let's get back to the plan drawings for the OA-1K. After looking over the AT-802 plans, I determined the following are some of the wing modification/additions needed: 1) addition of wing/fuselage ordnance hardpoints structure; 2) replace the center wing aileron servo with individual flaperon servos on each side of the wing; 3) add wingtip blocks and shape to match those used on the OA-1K; 4) use basswood for the wing main spars; 5) new thicker wing ribs using the NACA 4415 airfoil profile that is used on the OA-1K; and 6) addition of some gussets to the wing structure. These plan changes can be seen in Figure 10 below of the left half of the wing.

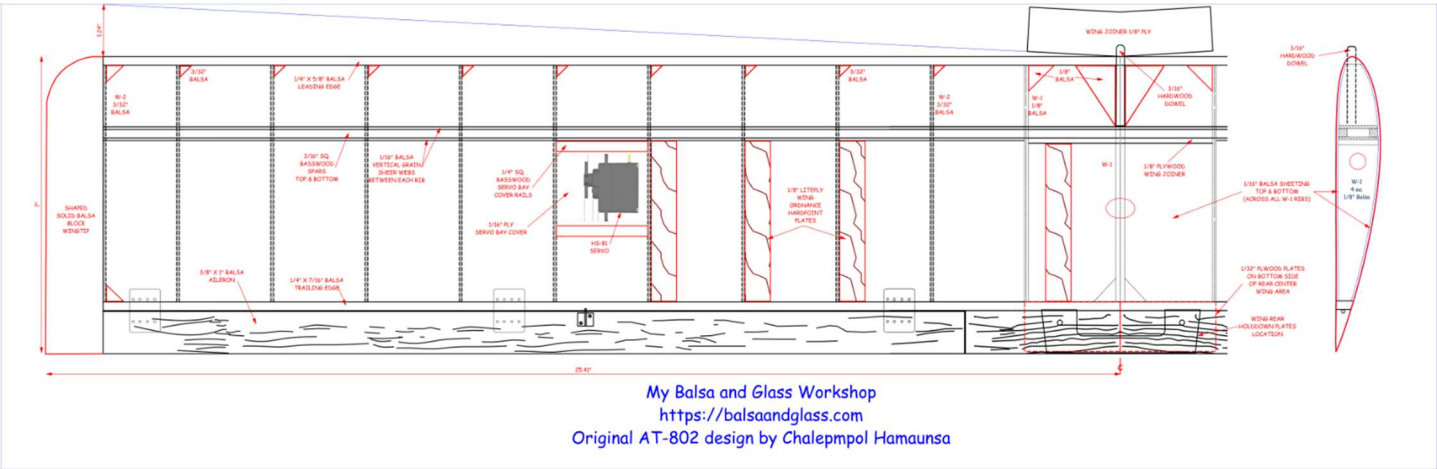


Figure 10 – OA-1K Left Wing Half 2D CAD Plan (OA-1K_Left_Wing.pdf)

For the horizontal and vertical stabilizers (*tail feathers*), the modifications I see needed are: 1) extend the elevator tips forward to better match what used on the OA-1K; 2) addition of some 1/32" and 1/64" plywood plates; and 3) addition of two vertical strakes on the horizontal stabilizer lower surface to match those used on the OA-1K. These plan changes can be seen in Figure 11 below.

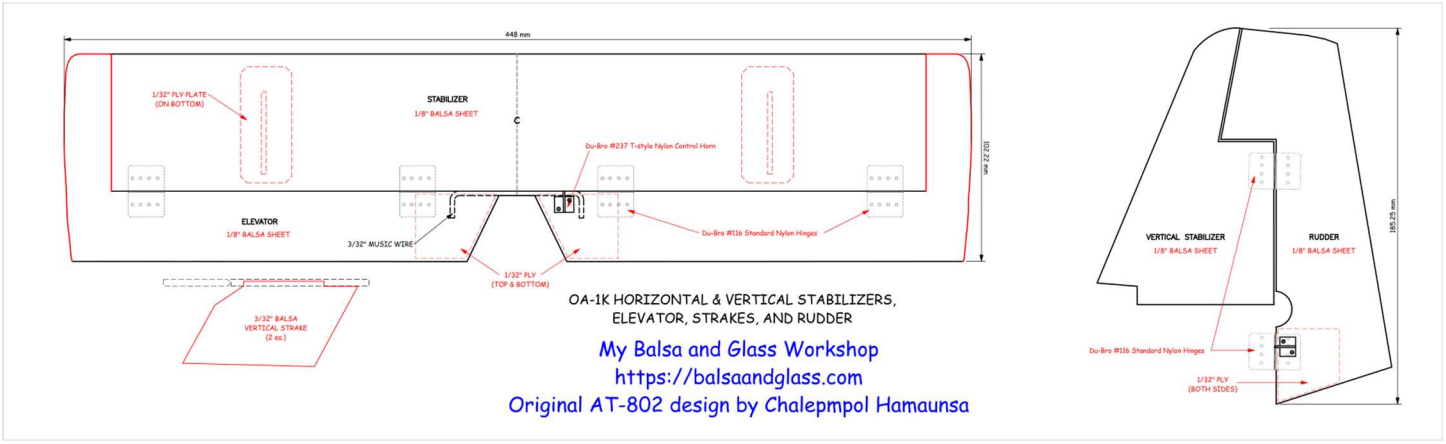


Figure 11 – OA-1K Tail Feathers 2D CAD Plan (OA-1K_Stabs_Plus.pdf)

Next are the modifications to the AT-802 fuselage plan. **Note** – I updated all the plans to change any measurements from metric to Imperial (US). While I find it easier to build using metric, to aid other builders in ordering balsa and plywood, Imperial measurements are a must. Having selected a BadAss 2814-980Kv Brushless motor for my power system, the original wooden structure of the motor box used in the

AT-802 plan was replaced with a Innov8tive Designs 3D Printed Motor Mount for 28mm motors, 40mm length, to ensure a correct spacing between the propeller and fuselage nose. With the change of wing rib profile to a NACA 4415, this drives some modifications to the fuselage sides, doublers, several formers, and the area below the wing center section to match the fuselage profile. The various plan changes can be seen in Figure 12 below.

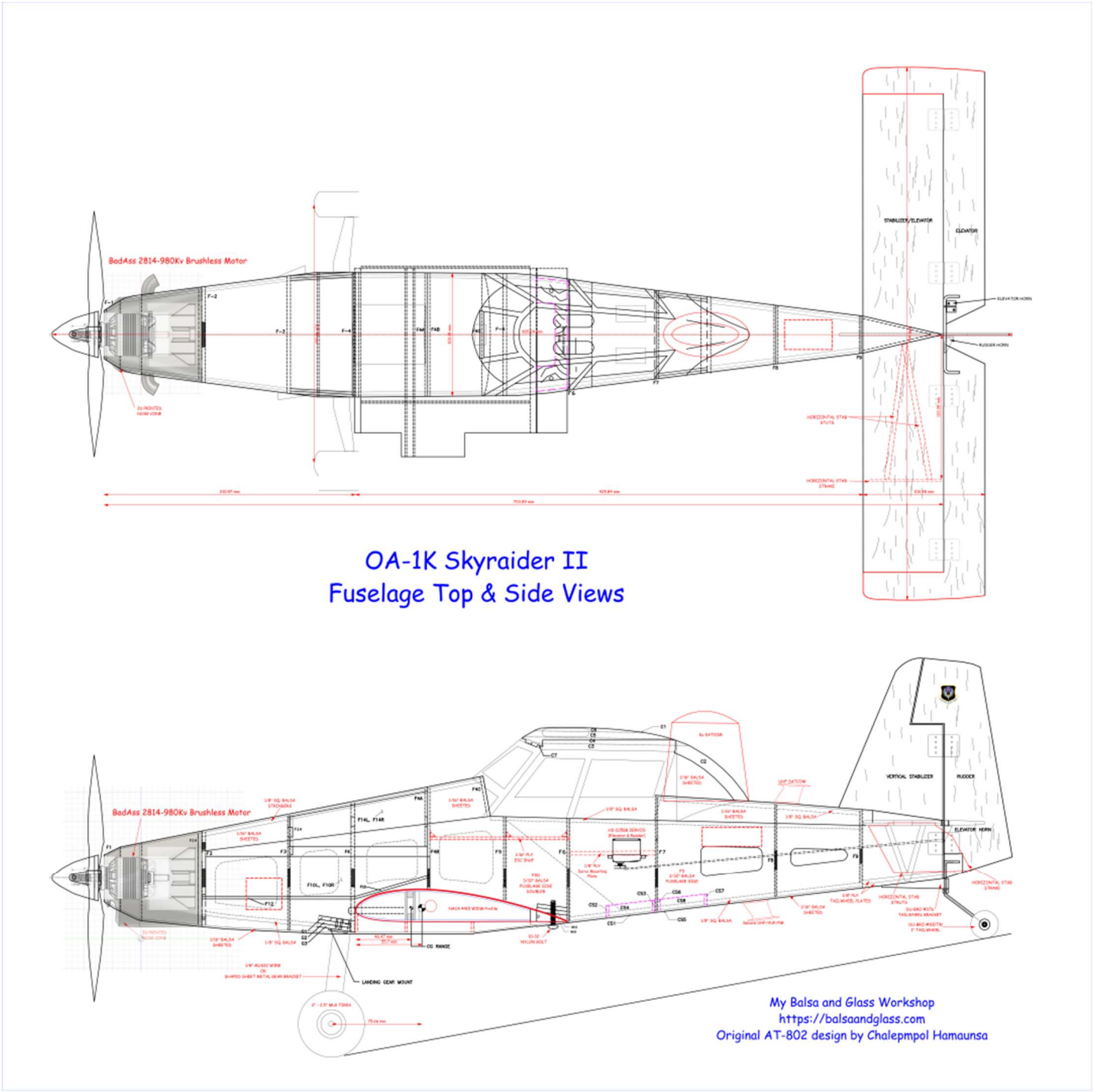


Figure 12 – OA-1K Fuselage 2D CAD Plan Views (OA-1K_Fuselage_Views_Updated.pdf)

Changing to the NACA 4415 wing profile resulted in modifications to the fuselage sides, doublers, and formers F3, F4, F4B, and F5. These changes can be seen in Figures 13 below. **Note** – These former templates were also updated to reflect changes I found needed later in this build description.

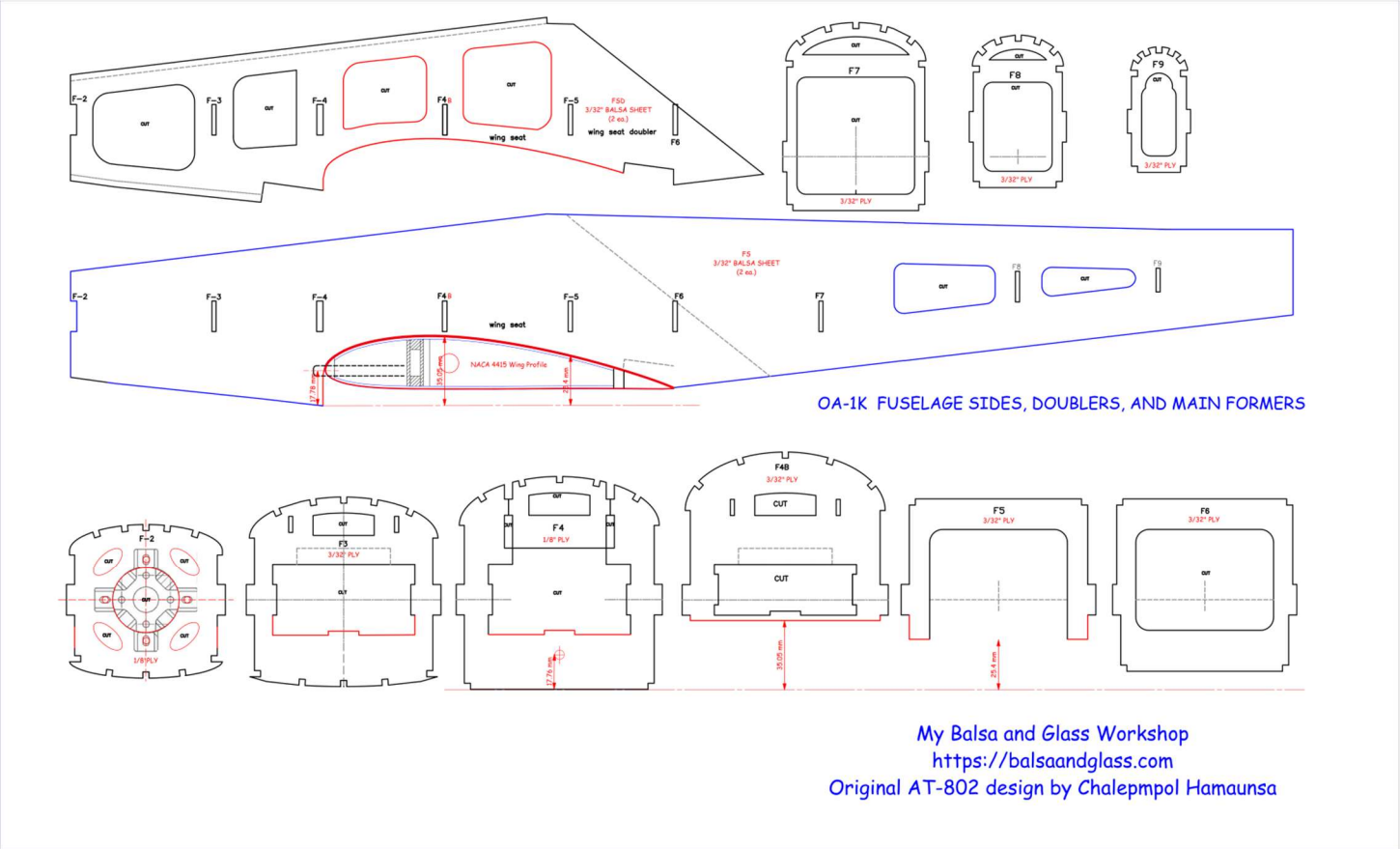


Figure 13 – OA-1K Fuselage Templates Modifications (OA-1K_Fuselage_Templates_Updated.pdf)

The motor nose cone needed to be modified to better represent the nose of the OA-1K. Using the nose former templates for the AT-802, and a front view image of the OA-1K, I made several modifications to try and capture the turbine engine air intake and landing lights at the front of the nose cone as shown in Figure 14 below.

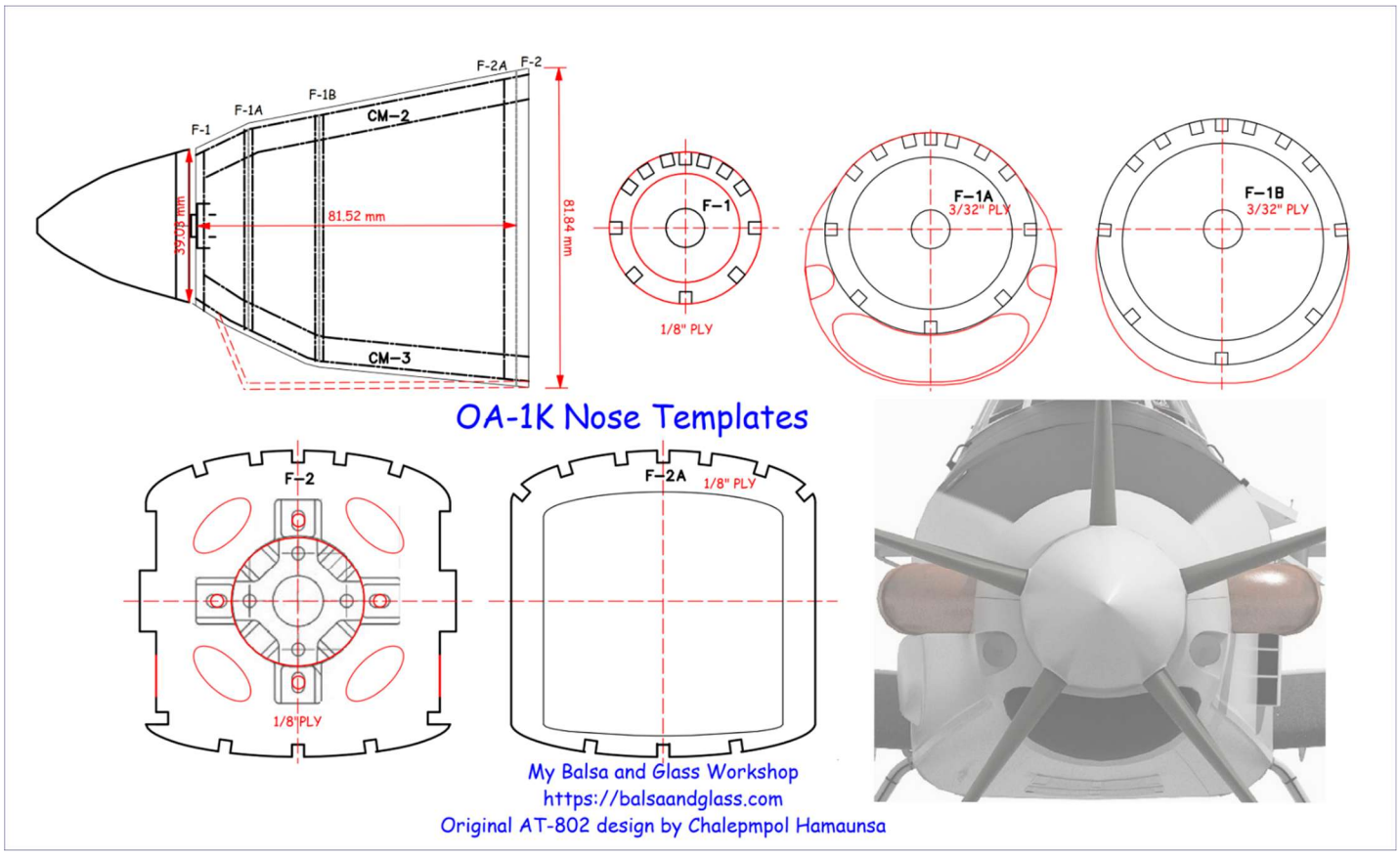


Figure 14 – OA-1K Nose Cone Templates Modifications (OA-1K_Nose_Templates_Updated.pdf)

Source of Lower Right Image: https://www.turbosquid.com/3d-models/air-tractor-at-802u-rigged-719751

I wanted to model the OA-1K nose cone such that I could build it using a 3D printer versus the former, stringers, and balsa ply sheeting method used in the AT-802 plans. To do this I first had to learn how to use a 3D CAD program to produce the STL file required for 3D printing. So, I was off again learning yet another new computer program and jumping feet first into the world of 3D modeling. After many hours of research and trying my hand at several 3D programs, I finally settled on using Autodesk Fusion 360 (https://www.autodesk.com/products/fusion-360/personal). Autodesk offers a 100% free Fusion 360 license to Students and Hobbyists. I'm working with the free version using a Personal Use license.

While I'm very comfortable using my 2D CAD program, I found the 3D world rather challenging for my old mind. To aid in getting my mind and mouse fingers up to speed, I worked through several of the outstanding Fusion 360 video tutorials available on the web. Using my modified drawings of the nose cone formers, I imported a PNG image of Figure 14 into Fusion 360 to build my 3D nose cone. After many hours of working with and learning the program, I finally was able to produce my first 3D model shown in Figure 15. This nose cone with turbine exhaust pipes weighs in at 32 grams.

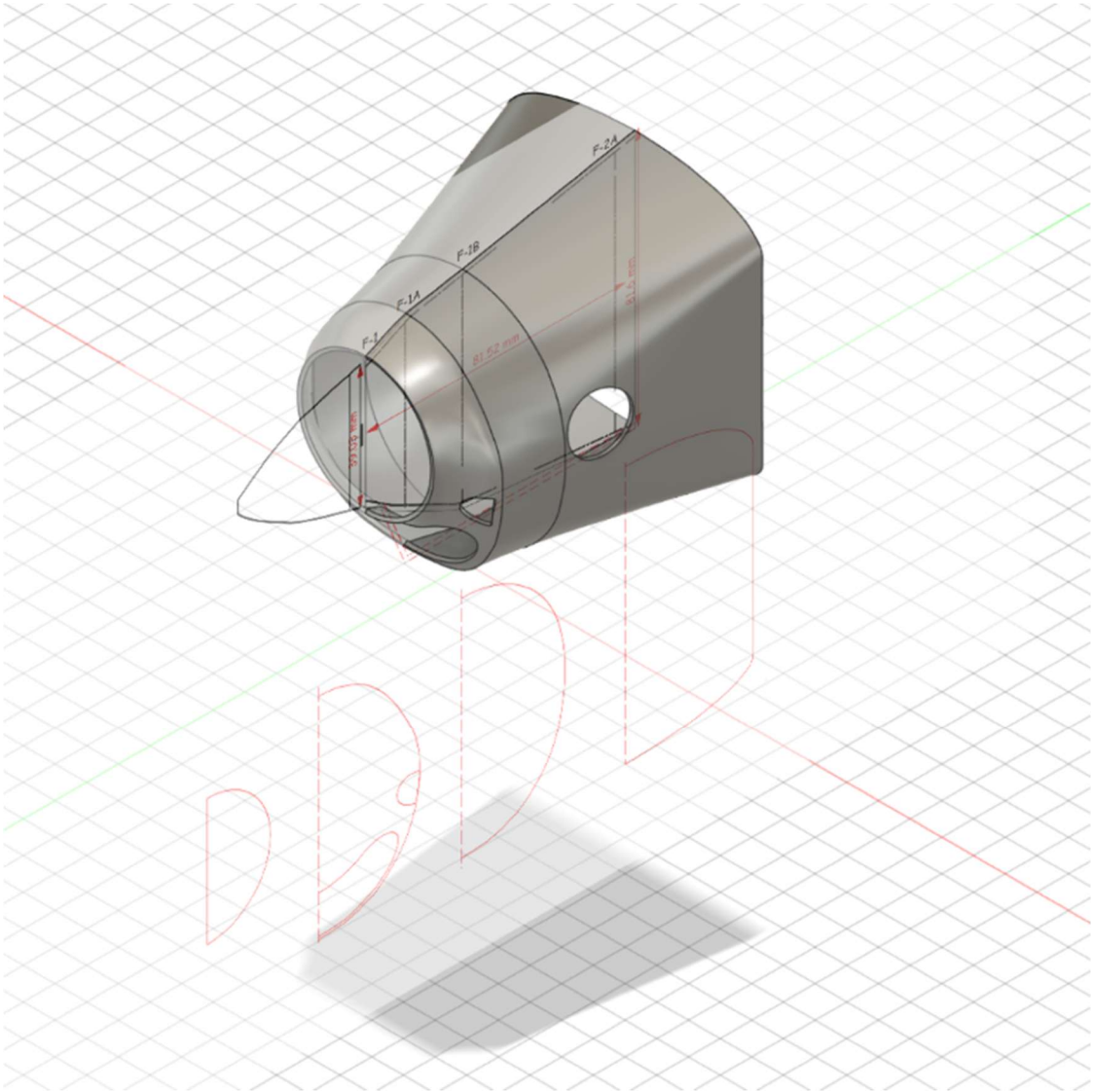


Figure 15 – OA-1K Nose Cone 3D Model in Fusion 360

So, next up was to try and 3D model the cockpit canopy. While I tried to work my way through the canopy 3D modeling, I started my scratch build of the OA-1K Skyraider II with the wing.

The first thing I do with all my scratch builds is to print out the plans on my Canon printer using the "poster" settings for a full-size plan. Then I take all those pages and put them together to get the full-size plan sheets for the OA-1K. You can also get your plans printed out at any FedEx or Staples Store, which will run you approximately $20.

Using the OA-1K plans, I determined what materials I would need to make my scratch build. Once I had a complete wood and material list, any balsa sticks and sheets, basswood sticks, and plywood that I don't already have in my material stocks were ordered from Balsa USA (https://balsausa.com/). The four Hitec HS-81 16.6g Nylon Gear Analog Micro Servos, Spektrum AR410 4-Channel RC Sport Receiver, Du-Bro #500 36" Lazer Rod Pushrods, main landing gear wheels, steerable tail wheel assembly, MAS 9x7 3-Blade Propeller, spinner and all other required hardware were located on the web or purchased from my local hobby shop. The BadAss Power System is comprised of the following components: - Motor: BadAss 2814-980Kv Brushless; ESC: BadAss Rebel V2 Series Brushless ESC, 50A; Battery: BadAss 45C 2,600mah 4S LiPo. This system was purchased from "Innov8tive Designs" at https://innov8tivedesigns.com/.

The "OA-1K Materials and Parts List" below contains all the materials and hardware required to build my Skyraider II.

OA-1K Skyraider II Materials and Parts List

Wing:

Quantity	Description	Use
Balsa		
4	1/16" x 3" x 36" balsa sheets	center section sheeting & spar sheer webbing
1	1/16" x 4" x 12" balsa sheet	center section sheeting
1	3/32" x 3" x 36" balsa sheets	W-2 wing ribs (20 each)
1	1/8" x 3" x 12" balsa sheet	W-1 wing ribs (4 each)
2	¼" x 7/16" x 24" balsa sticks	trailing edge (can also be cut from ¼" sheet)
2	¼" x 5/8" x 24" balsa sticks	leading edge (can also be cut from ¼" sheet)
2	3/8" x 1" x 24" aileron stock	flaperons
2	1-1/4" x 1–3/8" x 7" balsa blocks	wing tips
Basswood & Hardwood		
4	3/16" x 3/16" x 24" basswood sticks	top/bottom wing spars
1	¼" x ¼" x 12" basswood stick	flaperon servo bay rails
1	3/16" x 2" hardwood dowel	front center wing hold down
Plywood		
1	1/32" x 1" x 4-1/2" 3-ply birch plywood	center rear wing bottom plate
1	1/16" x 2" x 4" 3-ply birch plywood	servo bay covers
10	1/8" x ¾" x 4" Lite plywood	ordinance hardpoint plates
1	1/8" x 1-1/2" x 4-1/2" birch plywood	wing joiner plate

Tail Feathers:

Quantity	Description	Use
Balsa		
1	1/8" x 3" x 8" balsa sheet	rudder
1	1/8" x 4" x 24" balsa sheet	horizontal/vertical stabs and elevator
1	3/32" x 2" x 8" balsa sheet	stabilizer vertical strakes
Plywood		
1	1/64" x 2" x 12" birch plywood	elevator and rudder plates
1	1/32" x 2" x 3" birch plywood	horizontal stab bottom plates

Fuselage:

Quantity	Description	Use
Balsa		

4	1/16" x 4" x 36" balsa sheets	LiPo bay hatch sides, fuselage sheeting, canopy sides/front/back
3	3/32" x 4" x 36" balsa sheet	F10L/R, fuselage sides & doublers
7	1/8" x 1/8" x 36" balsa sticks	fuselage stringers

Plywood

1	3/32" x 12" x 24" Lite-Ply	C7, fuselage formers, servos access covers & assembly
1	1/8" x 6" x 6" Lite-Ply	C1, C2 canopy formers
1	3/16" x 6" x 12" Lite-Ply	C3L/R, C4L/R, C5L/R canopy parts
1	1/16" x 6" x 12" birch plywood	F14L/R, F12, F13, ESC mounting plate
1	3/32" x 2" x 5" birch plywood	M2 (2 each) motor mount formers
1	1/8" x 12" x 12" birch plywood	F2, F4, wing hold-down plates, MLG mount plates, wing joiner, tail wheel plates, rudder & elevator servos tray

Flight Control System:

1	Spektrum AR610 6-Channel RC Sport Receiver	2.4GHz DSMX receiver
2	Hitch HS-225BB 27.7g Nylon Gear Analog Mini Servos	rudder & elevator servos
2	Hitch HS-81 16.6g Nylon Gear Analog Micro Servos	flaperon servos
4	8" Servo Lead Extensions	flaperon servo leads

Electric Power System:

1 BadAss 2814-980Kv Brushless Motor
1 Innov8tive Designs 3D Printed Motor Mount for 28mm motors, 48mm Length
1 BadAss Rebel V2 Series Brushless ESC, 50A
3 14AWG ESC to Motor Extension Cables w/3.5mm bullet connectors (20cm)
1 BadAss 45C 2,600mah 4S LiPo Battery
1 MAS 9x7 3-Blade Propeller (https://www.amazon.com/Master-Airscrew-Blade-Propeller-MAS0970T/dp/B0000WS5TG?th=1)
1 3-Blade Plastic Spinner, 42mm (1.65") backplate diameter (3D printed using PETG)

3D Printing Materials:

Creality Hyper-PLA: Gray – Ordnance models, pilot & weapons specialist busts
Creality Hyper-PETG: Gray – Nose Cone, Weapon Station Pylons, Canopy, air cooling scoops/vents/grills, Various Antennas
Giantarm Silk Metallic Silver PLA – Turboprop Exhaust Pipes

Miscellaneous Items:

1	Aluminum 25-40 Class Landing Gear Wheel Kit (includes 2" foam wheels)	
1	3/32" x 6" music wire	elevators joiner wire
1	Du-Bro #376 Tailwheel Bracket	tailwheel assembly
1	Du-Bro #100MW 1" Mini Lite Wheel	tailwheel
2	Du-Br0 #138 3/32" Wheel Collars	tailwheel assembly

2	#3 x 5/16" Socket Head Screws	tailwheel bracket
1	Du-Bro #164 10-32 Nylon Wing Bolts (set of 4)	wing mounting bolts
1	Du-Bro #129 Socket Head Bolt & Blind Nut Set	motor mount to F2 firewall mounting
12	Du-Bro #116 Standard Nylon Hinges	elevator, rudder and flaperons hinging
1	Du-Bro #500 36" Lazer Rod Pushrods	rudder/elevator control rods
2	Du-Bro #237 T-style Nylon Control Horns (2 each)	control surfaces rigging
2	Du-Bro #600 2-56 Spring Steel Kwik-Link Clevises	control surfaces rigging
2	Du-Bro #855 E/Z Links	flaperons rigging
2	6" 2-56 control rods	flaperons rigging
8	2-56 nuts	rudder, elevator, and flaperons rigging
4	#1 x 1/8" pan head screws	Horizontal Stab Struts
12	#1 x 5/16" pan head screws	servo hatch cover & wing servo mounting plates
1	2" x 12" VELCRO fastener tape	ESC and LiPo battery mounting
1	Hangar 9 Self Stick Weight 6 Oz	for CG balancing (if needed)
22	4x2mm Neodymium disc magnets	pylons & wing hardpoint attachment rails
16	5x2mm Neodymium disc magnets	LiPo bay access hatch, canopy/cockpit floor
1	8x11.5" 10mil clear plastic sheet	canopy windows
1 bottle	Titebond Ultimate III wood glue	
1 set	20 minute two-part epoxy	
1 sheet	220 & 320 grit sandpaper	initial & finish sanding
Various	Acrylic Paints	use to paint ordnance, pilot busts, etc.
1 roll	Light Gray Ultracoat	model covering

OA-1K Skyraider II RC Model Specifications

Type: 1/15th Semi-Scale Warbird
Wingspan: 50.8" (1,291mm)
Wing Chord: 7" (177.8mm)
Total Wing Area: 355.6 in^2 (229.5 dm^2)
Wing Aspect Ratio: 7.26
Wing Location: Low Wing
Wing Airfoil Profile: NACA 4415
Wing Dihedral: 1.25" (31.8mm) at wingtips
Horizontal Stabilizer/Elevator Span: 17.6" (448mm)
Horizontal Stabilizer/Elevator Chord: 4.0" (102.5mm)
Total Horizontal Stab/Elevator Area: 70.4 in^2 (45.7 dm^2)
Rudder Height: 7.3" (185mm)
Rudder Area: 13.5 in^2
Total Vertical Stabilizer/Rudder Area: 23.6 in^2
Fuselage Length: 31.7" (805mm)
Fuselage Width: 4" (103mm) max.
Recommended C.G Range: 1.83 – 2.19 in. (46.5 – 55.7mm) aft of wing root chord leading edge
Rec. No. of Channels: 4 – Throttle, Elevator, Rudder, and Flaperons
Ready to Fly Weight: 53 – 64 oz. (1,500 – 1,800g.) depending on power system selected
Wing loading: **21.5-25.9** oz./ft^2

Electric Powered: Output of 475-650 watts, 50A brushless ESC; 4-cell LiPo pack sized up to 2,600 mah

Building the OA-1K Wing

Now the real fun begins. For this scratch build I once again used my magnetic building board and mag fixtures, so I put the modified right wing-half plan sheet on the mag board and cover it with transparent plastic film to prevent the glue from sticking to the plan. Using the new modified W-1 and W-2 rib templates from OA-1K_Templates-3.pdf, I cut out the required number of ribs from 3/32" and 1/8" balsa sheets and then place them over the plan to check for proper fitting. An item I found that really simplifies putting the various templates on the balsa and plywood sheets is Piper's Pattern Paper (https://www.anythinginstainedglass.com/cuttermate/pipers-pattern-paper.html#3420). This is an adhesive backed pattern paper used in cutting Stained Glass. I just print the templates from my 2D CAD program onto the pattern paper and then cut and sand the parts up to the template lines. No tape or glue or spray adhesive mess to deal with. It is much easier than having to trace the templates off the plan with tracing paper, cut the templates out, and then trace around the templates with a pencil on the balsa for cutting and sanding. ***Yet again a new trick for an old dog.***

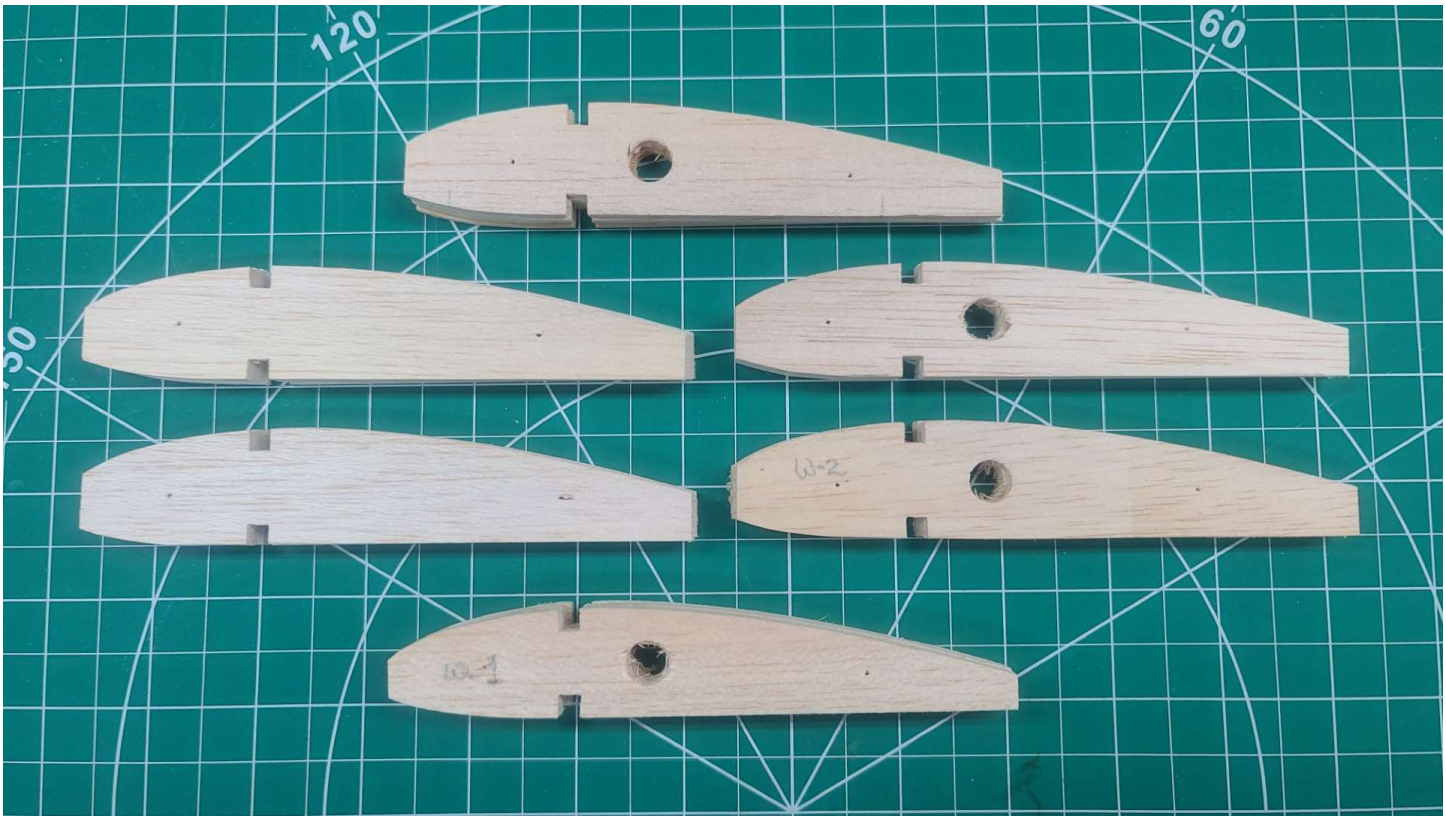


Figure 16 – OA-1K NACA 4415 Airfoil Profile *Wing Ribs (24 total)*

Another item to mention is my Master Airscrew MA4000 Balsa Stripper. I use this neat little tool to cut balsa sheets into the various sizes of balsa strips I will need for the wing, like the ¼" x 7/16" trailing edge. This stripper is engineered to accurately cut balsa sheets up to ¼" thick into strips up to ¾" wide. It has a lead screw with 32 threads per inch so that each turn of the wheel will move the blade 1/32 of an

inch and uses a standard Type 11 hobby blade. You can find the balsa stripper at your local hobby store and on Amazon.

Builders Notes – 1) I substituted 3/16" x 3/16" basswood for the wing spars versus the 5x5mm balsa spars called out on the plan. 2) To add strength to the wing I increased the thickness of the W-1 ribs to 1/8" and the W-2 ribs to 3/32". 3) Don't forget the two W-1 ribs need to be raised 1/16" off the building board to allow for the 1/16" sheeting that goes on the wing center section after the two halves are jointed together. 4) I added ¼" x 7/16" doublers on the inside of the tailing edge where the flaperon hinges will be installed. 5) You should raise the leading edge off the building board using 3/32" spacers.

Figure 17 below shows the modified right wing-half in a full-up dry run fit check. ***Here is the real beauty of a magnetic building board.*** You can take most, if not all, of the parts for an assembly, and verify how they all fit together ***before*** you glue anything. This is the part of a scratch build that I really enjoy. Seeing how the 2-D drawing of a modified plan comes together for a *hopefully* functional 3-D balsa RC model aircraft.

Figure 17 – OA-1K Wing Right Half Full-Up Dry Run Fit Check on Magnetic Build Board

Once satisfied that everything fits, I started gluing the right wing-half together using Titebond III Ultimate wood glue. I find it much easier to glue parts by putting the Titebond III in an *"Industrial Plastic Syringe with Blunt Luer Lock Needle"*, versus trying to place the glue straight from a large glue bottle. You can find the syringes on Amazon.

I needed to determine the location of the cut-outs for the pylon mounting rails in the 1/8" Lite ply weapon station hardpoints. To do this I first had to decide on the type of pylon and hardpoint mounting rails to be used. After a quick search of the web, I found a nice set of weapon hardpoint pylons designed by ShadowVFX on Cults3d.com (https://cults3d.com/en/3d-model/game/hobbyking-avios-super-tucano-weapon-hardpoint-pylons). These are weapon pylons, bombs and central fuel tank for the Avios Super Tucano RC airplane. They are designed to use standard Freewing attachment hardware, but he also

provides copies of the Freewing attachment hardware in STL files (both Male and Female) for use on the airplane wing (to attach the pylon to the wing) and any potential weapons you want to attach to the pylon. Figure 18 shows you the Hobbyking Avios Super Tucano Weapon Hardpoint Pylons.

Figure 18 – Hobbyking Avios Super Tucano Weapon Hardpoint Pylons

With pylons in hand, I now needed to find some models of the ordnance I wanted to hang under the wing and fuselage of my OA-1K. For a targeting pod, because I had worked in the USAF Targeting Pod Program Office as an acquisition program manager for six years, I wanted to use the AN/AAQ-28(V) Litening Targeting Pod. I was able to find exactly what I wanted again on Cults3d.com (https://cults3d.com/en/3d-model/game/1-10th-scale-an-aaq-28-v-litening-targeting-pod). This 3D model was designed by DirtyDee and is modeled for the 1.7m Freewing A-10 Thunderbolt II. The pod body has a slot to use standard Freewing attachment hardware. For one of the ordnance items, I selected a DirtyDee model of the GBU-12 Paveway II laser guided 500 lb. bomb (https://cults3d.com/en/3d-model/game/1-10th-scale-gbu-12-paveway-ii). This too is modeled for the 1.7m Freewing A-10 Thunderbolt II, and the bomb body has a slot to use standard Freewing attachment hardware.

All these 3D model STL files were 1/10th scale, so I reduced their size to match my 1/15th scale OA-1K. After running the various STL files through Creality Print to make the required adjustments I then printed out all the parts on my Ender-3 V3 printer using Gray Creality Hyper-PETG. The top image below shows you the results for the targeting pod (30 g.) and a GBU-12 bomb (20 g.). These are fairly well detailed and once painted up to match the real articles should work out well for my OA-1K. In the bottom image are the two pylon styles (wing & fuselage), and a set of rails, which I'm not too sure if they will be

strong enough or not, even when using PETG filament. If not, I'll have to epoxy the pylons to the bottom of the wing/fuselage and use the rails only to attach the ordnance to the pylons. The wing pylon weighs 14 grams.

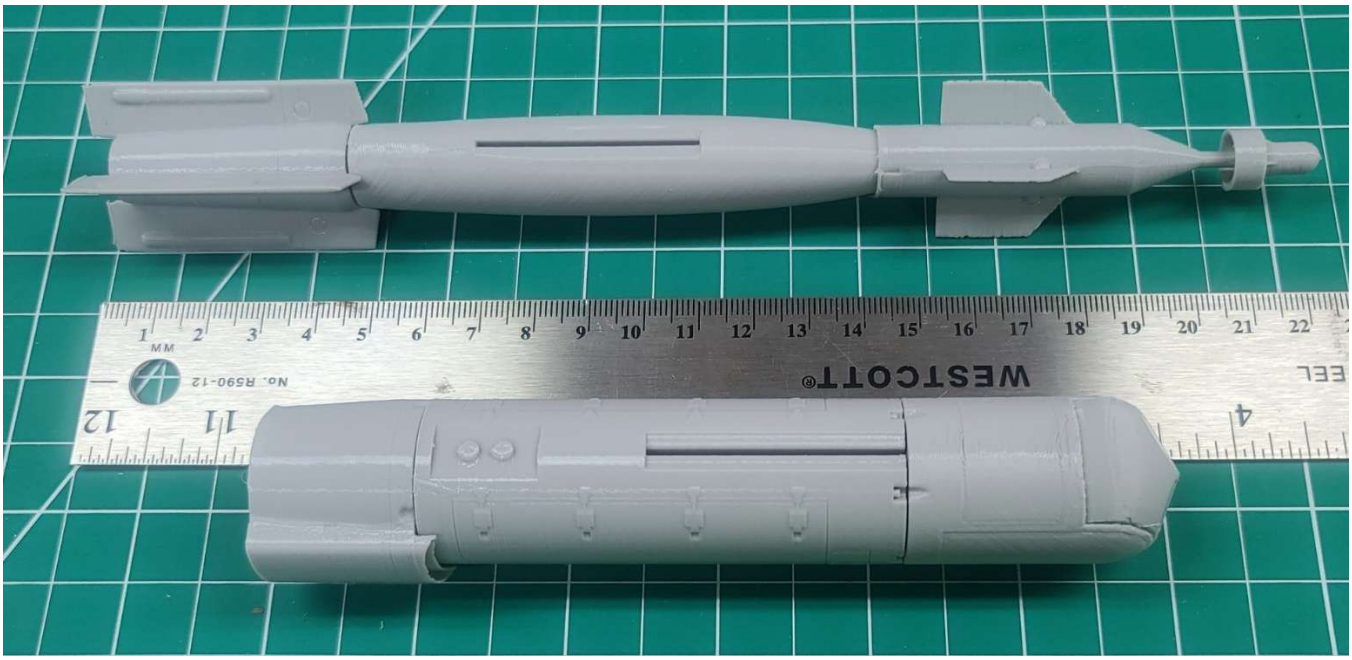


Figure 19 – AN/AAQ-28(V) Litening Targeting Pod & GBU-12 Paveway II 3D Printed Models

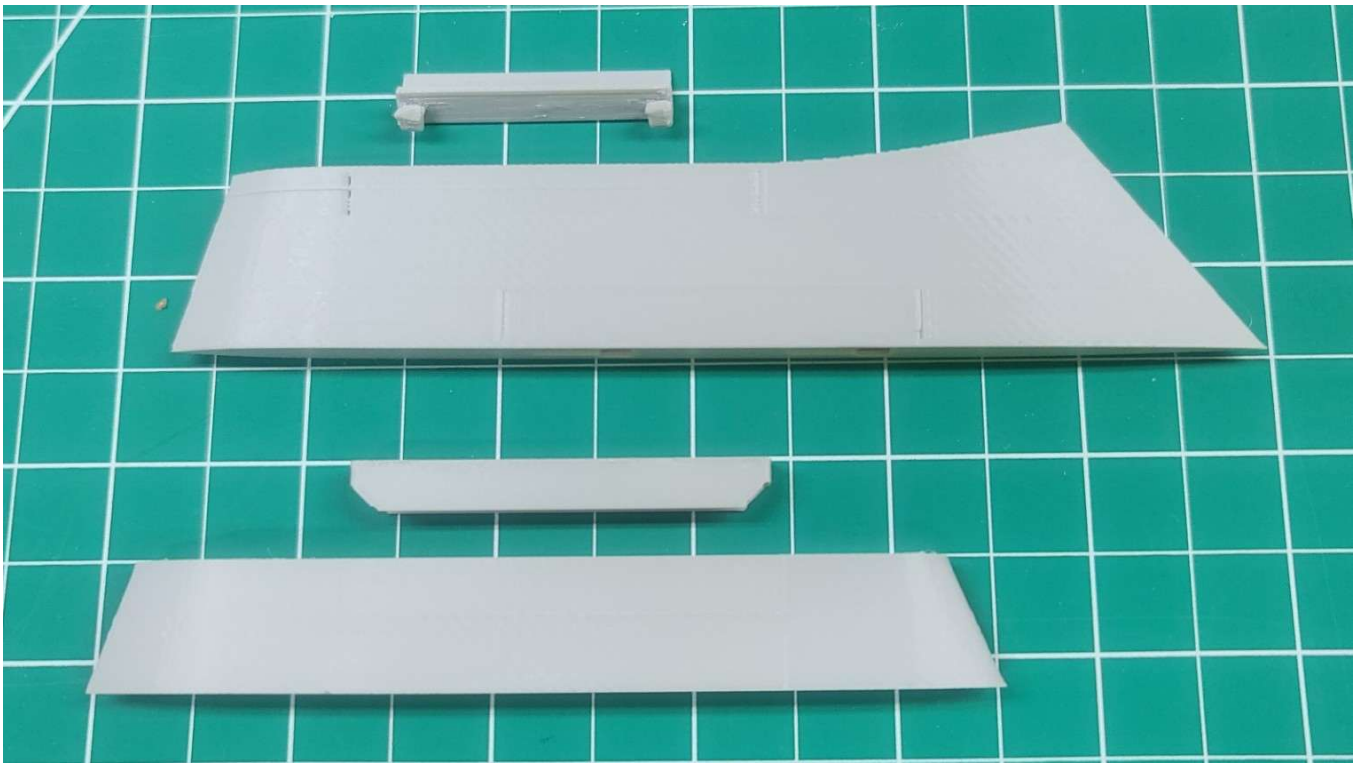


Figure 20 – Wing & Fuselage Pylons & a Set of Rails

So, with these printed I was able to determine the location of the cut-outs for the pylon mounting rails in the 1/8" Lite ply weapon station hardpoints.

While building the wing panels, I decided to also work on some other ordnance models. I wanted to hang some AGM-114 Hellfire missiles on a pylon under the wing. For these I found a nice SLT file on Thingiverse.com (https://www.thingiverse.com/thing:1322049). This 3D model was designed by Robert Fitz. Again, I needed to resize the model to produce a 1/15th scale Hellfire missile for my OA-1K and then printed out four missiles on my Ender-3 V3 printer using Creality Hyper-PLA. Figure 21 shows you the results. These are simple but nice models and once painted up to match the real articles they should work out just fine. They each weigh 7 grams.

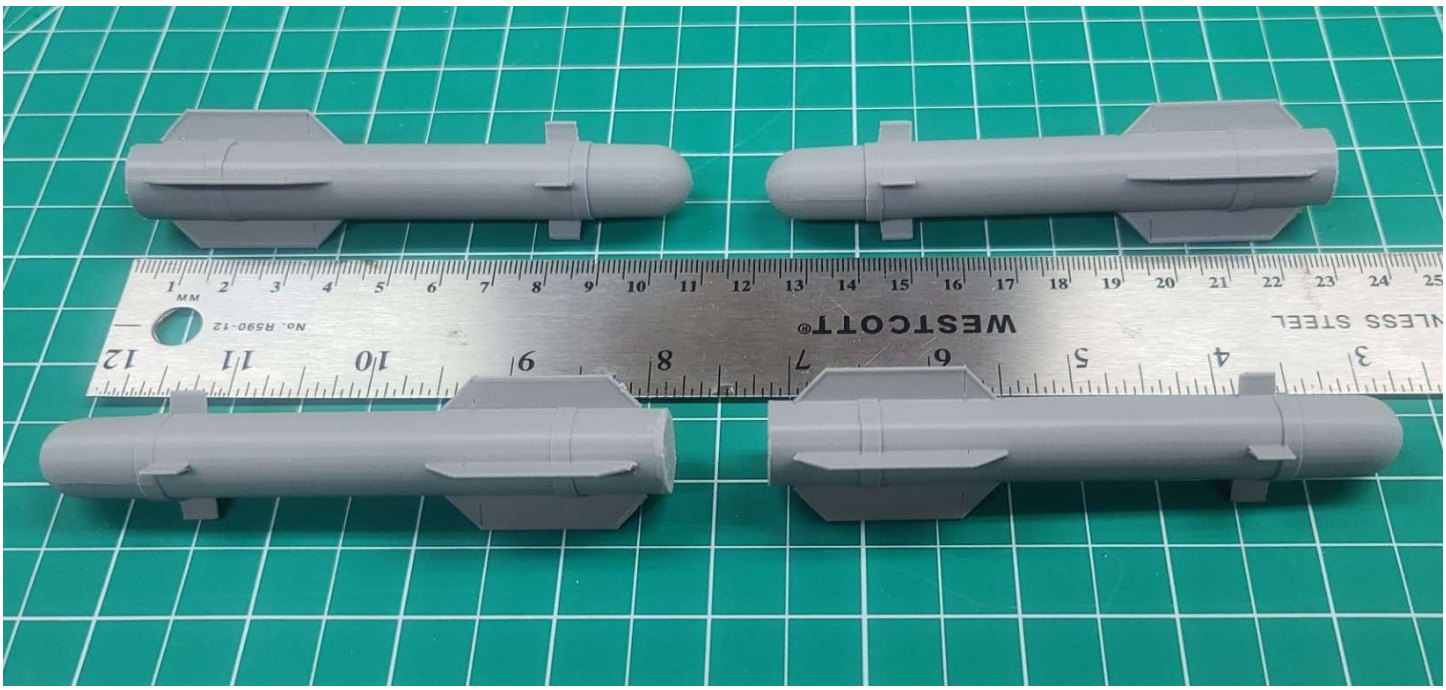


Figure 21 – 1/15th Scale AGM-114 Hellfire Missiles – 3D Printed Models

Now to find a launcher rack that I can use to hang two Hellfire's from a single wing pylon station. The USAF uses the M310 launcher on the MQ-9 Reaper, and yes there are some really nice scale plastic models of that launcher, but I was not able to find any SLT files for the M310. So, I went back to Fusion 360 again to see if I could work up a M310 model for myself.

I started out my design effort using the drawing in the left image of Figure 22 below. After ***many hours*** of trials and reworking the design, I was finally able to produce something that looks like an M310 2-rail launcher, which you can see in the right image. These each weigh 7 grams.

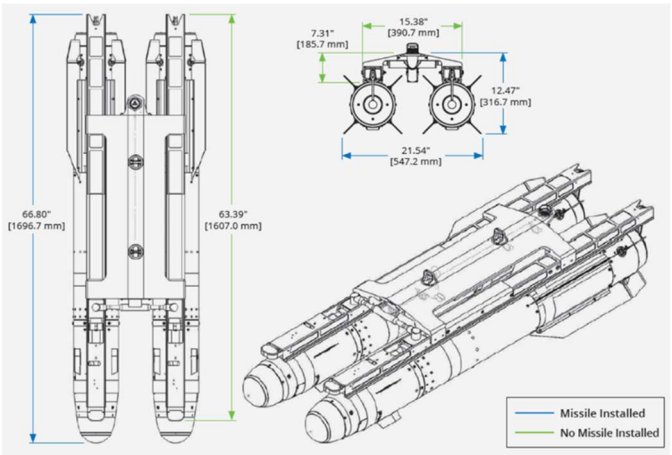


Figure 22 – My M310 2-Rail Launcher for AGM-114 Hellfire Missiles – 3D Printed Models

Let's go back and take another look at the weapon station hardpoints and some modifications I feel are needed to the pylon mounting rails that will be installed in the bottom of the wing. To aid in holding the pylons in place on the bottom of the wing, I decided to use a small 4x2mm Neodymium disc magnet at each weapon station and in each weapon pylon. I found a good source on Amazon at (https://www.amazon.com/dp/B0B2M13NDW?ref=ppx_yo2ov_dt_b_fed_asin_title&th=1). I also decided to ***"beef up"*** the design of the wing male pylon mounting rail and add a hole for a disc magnet. After taking measurements of the Freewing attachment hardware, I drew up a modified male rail using Fusion 360 (see Figure 23), exported the resulting STL file and 3D printed the modified rail. After a couple of iterations of my design, you can see the final results in Figure 23. One of these rails will be epoxied into the 1/8" Lite ply at each weapon station hardpoint (now 8 total) in the bottom of the wing. Additionally, I needed to modify the pylon 3D models to add the required hole for the small 4x2mm Neodymium disc magnet.

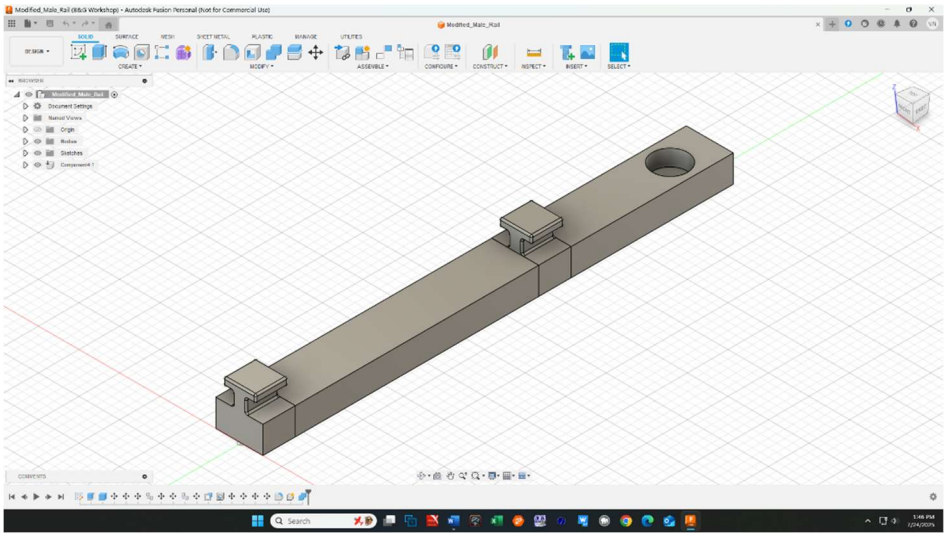


Figure 23 – Modified Freewing "Male" Pylon Mounting Rail Model in Fusion 360

Figure 24 – Modified Freewing "Male" Pylon Mounting Rails

Alright, with the pylon mounting rails design finally settled, I fitted and glued in place all four 1/8" Lite Ply weapon station hardpoints in the right wing-half as shown on the modified wing plan. I then removed the wing-half from the building board and repeated the entire process to build the left wing-half.

With both wing halves built, I surface planned and sanded the leading and trailing edges to match the shape of the wing ribs. Next step was to join the two halves together using the 1/8" birch plywood joiner. I laid the right wing-half flat on the build board securing it in place with magnetic fixtures and my lead shot sock weights. Then I slide the two halves together positioning the left wing-half with the bottom of the wingtip rib 1.25" above the work surface (for a 3.5 degree dihedral). After everything was lined up to my satisfaction, I epoxied the 1/8" plywood wing joiner against the backside of the two 3/16" square basswood spars. **Remember to place 1/16" shims under the W-1 ribs to allow space for the wing center section 1/16" balsa sheeting.** This lay-up can be seen in Figure 25.

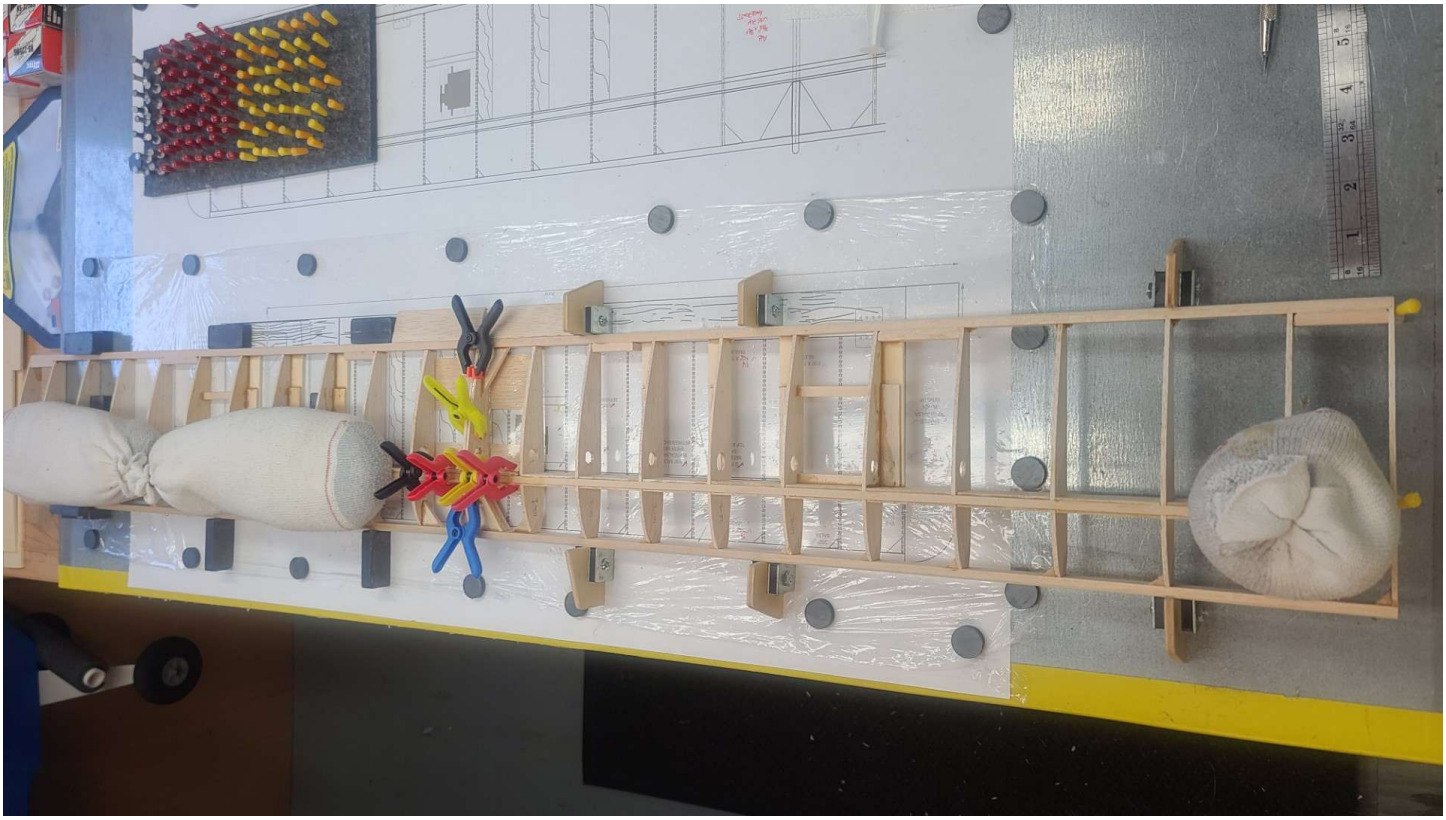


Figure 25 – Wing Sections Join Lay-up

With the epoxy fully set, I removed the wing from the lay-up and sheeted the top and bottom of the wing center section across all four of the W-1 ribs with 1/16" balsa sheets (balsa sheet grain running wing lengthwise). Next I took two 1-1/4" x 1-3/8" x 7" balsa blocks, glued them to the wingtip W-2 ribs, and then shaped them to make the AT-802 style wingtips shown in Figure 26.

Figure 26 – AT-802 Side View

Now for the flaperons. Using two pieces of 3/8" x 1" x 24" aileron stock, I cut them to the required length and temporarily fitted them to the wing using Du-Bro #116 Standard Nylon Hinges. Since this is a **"Semi-Scale"** build, I decided to **not** try and make the flaperon hinges used on the actual AT-802/OA-1K, and there are no flaps for this 1/15th scale model, but instead full wing length **flaperons**. The wing at this stage is shown in Figure 27, and to build any further I needed to have a fuselage to sit this wing into so I could determine the shape of the filler needed on the wing underside such that it would match the fuselage contour.

Figure 27 – OA-1K Wing

Building the OA-1K Fuselage

So, with that said, it was time to start the build of my OA-1K fuselage. The first thing I did was to go back to my 2D CAD plan OA-1K_Fuselage_Templates_Updated.pdf (Figure 13) and copy all the fuselage formers to a file and then print out the templates on Piper's Pattern Paper. This stuff works great when I need to cut out a complex and detailed template using my tabletop band saw and miter saw. Using the templates, I then cut out the fuselage formers using 1/8" or 3/32" ply as called out for each former. **Note** – While the original plans referred to using Lite ply for all formers other than F2 and F4, I used Birch ply for all my fuselage formers. *I'm well known for building tanks when it comes to my scratch builds*. Figure 28 shows you all the formers needed to build the OA-1K fuselage.

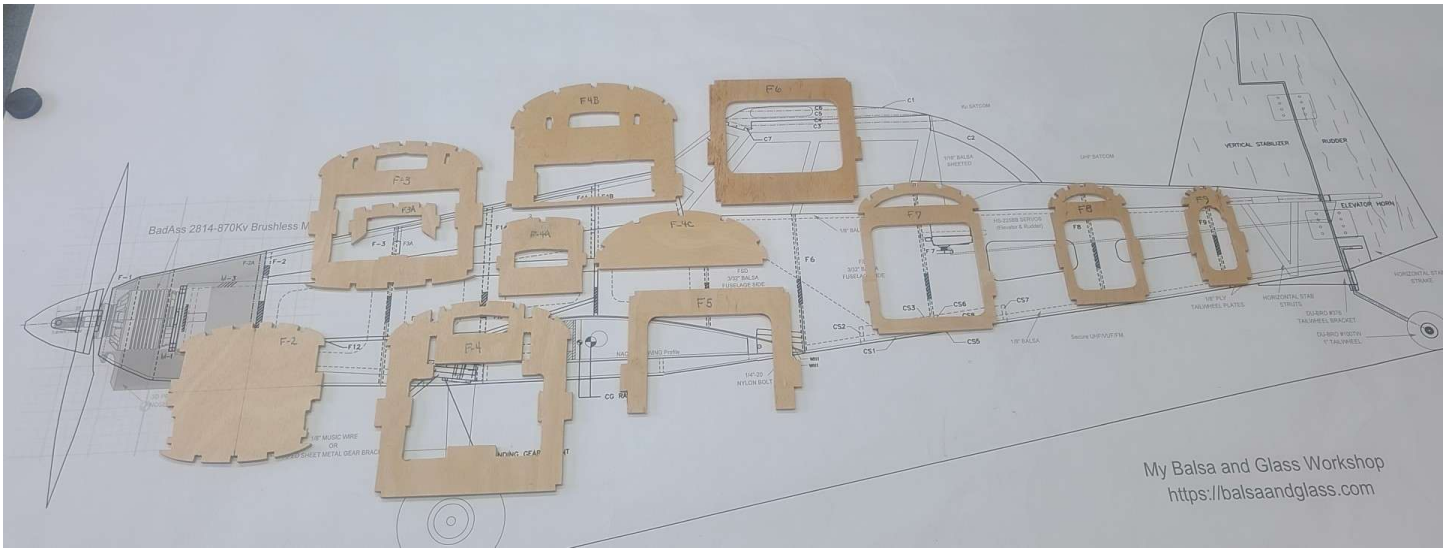


Figure 28 – OA-1K Fuselage Formers

Now for the fuselage sides. Again, using my 2D CAD OA-1K_Fuselage_Templates_Updated.pdf plan (Figure 13), I printed out fuselage side templates using some 110# paper card stock, and then with a new sharp X-Acto knife in hand I cut out two fuselage sides and forward fuselage wing seat doublers from 3/32" x 4" x 36" balsa sheets. The results of my efforts are shown in Figure 29.

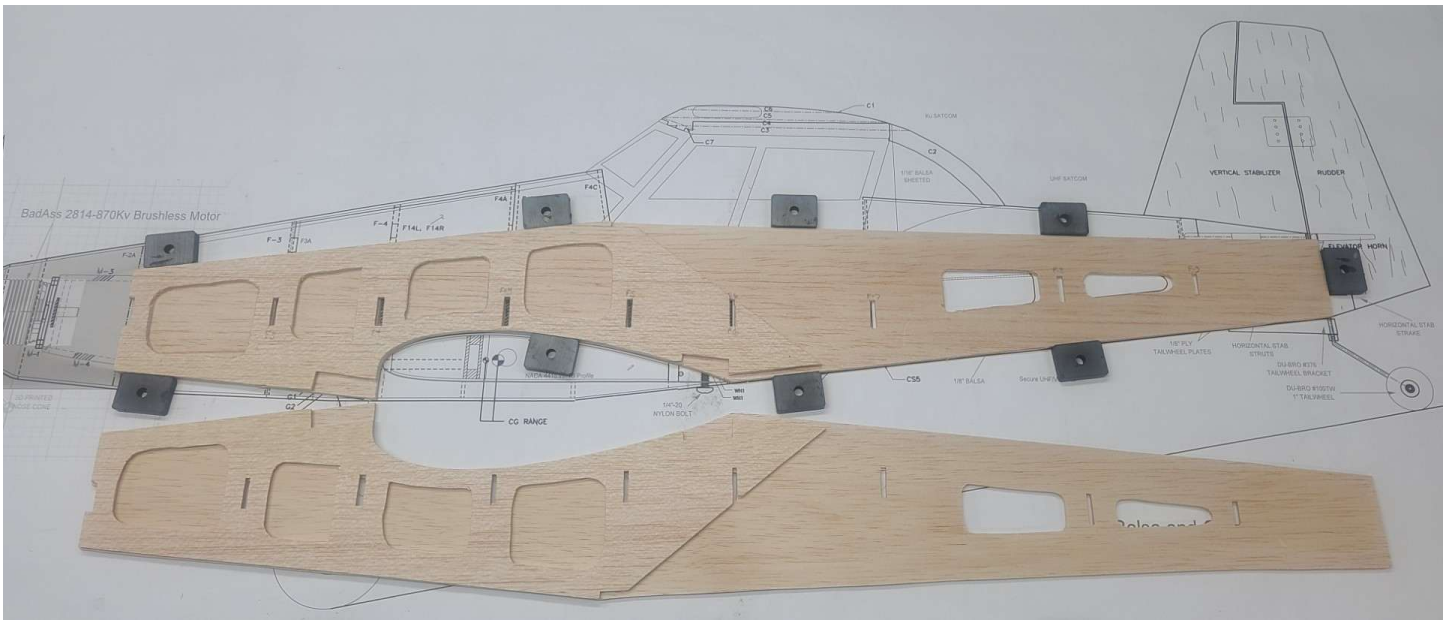


Figure 29 – OA-1K Fuselage Sides and Wing Seat Doublers

I took the forward fuselage wing seat doublers and glued them to the fuselage sides using Titebond Ultimate III wood glue. Since there are no assembly instructions available for this build, before I started gluing any more parts together I needed to cut out a few more fuselage parts, and then using my magnetic build board I did a forward fuselage dry run fit check to see how the parts would fit together, and where the internal components (LiPo battery pack, ESC, rudder/elevator servos, and receiver) would fit correctly. So, I cut out the modified LiPo bay side walls F10-L & R from 3/32" balsa sheeting, and battery hatchway sides F14-L & R from 1/16" balsa sheeting. The LiPo bay flooring F12 and F13 were cut from 1/16" plywood and the rudder/elevator servo tray from 1/8" plywood. With everything needed (I hope), I

broke out the mag fixtures and started working to try and fit all these parts together. Figures 30 & 31 below show how all this worked out.

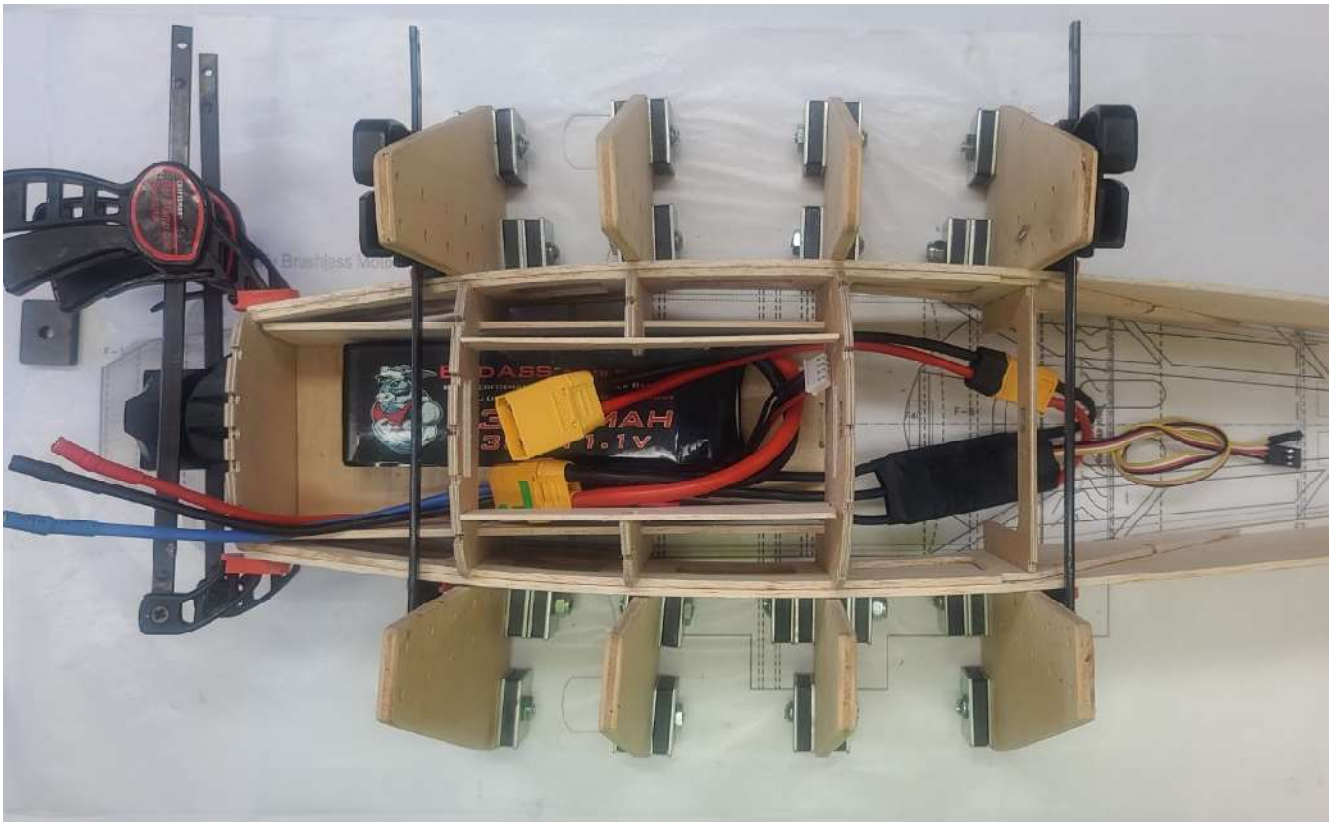


Figure 30 – OA-1K Forward Fuselage Dry Run Fit Check on Magnetic Build Board

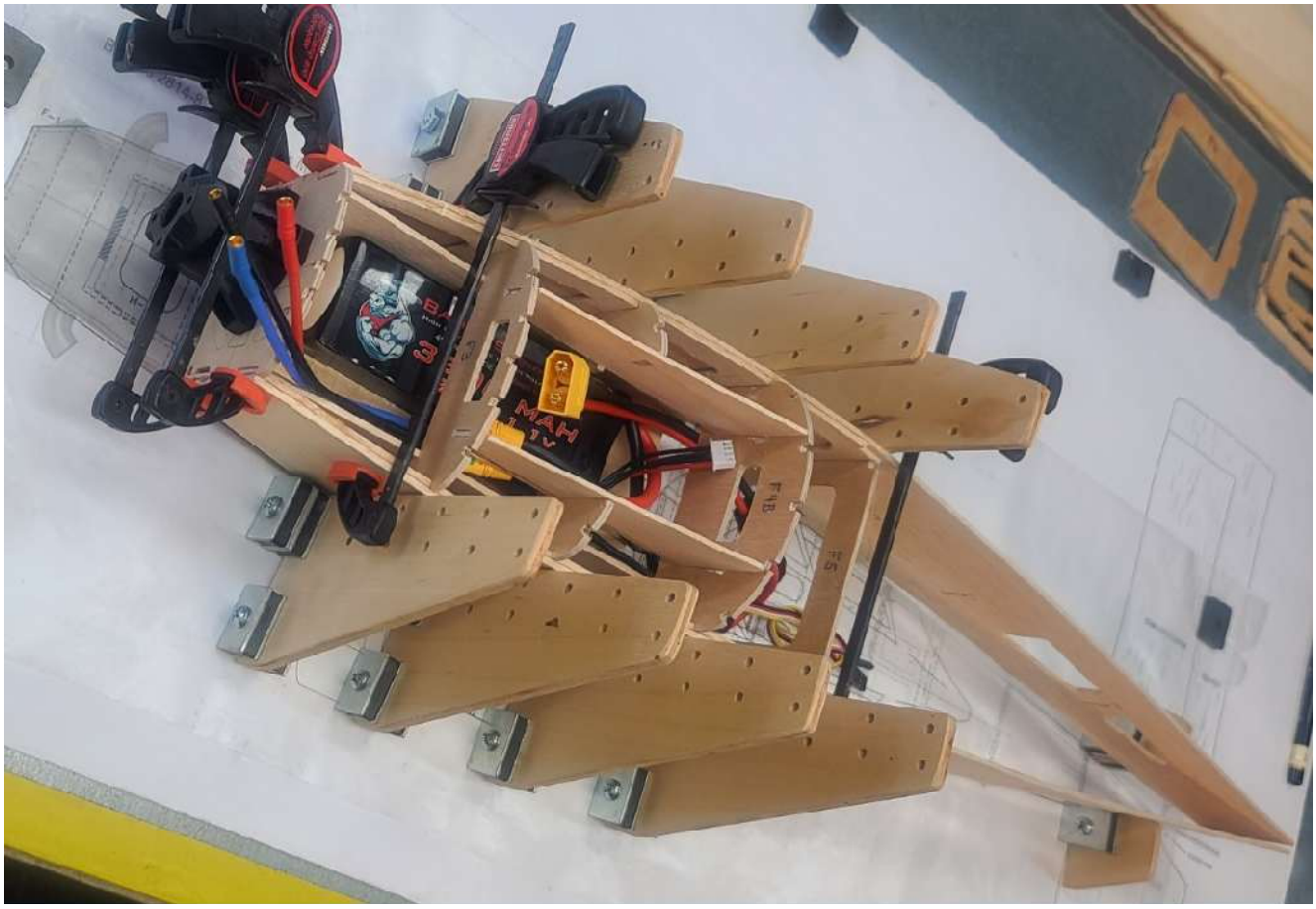


Figure 31 – OA-1K Forward Fuselage Dry Run Fit Check on Magnetic Build Board

First, I was rather surprised as to how well all the parts fit together. Normally I would have more cutting and sanding of the parts to get them to fit correctly, but all the front end work on the 2D CAD program seems to have paid off. The next big thing that jumped out from this dry run fit check was that getting all the required flight components inside the fuselage is going to be tight. Also, having changed the wing airfoil profile to a NACA 4415 drove raising the wing further up into the fuselage which reduced the volume of the LiPo bay. I placed a 3,300mah LiPo in the bay, but I may end up having to use a 2,200 mah, depending on the results of the CG measurements. With the smaller battery bay, there now is no room for the ESC, so it will have to be mounted aft of fuselage former F4B.

Builders Notes – The dry run fit check generated several tasks that needed to be worked off before the fuselage build could proceed any further: 1) design and cut out all parts required for the new ESC mounting platform; 2) recut F14L/R using 1/16" ply; 3) drill holes in F3/F3A and F4A/B for the LiPo bay access hatch magnets; 4) recut new F2 (firewall) to remove notches along lower edges originally intended for F10L/R, add cooling air holes thru firewall, drill holes and install #4-40 blind nuts for 3D printed motor mount, and verify F2 sizing against PLA nose cone 3D printout; 5) shorten F10L/R to make room for balsa triangles on aft side of F2; 6) add servo tray rails to inside of fuselage sides; 7) cut elevator/rudder control rod holes in aft fuselage sides; 8) glue 1/8" square balsa stringers along fuselage sides; 9) drill 3/16" hole in F4 for wing hardwood dowel; 10) cut out remaining fuselage parts such as 1/8" ply G1-3, WH-1s', tailwheel plates, and LiPo access hatch sides from 1/16" balsa sheet.

To reduce weight aft of the CG I decided to place the elevator/rudder servo tray rails forward of former F7. Also, I found that I did not have to cut elevator/rudder control rod holes in aft fuselage sides given that with my placement of the servos and using Du-Bro #237 T-style Nylon Control Horns, the

control rods exit through the fuselage side via the aft fuselage lightening holes already cut out. I did need to add some light cross-fuselage bracing for the two control rod guide tubes.

I started my fuselage assembly over a top view of the OA-1K_Fuselage_Views_Updated.pdf plans (covered with wax paper) by gluing formers F4, F4B, F5 and F6 to the fuselage sides with Titebond Ultimate III wood glue and used mag fixtures to hold everything in their correct position *until the wood glue had fully dried*.

Figure 32 – Start of OA-1K Fuselage Assembly

After the assembly had dried overnight, I next applied glue to the edges of former F3 and placed it in position between the two fuselage sides. To aid in bending the fuselage sides, I first lightly sprayed the outside of the two sides just forward of former F4 ***using hot water*** to soften the balsa sheeting. Then, using my small bar clamps I ***slowly*** pulled the two sides together to join with F3. I again used mag fixtures at F3 to ensure the correct vertical alignment of the assembly with the plan top view. Next I glued the LiPo battery bay 1/16" ply bottom sheets F13 and F12 to formers F3 – F4B. Then I glued the battery bay 3/32" balsa sides F10L/R and 1/16" ply sides F14L/R in their correct positions on formers F3 – F4B. You should now have something that looks similar to Figure 33. Note that I used my lead shot filled sock bags to keep the fuselage assembly flat on the building board. I allowed the assembly to fully dry.

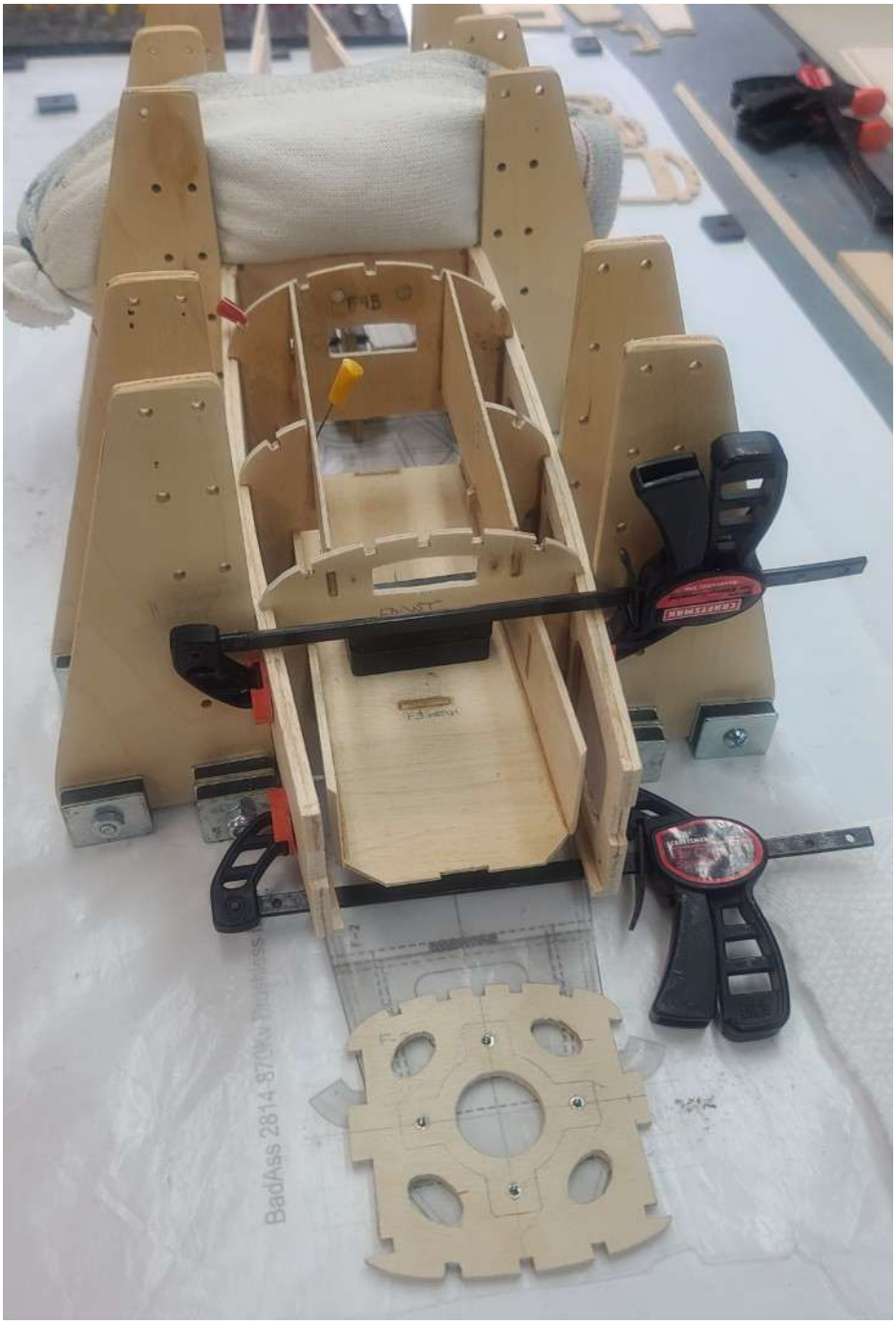


Figure 33 – OA-1K Fuselage Assembly (cont.)

Again, after sitting overnight, the next item up was to epoxy the firewall F2 in place. I first applied some hot water to the sides of the fuselage forward of F3, liberally applied some 20 minute epoxy to the edges of F2, and then using my small bar clamps I ***slowly*** pulled the two fuselage sides together to join with F2. I then cut and installed using epoxy a length of 3/8" balsa triangle along the joints between F2 and the fuselage sides. Next, I move to the aft fuselage gluing formers F7, F8, and F9 in position using my clamps and mag fixtures to ensure everything was in correct alignment with the fuselage top view plan. *She is starting to look like an airplane.* The results of these steps are shown in Figure 34.

Figure 34 – OA-1K Fuselage F2, F7-F9 Assembly

After the glue had dried, I removed all the mag fixtures/clamps and then removed the assembly from the building board. Using my glue syringe, I went through the entire assembly and applied a small bead of glue along all joints between the various fuselage parts. I cut three MLG mount plates (G1 – G3) and two wing hold down plates (WH1 – WH2) from 1/8" birch ply and sized them to fit in their respective notches in the fuselage assembly. Once satisfied with the fit, I epoxied these parts in place. I then took the new ESC shelf cut from 1/16" ply and mounted it so it would sit on the top edges of the large openings in formers F5 and F6, and against the aft side of former F4B (see my updated fuselage side view in Figure 12). I used $\frac{1}{4}$" balsa triangle to help secure the ESC shelf to the three formers.

Moving to the aft end of the fuselage, I first sanded the inside edges of the two 3/32" balsa sides so they would fit flat against each other when the sides are drawn together at the tail. Then using 1/8" ply I cut a tailwheel mounting plate and horizontal stabilizer mounting plate to fit aft of former F9 and between the two fuselage sides, one at the top and the other at the bottom. Both plates were glued and clamped in place. I next installed the five stringers running along the tops of formers F7, F8, and F9 using some good hard 1/8" square balsa sticks.

With the fuselage turned upside down, I glued the 1/8" ply servo mounting plate to the two fuselage side rails I had previously installed between formers F6-F7 and then mounted the elevator/rudder servos to the plate. Using scrape balsa sticks I made servo control rod tube holders to secure the two plastic tubes inside the fuselage running from former F7 to the rear exit holes on each side of the fuselage.

Moving back to the front end of the fuselage, I fitted former F4C between the fuselage sides and then glued it in place ensuring it was at the correct forward angle using a small template made from the fuselage side view plan. F4C was held in place by gluing the three short 1/8" square balsa stringer between former F4C and F4B. I then glued the two long outer most 1/8" square balsa stringers running along the tops of formers F2-F4C.

Next up was assembly of the LiPo bay access hatch parts. The hatch was made up of formers F3A, F4A, the top center section of F4, and the two 1/16" balsa LiPo bay access hatch sides. I glued all these parts together, using mag fixtures to keep everything aligned perpendicular to each other and flat against the building board. Once dried I glued the 1/8" square balsa stringers along the tops of the three hatch formers. I then checked the fit of the hatch between formers F3-F4B and made some needed adjustments. I will need to determine how this hatch will be removed from the fuselage to install the LiPo battery. I'll have to make some kind of small tabs, or notches in the hatch. More to come on this later.

I temporarily placed the flat aluminum MLG on the ply mounting plates forward of F4 so I could determine what filler material would be needed in front of the 1" MLG strap. After that filler was installed, I glued the three short stringers running along the bottoms of F2 back to the MLG filler. I did not install the three short stringers along the tops of F2 and F3 until I knew how the motor and ESC wiring were going to be connected and routed. With all that done, you should now have something that looks like Figures 35-36.

Figure 35 – OA-1K Fuselage Assembly Bottom View (cont.)

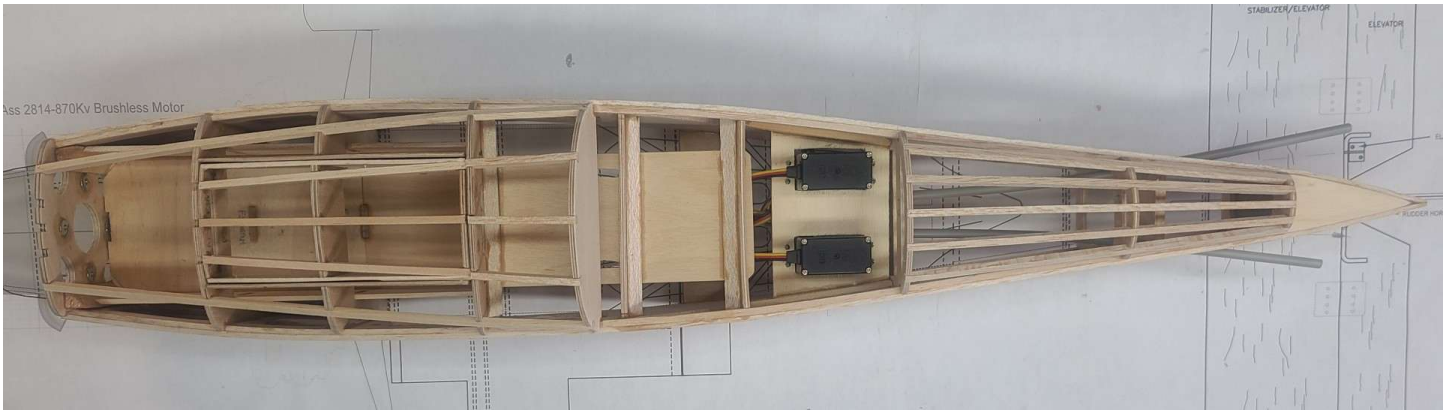


Figure 36 – OA-1K Fuselage Assembly Top View (cont.)

Alright, this gave me enough of the fuselage such that I could go back and finish the wing build. First, I checked the fit of the wing center profile to that of the wing saddle in the fuselage. Some shaping and sanding of the wing saddle was required, especially in the wing nose area, to get a good fit. The fit between the wing and fuselage saddle can be seen in Figure 37.

Figure 37 – OA-1K Wing to Fuselage Wing Saddle Fit

With that done I next had to build-up a *"wing center section filler"* so the bottom of the wing would blend into the bottom contour of the fuselage. To do this I started with my OA-1K_Fuselage_Views_Updated.pdf plan (Figure 12) and made a couple templates to place on the actual wing. Before I could start building the filler, I first needed to install the 3/16" hardwood dowel in the leading edge of the wing. To determine the location of the 3/16" hole needed in the leading edge, I cut a short length of 3/16" brass tubing so that it would just stick out from the aft side of F4 when inserted into the wing mounting hole in F4. I carefully centered the wing in the fuselage wing saddle, making sure it was flat in the saddle and perpendicular to the fuselage, and I then pressed the wing against F4 so the brass tube would cut a shallow circle into the leading edge to mark the 3/16" hole location. Using that alignment mark, I drilled a 3/16" hole into the wing leading edge back to the front of the main spar, cut the required

length of 3/16" hardwood dowel, and epoxied it into the wing. The aft wing hold down bolt hole locations will be determined once the filler is completed.

After checking the fit of the *"wing center section filler"* templates against the bottom of the wing, I then cut the various parts I needed from 3/32" and 1/16" balsa sheeting. Note – I originally planned to have two wing armament hard points in the wing center section, but I decided the eight hard points already located in the wing would be sufficient. With the wing fully seated in the fuselage wing saddle with wax paper between the wing leading edge and F4, I positioned each of the filler parts to double check their fit and then glued each of them in place. The resulting *"filler"* is shown in Figure 38.

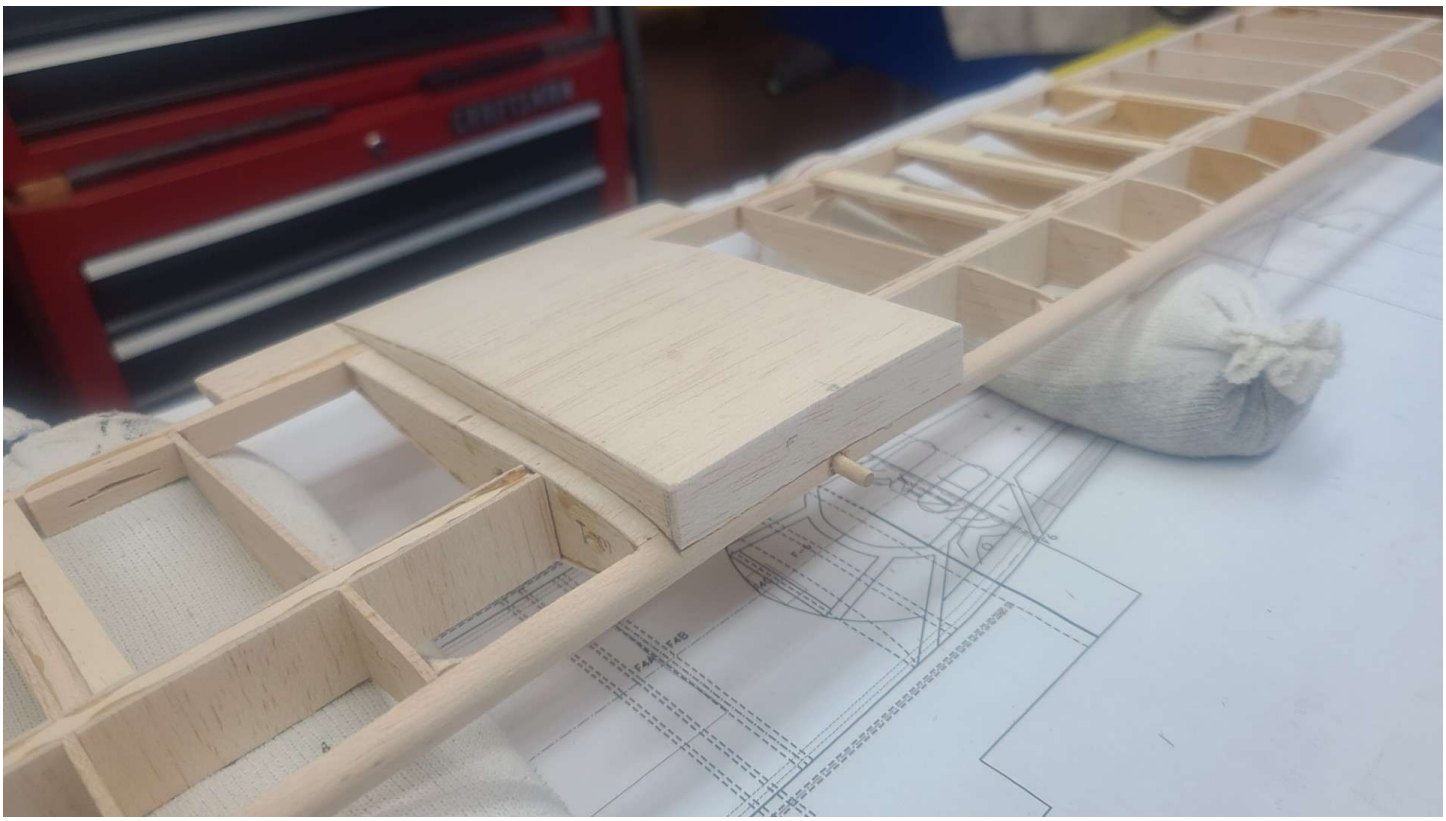


Figure 38 – OA-1K Wing Center Section Filler

To provide a solid surface for the two wing $\frac{1}{4}$-20 hold down bolts, I added a small rectangle (25x90mm) of 1/32" ply to the aft of the "filler". With that finished I again put the wing aside until the fuselage is finished.

Building the OA-1K Tail Feathers

Next I decided to build the tail feathers, also known as the horizontal stabilizer/elevator and vertical stabilizer/rudder. Using my 2D CAD plan OA-1K_Stabs_Plus.pdf, I printed out the various templates I would need. Using a sheet of 1/8" x 4" x 36" balsa I first cut-out the horizontal stabilizer and elevator. Then from the reminder of that sheet I cut out the vertical stabilizer and rudder. After rounding the outside edges of the pieces and beveling the forward edges of the elevators and rudder, I temporarily installed six Du-Bro #116 Standard Nylon Hinges. As shown on my plans, I connected the two elevator halves together using some 3/32" music wire and 1/32" plywood plates on the top and bottom of the inner

ends of the elevators. To strengthen the lower portion of the rudder where a hinge, control horn, and tailwheel wire will all be mounted, I glued 1/32" plywood plates on each side as shown on the plan sheet.

I originally planned to make the horizontal stab strakes and mounting plates from balsa and plywood, but I decided to see if I could make both using a 3D model and then print them out using some PETG filament. First I exported from my 2D CAD program the templates of the stake and its base as .dxf files, which I then imported into Fusion 360. From these I was able to generate a 3D model of the strake and base, as shown in Figure 39.

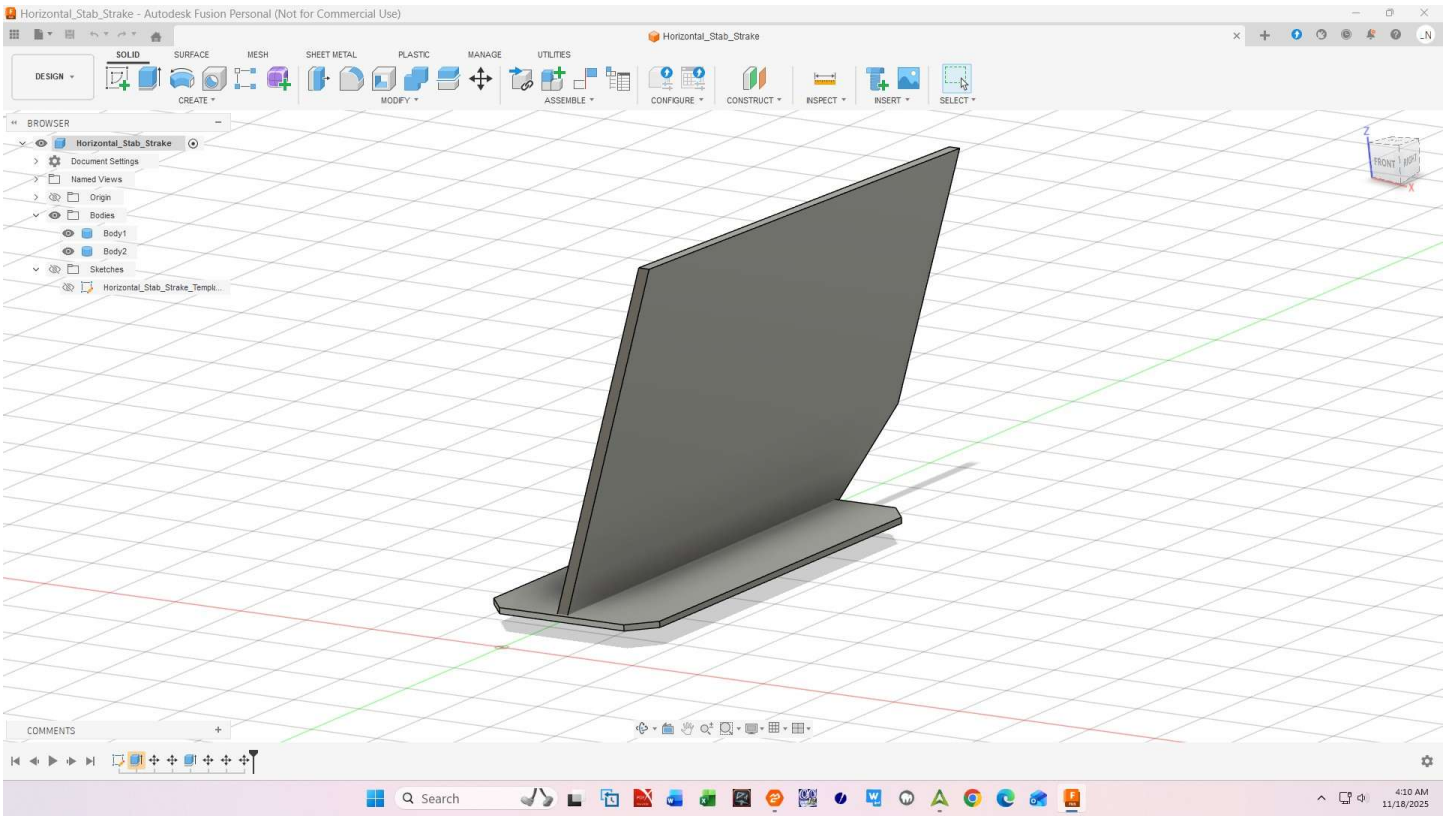


Figure 39 – OA-1K Horizontal Stab Strake Assembly 3Dmodel in Fusion 360

I then exported an STL file from Fusion 360, which I loaded into Creality Print 6.3 and using some Black Hyper-PETG filament with a 0.4mm nozzle and 0.15mm layer height I 3D printed a set of stakes for my OA-1K. These will be installed after the stab is covered with Ultracoat. My OA-1K tail feathers at this stage are shown in Figure 40.

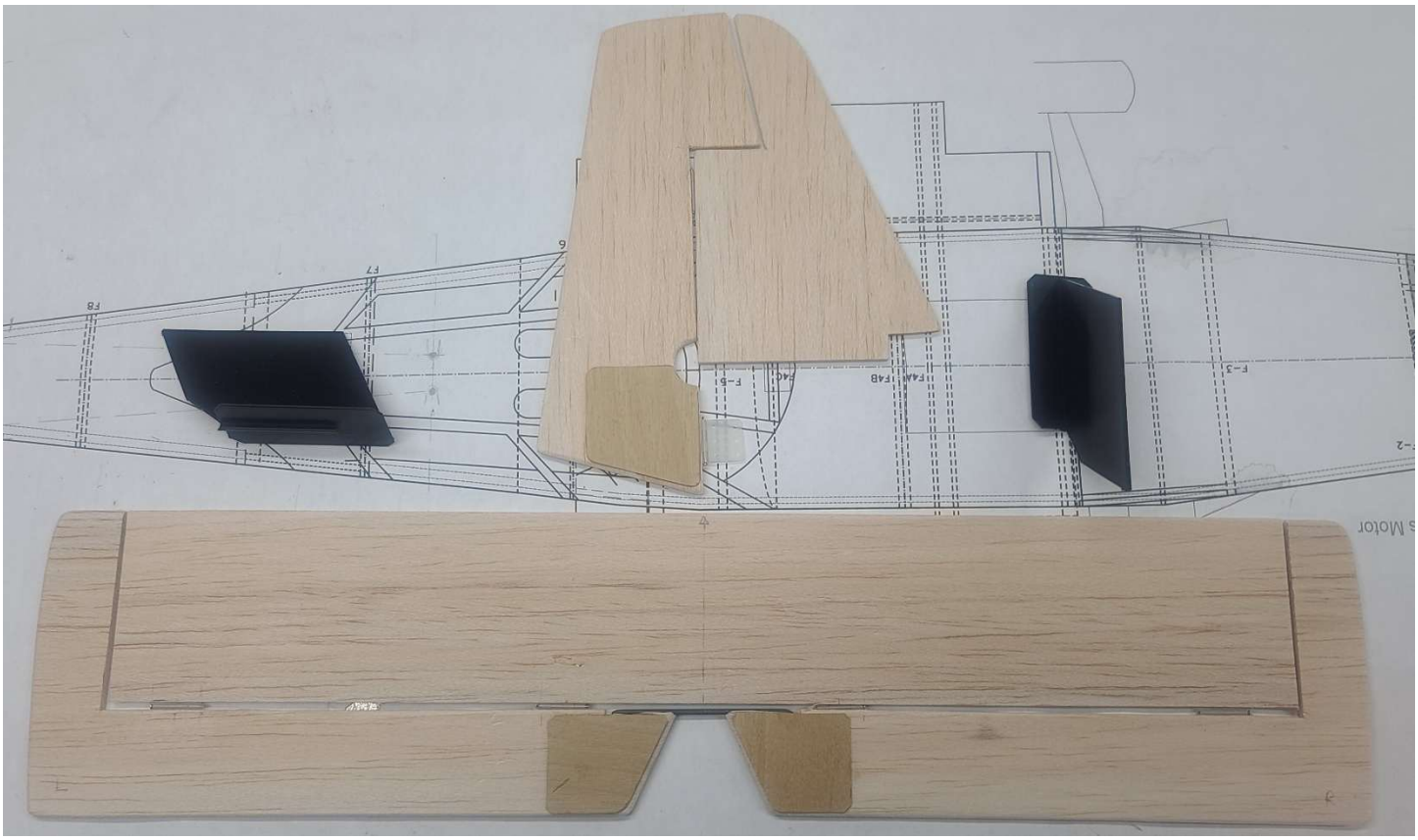


Figure 40 – OA-1K Tail Feathers & Strakes

Building the OA-1K Fuselage (cont.)

Before I could press forward completing the fuselage build, I first needed to verify the arrangement and fitting of all the power system components to include the motor, its 3D printed mount, the ESC and associated wiring, receiver, and 3D printed LiPo battery mounting tray. While I had all the components set out, I quickly paired the OA-1K receiver with my DX8 transmitter, and then with the ESC connected to the motor leads I verified the correct motor rotation direction and marked the leads using colored heat shrink tubing.

Using 2" wide VELCRO fastener tape, I temporarily mounted the LiPo tray and ESC to their respective mounting plates and ran the ESC leads forward through the LiPo bay. I then attached the BadAss 2814-980Kv Brushless Motor to the 3D mount, bolted these to the firewall former F2 and ran the motor leads aft into the LiPo bay. As shown in Figures 41a & b, with the ESC as positioned (left image), I had *just enough length* in the three ESC/motor leads to make the connections (right image). I also checked the clearance between the motor shaft propeller back plate and the front of the 3D printed nose cowl and found I would need another 1/8" spacer between the motor mount and firewall F2. Now you can see why I did not earlier install the three 1/8" balsa stringers between the tops of formers F2 and F3.

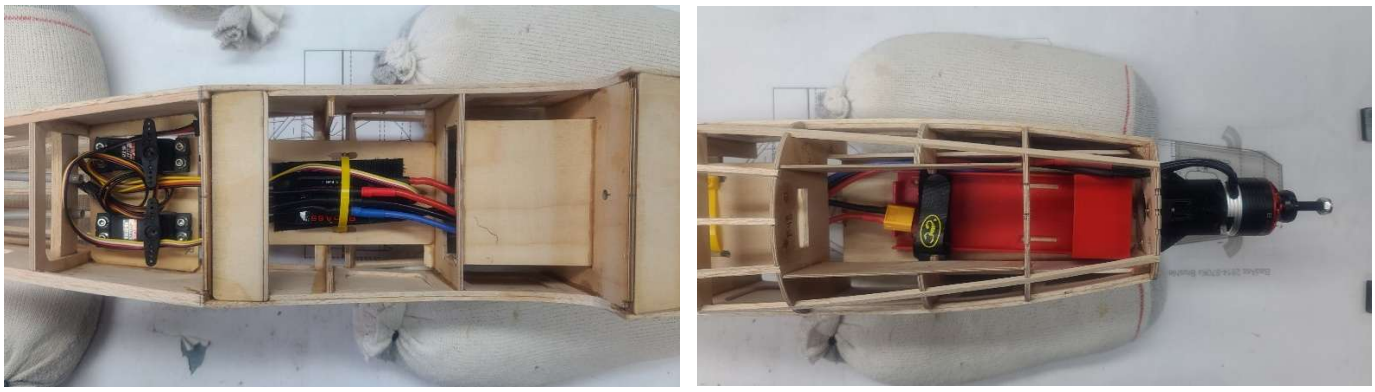


Figure 41 – ESC to Motor Cable Routing

I found the best place to mount the Spektrum AR610 6-Channel RC Sport Receiver to be on the side of the fuselage below the ESC and between formers F5 and F6. With the position of all the power system components verified I could finish building the fuselage.

First I turned the fuselage upside down so I could sheet the bottom surfaces. **Builders Note** – I did not cut-out parts CS1 – CS8 originally intended to put servo access hatches in the bottom of the fuselage. Rather, I made a single access hatch similar to a standard aileron servo mounting plate I use on wings. I placed my servo access hatch in a piece of 3/32" x 4" balsa sheeting just aft of the wing saddle between formers F6 and F7. Then I transitioned to 1/16" x 4" balsa for all the remaining sheeting on the aft bottom. *To add strength to the aft fuselage I cut the aft sheets so the grain runs perpendicularly to the fuselage centerline.*

Once that was finished I built-up around the MLG plate using some scrap 1/8" balsa and then sheeted the forward bottom of the fuselage using 1/16" x 4" balsa sheet. *To form the sheets better around the bottom curve of formers F2 and F3, I cut the forward sheets so the grain runs parallel to the fuselage centerline.* Finally, I sanded all the bottom sheeting to match the fuselage sides and then slightly rounded the edges. The finished bottom of the fuselage is shown in Figure 42.

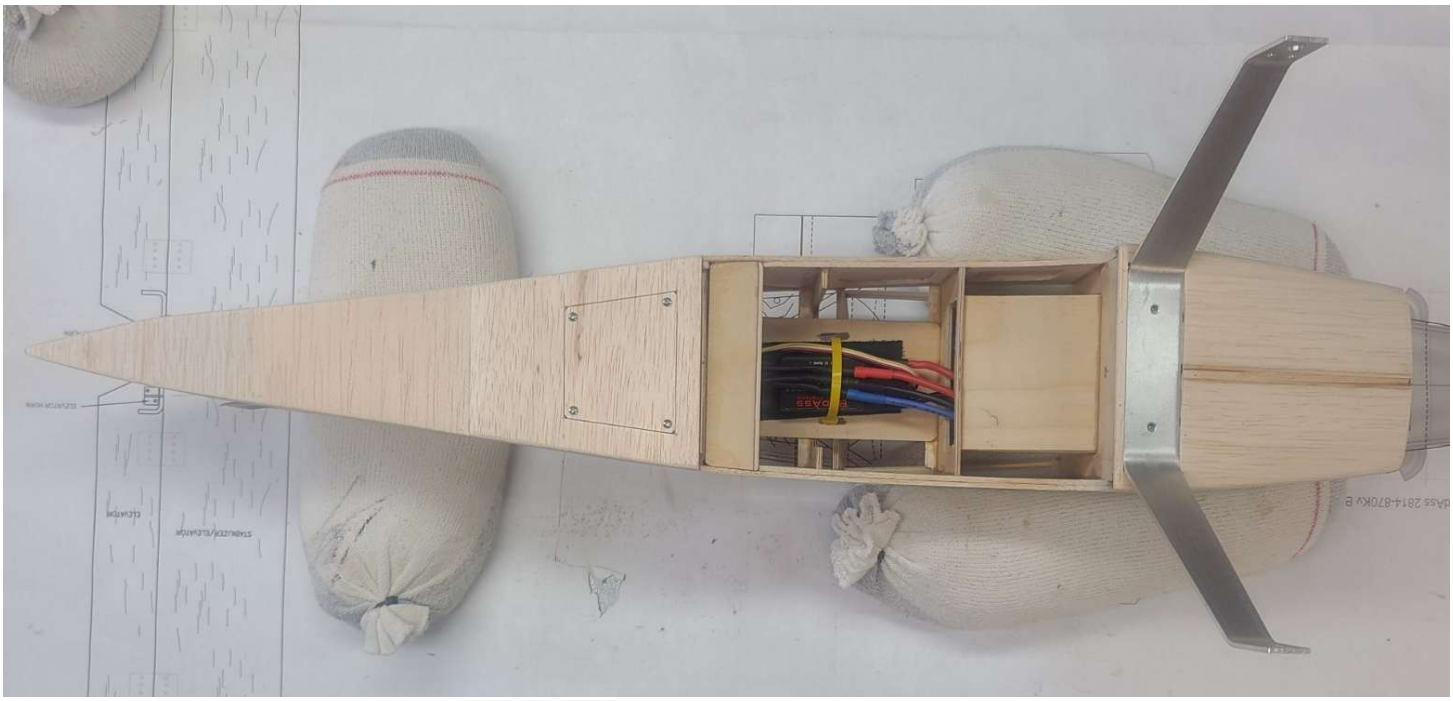


Figure 42 – OA-1K Fuselage Bottom Sheeting with Servos Access Hatch

Alright, with that finished I flipped the fuselage back upright and then proceeded to cover the turtle deck aft of the cockpit canopy using some more 1/16" balsa sheet. Here I sprayed hot water on the outside of the balsa so I could bend the sheets around the contours of formers F7-F9. I also did not try to cover the entire area with a single sheet but found it much easier to use three narrow strips of balsa that joined together along the 1/8" square stringers supporting the sheets.

I then moved to the front of the fuselage and covered the entire area along the tops of formers F2-F4C with 1/16" balsa sheets, including the LiPo access hatch. Once the glue was dry, I sanded all the top sheeting to match the fuselage sides and then slightly rounded the edges. The finished top of the fuselage is shown in Figure 43.

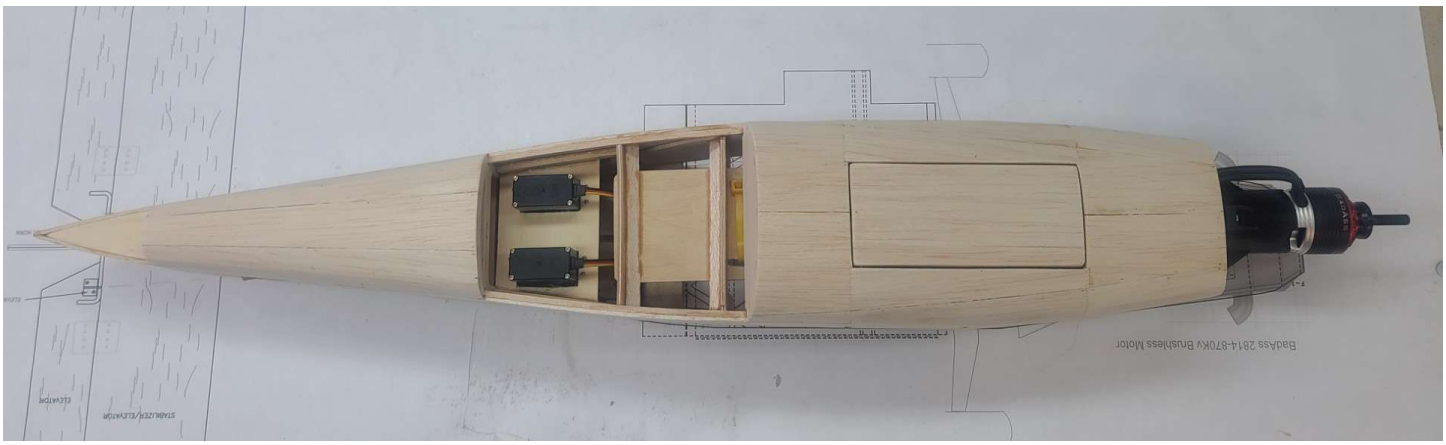


Figure 43 – OA-1K Fuselage Top Sheeting

Building the OA-1K Canopy

Now for the cockpit and canopy. I really wanted to print a 3D canopy for my OA-1K, but after spending more hours than I can even remember trying to model the canopy in Fusion 360 (see Figure 44), I decided to build one from balsa and Lite ply using the plan templates for now, and if I can ever figure out how to complete the 3D model, I'll replace the built-up canopy with a 3D printed version.

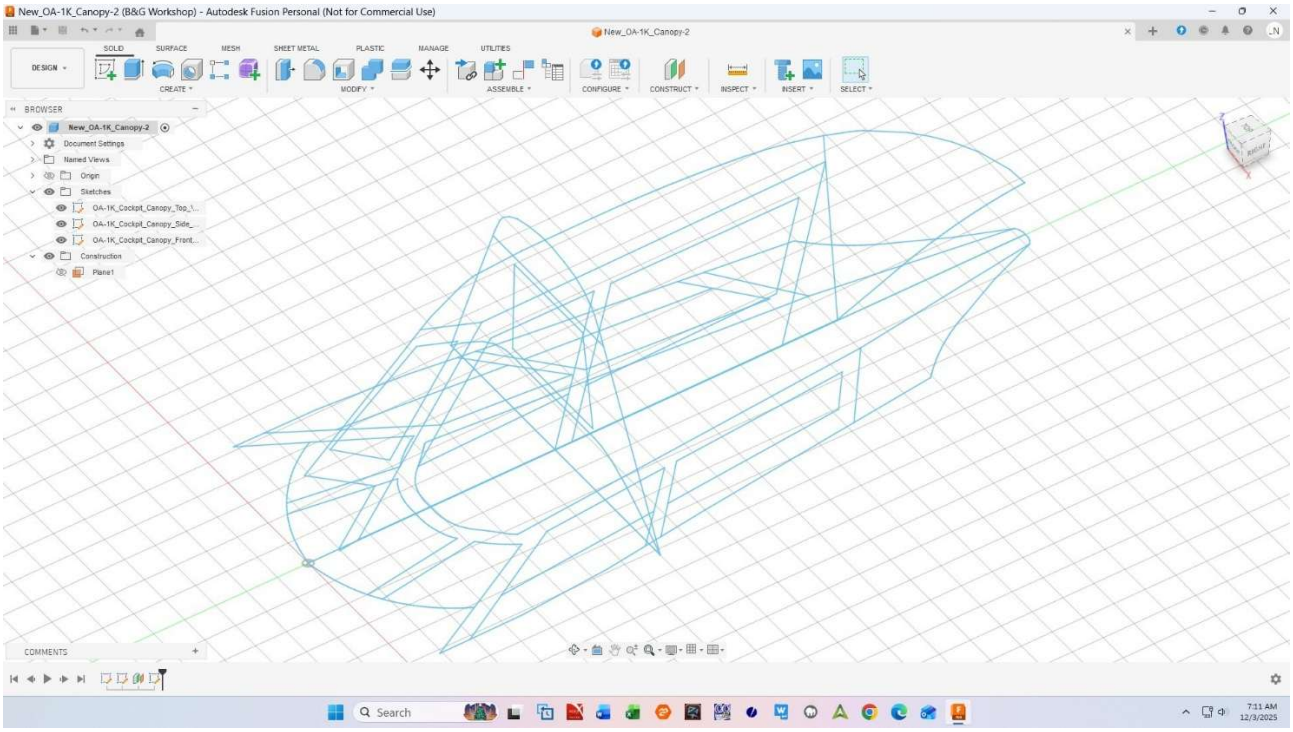


Figure 44 – OA-1K Canopy 3D Modeling in Fusion 360

From my 2D CAD plan OA-1K_Canopy_Templates.pdf, I printed out all the templates I would need, and then using the various thicknesses of Lite Ply and balsa as called out in the plan sheet, I cut out each part. The canopy needs to be removable, so I started the build by making a canopy floor from 3/32" balsa sheet that fits within the fuselage area between formers F4C and F7. This floor will be used to mount the 3D printed pilot and weapons specialist, along with their seat backs and station panels. The cockpit/canopy will be attached to the fuselage using magnets, so I cut out a front and rear cockpit former (I'll call them F4C-c and F7-c) from 3/32" balsa to match the portions of formers F4C and F7 in the canopy area. All the canopy parts discussed so far are shown in Figure 45.

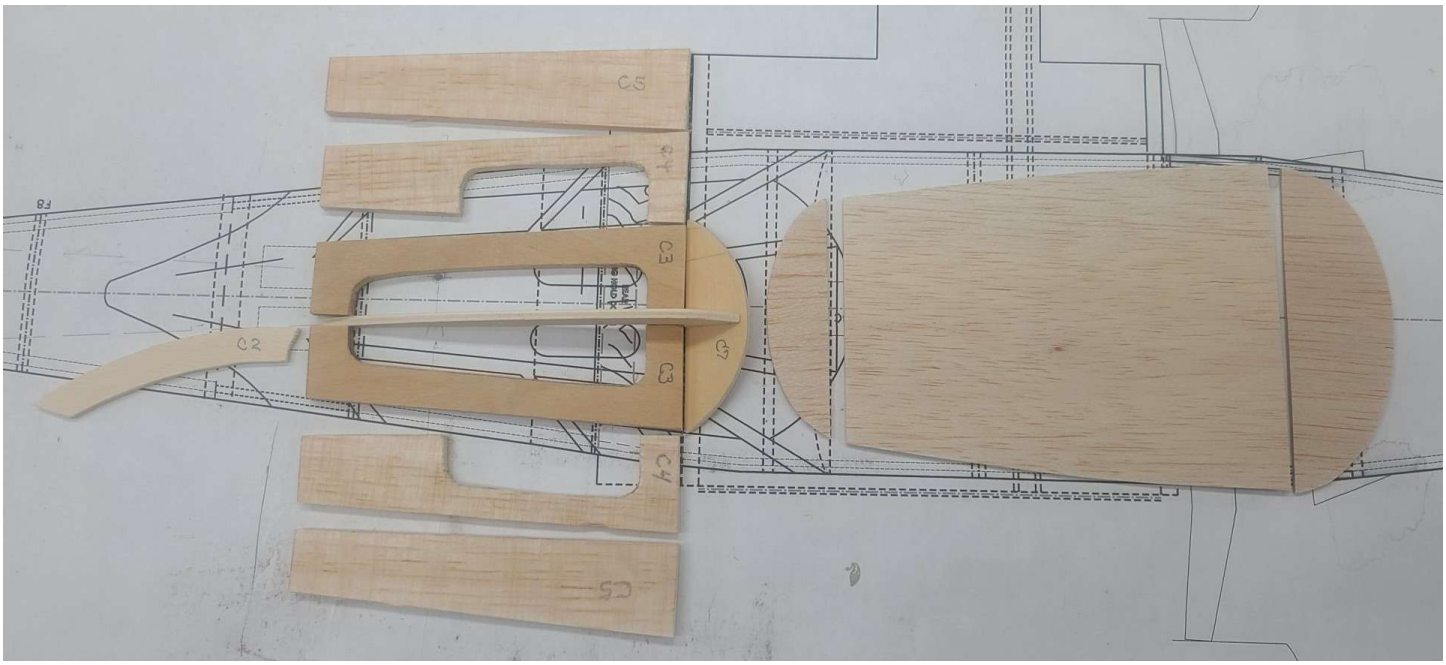


Figure 45 – Some of the OA-1K Canopy Parts

I placed clear plastic wrap between the fuselage and the canopy parts to keep from gluing the cockpit/canopy assembly to the fuselage. I will also need to keep the cockpit floor parts separated from the canopy until I can get all of the cockpit parts (pilot, weapons specialist, seat backs, station instrument panels, canopy windows, etc.) assembled and installed into the cockpit. While the AT-802 plan sheets provided me with a canopy side view, it does not give me the *"true"* size of the canopy side walls and windows. So, using my 2D CAD program I draw a correct representation of the side walls size using a front view (see Figure 46), and then using that plan I cut out two side walls from 1/16" balsa sheet, and strengthen them using ¼" X 1/8" and 3/16" x 1/8" basswood for the internal window frames. Also, I left a 1/16" gap along the top and bottom edges so the two sides would sit on the edge of the cockpit floor and the canopy C3 parts would rest on the upper basswood framing. This makes the canopy sides stick out slightly from the fuselage slides so they will look more like the armored panels used on the actual OA-1K. The build of the canopy side walls and top are shown in Figure 47.

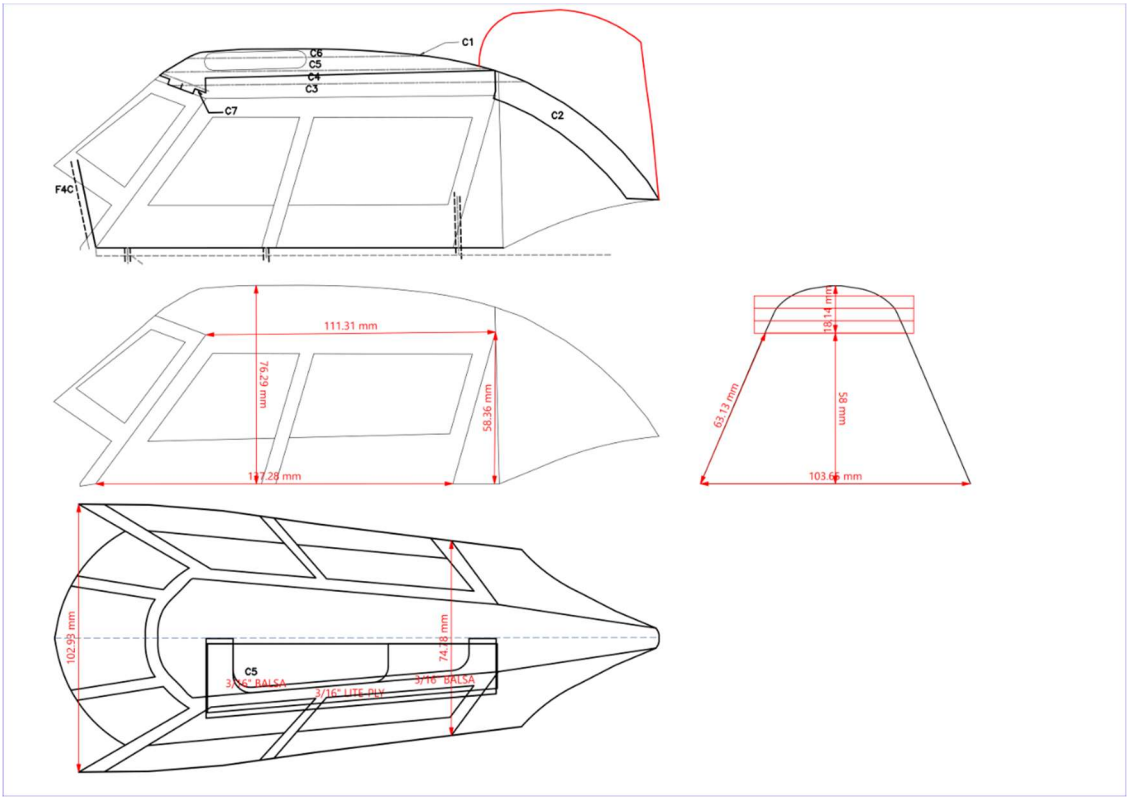


Figure 46 – OA-1K Cockpit Canopy Plan Views (OA-1K_Cockpit_Canopy_Views.pdf)

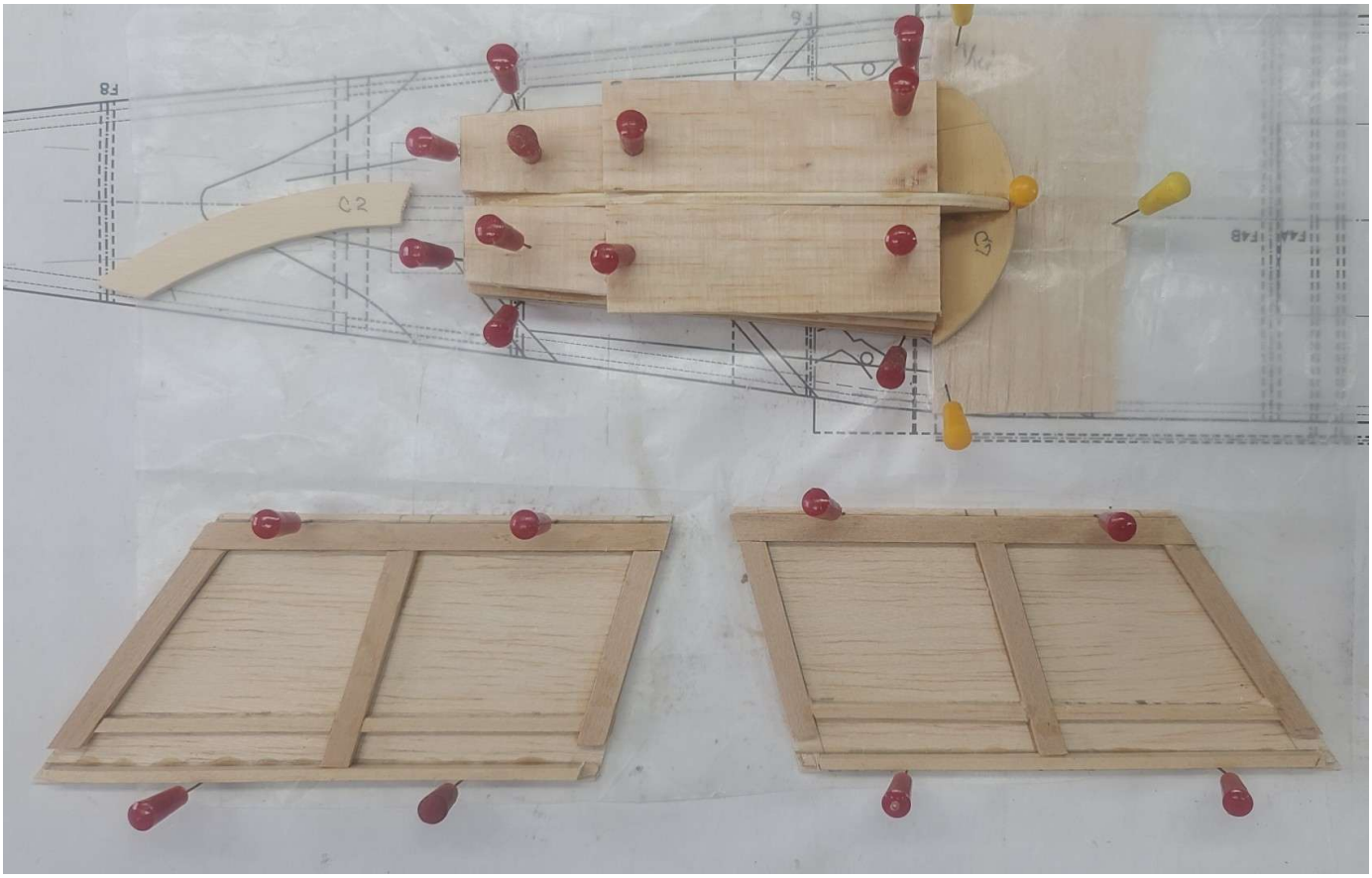


Figure 47 – OA-1K Cockpit Canopy Side Walls & Top Construction

After cutting out the windows in each side wall panel, I pinned a panel to each side of the cockpit floor. Using a sanding bar, I roughly shaped the canopy top to match the profile of part C1, and the rounded shape as seen in the front view. I then glued the canopy top to the two side walls holding them in place with pins and masking tape. Next, I glued part C2 to the aft edge of the canopy and pinned it to the centerline on the fuselage turtle deck aft of former F7. I also glued two 1/8" balsa corners to C2 at the top of the side walls.

While that assembly was drying, I cut out and trimmed a heavy paper template for the canopy front windows panel such that it would fit along the top front edge of part C7, the front edges of the two side walls, and across the top of the fuselage a short distance in front of former F4C. Using the template, I then cut the front panel from 1/32" plywood, cut out the three front windows, and glued pieces of ¼" X 1/8" basswood for the internal frames along each outer edge. This panel was then glued to the canopy. The cockpit canopy at this stage of the build is shown in Figure 48.

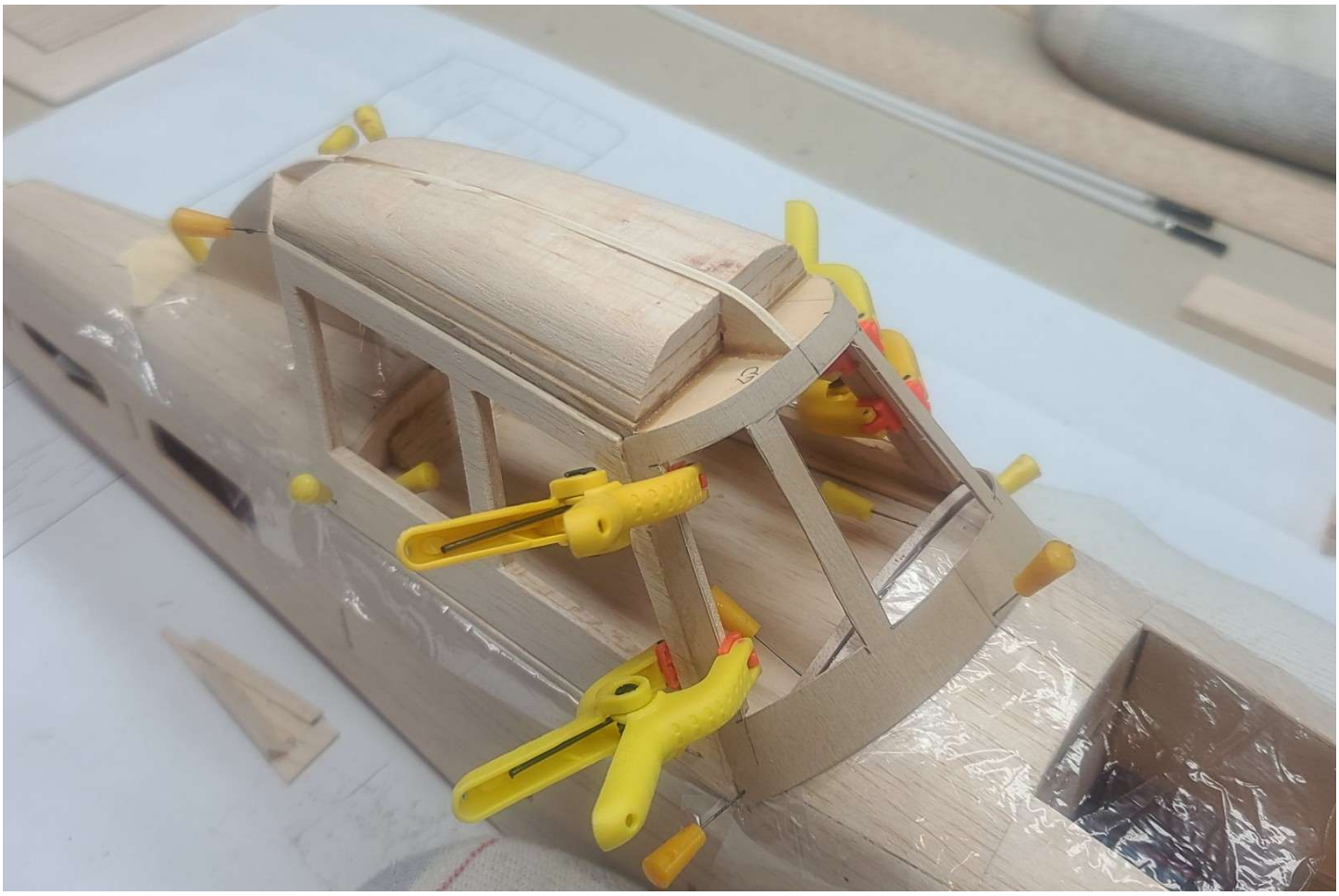


Figure 48 – OA-1K Cockpit Canopy Construction (cont.)

Next I moved to the back of the canopy and created a paper template for the back side walls. Once satisfied with the fitting I cut the two aft panels from 1/16" balsa sheet and glued them in place. I also used some scrap balsa to fill in the open area over the small triangles above the aft panels and the open area above C7. Once all this assembly had dried, I removed the canopy from the fuselage and roughly sanded it to the profile shape I wanted. I added two pieces of 1/4" X 1/8" basswood for the internal frames on each side of the center front windshield and strengthen all the internal glue joins with a bead of Titebond Ultimate III wood glue. The cockpit canopy now looks as shown in Figure 49.

Figure 49 – OA-1K Cockpit Canopy

Update on latest progress in trying to 3D model the canopy. With further research and viewing of some nice tutorial videos for Fusion 360 (https://www.youtube.com/watch?v=eBTAxZGYUug), I took a different approach in my 3D modeling effort. I had been trying to surface model using *"lofts"* as I did for the nose cone, but I tried another method which uses *"T-splines" or "Mesh"* bodies. As seen in Figure 50 my progress for the 3D printed OA-1K canopy looks promising.

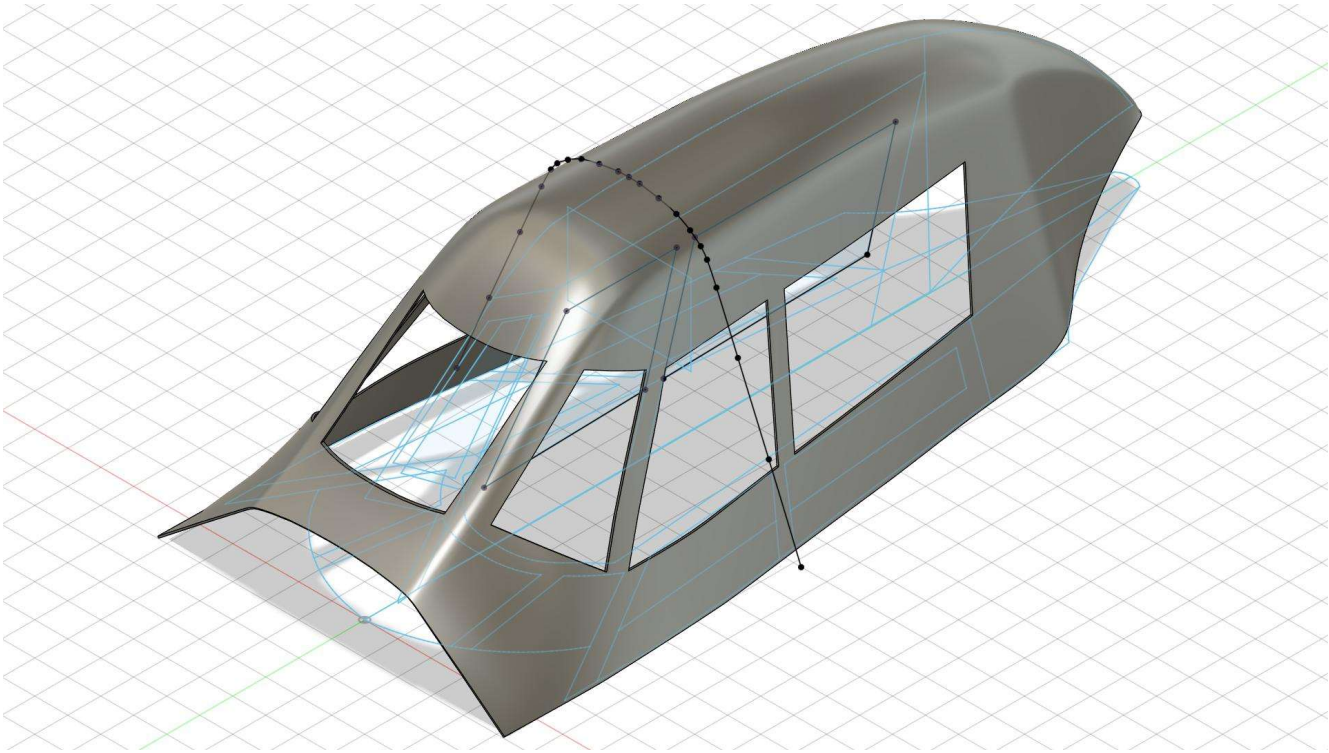


Figure 50 – OA-1K Cockpit Canopy Model using a "T-spline" Mesh

To attach the 3D printed nose cone to the fuselage I epoxied 5/16" square x 2" hardwood rails on the front of former F2, leaving a 1/16" gap along each side for the nose cone thickness. I will drill two holes in each side of the nose cone so it can be mounted using four #2 x 5/16" screws. My OA-1K fuselage at this stage is shown in Figure 51.

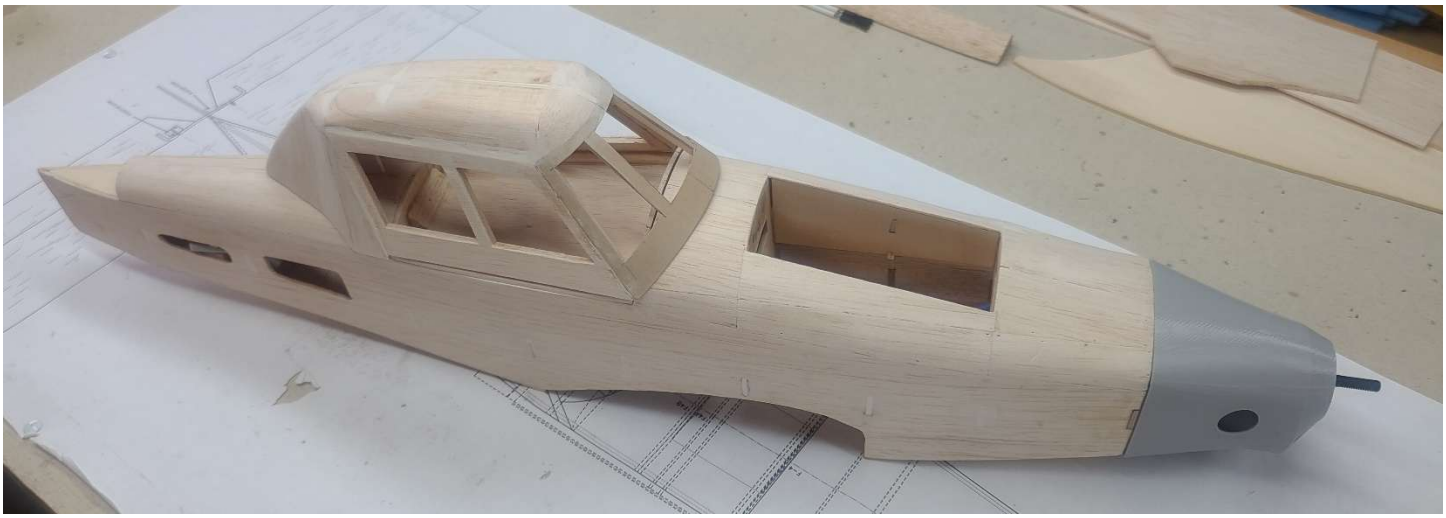


Figure 51 – OA-1K Fuselage Construction (cont.)

Ok, so it was time to start putting this little beast together. After placing the wing into the fuselage wing saddle, I measured from each wing tip to the fuselage aft tip to ensure the wing was square with the fuselage centerline. I then drilled two pilot holes for the Du-Bro #164 10-32 Nylon Wing Bolts, removed the wing, drilled and tapped the holes in the fuselage WH1 plywood plates, **hardened the hole threads with thin CA**, and then re-tapped the holes. Then I drilled the two holes required to attach the aluminum MLG to the G1-3 plywood MLG plates using two M3 screws. After mounting the MLG wheel axles I installed two 2.5" lightweight foam wheels. Figures 52 & 53 below show these installations and current stage of my OA-1K scratch build. She is finally starting to look like a real RC model airplane.

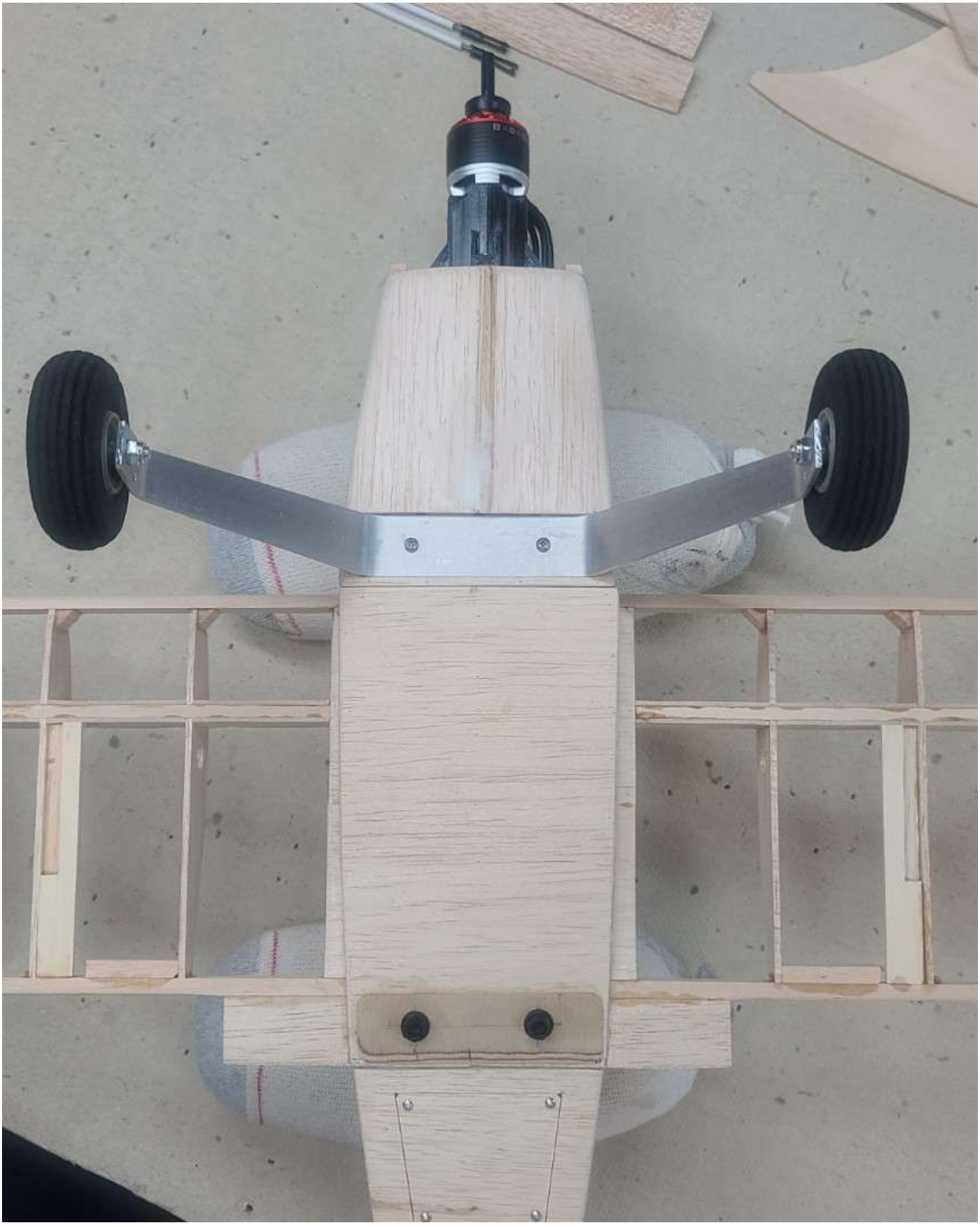


Figure 52 – OA-1K Wing & MLG Mounting to Fuselage

Figure 52 – Current Stage of my OA-1K Scratch Build

For my OA-1K cockpit I needed a 3D model for the pilot and mission payload operator. For the pilot I found a bust I could use on Printables. (https://www.printables.com/model/93582-pilot-133) For the mission payload operator I found an interesting model on Cults3D. (https://cults3d.com/en/3d-model/game/driver-fahrer-extraterrestrial) I took each of the STL files and edited them until I had what I needed, and then 3D printed each using Grey Creality Hyper-PLA with a 0.4mm nozzle and a 0.15mm layer height. The two busts for my OA-1K cockpit are shown below in Figure 53. They each weigh 12 grams.

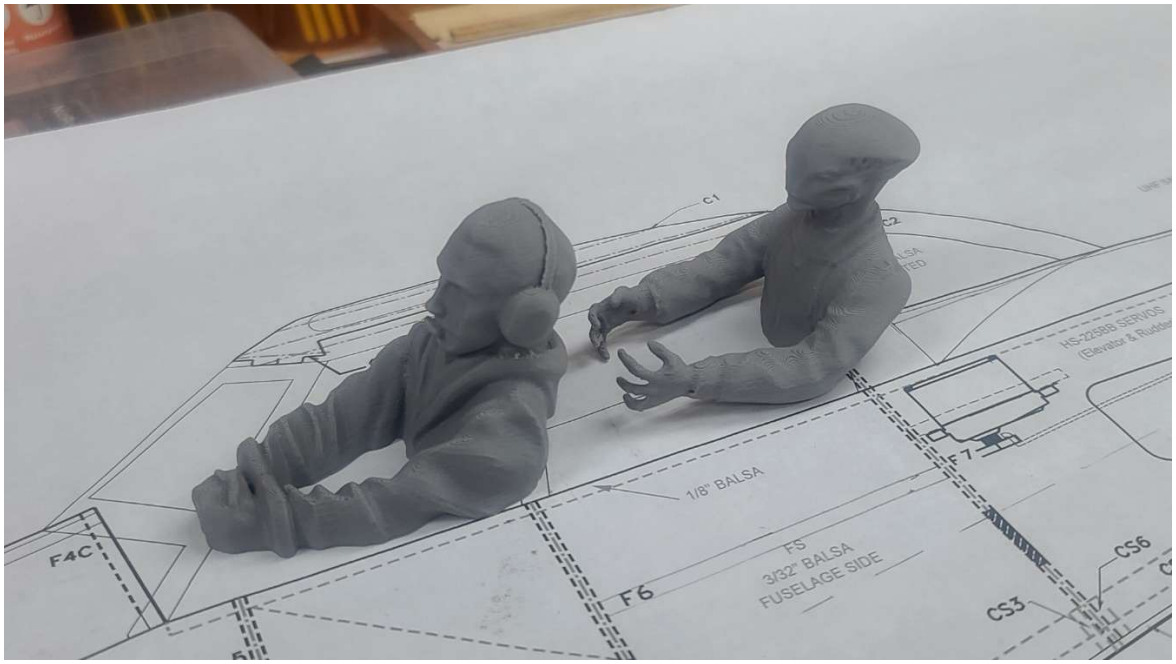


Figure 53 – OA-1K Pilot & Mission Payload Operator 3D Printed Busts

Some other parts I needed to 3D print for my OA-1K RC model were the various cooling air scoops/vents/grills used on the full scale plane (shown below), and these would aid in fuselage internal air cooling of the motor, battery, and ESC on my OA-1K RC model.

Figure 54 – Various OA-1K Fuselage Air Vents

In a web search I was able to find the STL files I needed on Printables (https://www.printables.com/model/969628-vase-mode-rc-air-scoop) and also some others on Thingiverse (https://www.thingiverse.com/thing:1443136). I downloaded the STL files I liked, adjusted them to the sizes I wanted for my OA-1K in Creality Print 6.3, and 3D printed them using Grey Creality Hyper-PETG with a 0.4mm nozzle and a 0.2mm layer height. With the lightening holes already cut in the aft fuselage sides, I couldn't add more holes for air cooling where the grills need to be placed, therefore, the two side grills will be *non-functional* and just glued in place to the outside surface as on the full size aircraft. To provide an actual exit for cooling air at the back of the fuselage, I will place a *functional* grill on the bottom of the fuselage between formers F8 and F9. The 3D parts shown in Figure 54 should help cooling air pass through the fuselage and add a little detail to my *Semi-Scale* OA-1K model.

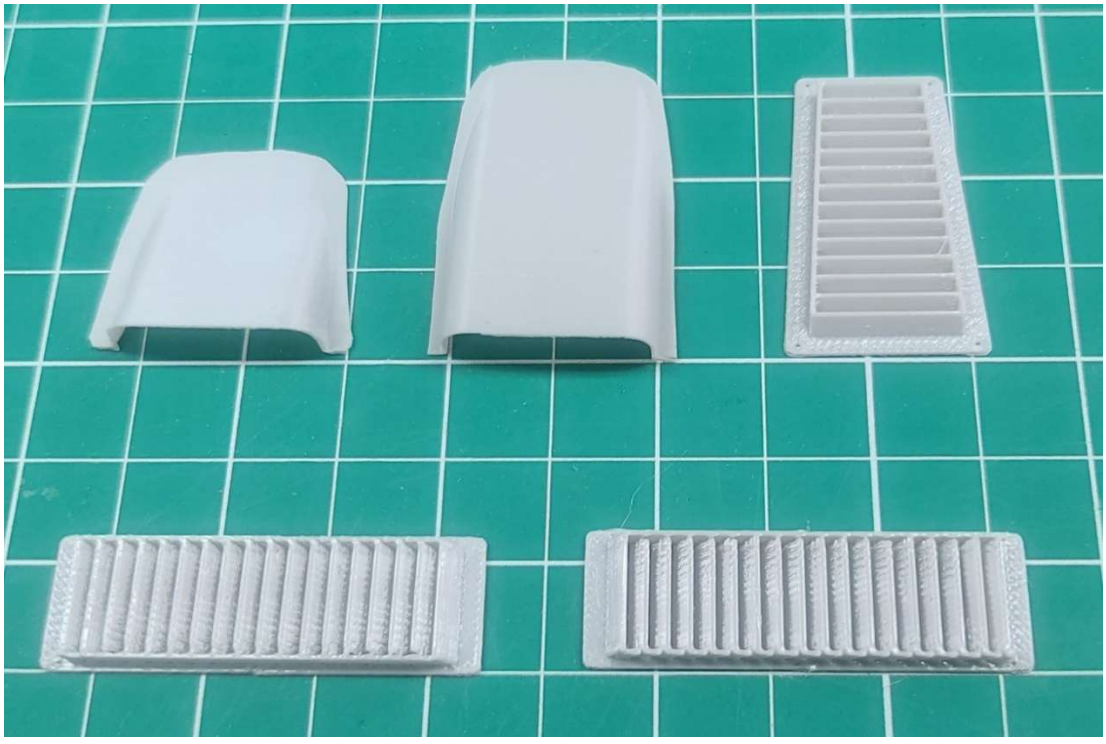


Figure 54 – OA-1K Fuselage Air Vents in Hyper-PETG

In addition to the large KU SATCOM Dome Antenna structure on the back of the canopy, I wanted to add some other communication systems antennas to my *Semi-Scale* OA-1K model that are used on the actual aircraft as can be seen in Figure 55.

Figure 55 – OA-1K Communication Systems Antennas

I found some nice 3-view engineering drawings for UHF SATCOM and Secure UHF/VHF/FM antennas as a small dish and a blade. I took the drawings, scaled them to match my 1/15th scale OA-1K, imported the resulting image files into Fusion 360, produced two STL files for the antennas (Figures 56 & 57), imported those into Creality Print 6.3, and 3D printed them using Black Creality Hyper-PETG with a 0.4mm nozzle and a 0.15mm layer height. I decided I would use the blade antennas as small tabs to remove the LiPo bay access hatch which is flush with the top of the forward fuselage and held in place with magnets. The resulting 3D printed communication systems antennas are shown in Figure 58.

Figures 56-57 - Communications Antennas in Fusion 360

Figures 58 - OA-1K 3D Printed Communications Antennas

OA-1K Full-Up Fit Check & Initial Center of Gravity (CG) Check

Let's see, I have a wing, two flaperon servos, a fuselage and canopy, some tail feathers, a tailwheel bracket and tailwheel, a 3D printed nose cone, a motor, propeller, 3D printed spinner, an ESC, LiPo battery, receiver, and two busts for the cockpit. It looks like I'm about ready for a full-up fit check of all the various assemblies to verify everything fits together as originally intended and then run an initial determination of the resulting C.G. location.

I first installed the nose cone using four #2 x 3/8" screws, then add the MAS 9x7 3-blade propeller & my 3D printed 3-blade PETG spinner. I attached the tail wheel bracket and tailwheel to the mounting plate on the bottom of the fuselage. Then I installed a six-channel receiver between formers F6& F7 using some Velcro tape. I put both flaperon servos in the wing, temporarily mounted both flaperons using Du-Bro #116 standard nylon hinges, and then bolted the fully assembled wing into the fuselage saddle. Next, I temporarily placed a BadAss 45C 2,600mah 4S LiPo battery all the way forward on the F12 support shelf and put the battery access hatch into the fuselage opening. I set the pilot and mission

payload operator busts in the cockpit and put the canopy in place over them. Finally, I temporally pinned the horizontal and vertical stabilizers (tail feathers) to the fuselage, placed the strakes and control horns on top of the horizontal stab, and ran the two control rods up inside their guide tubes.

As shown in Figure 59, I placed my OA-1K assembled model on three digital kitchen scales ***in a normal flying attitude*** (tail raised off the table for a wing zero angle of attack) and recorded the resulting weights. I measured the distance from the MLG axles to the tailwheel axle, and the distance from the MLG axles to the required location of the CG. I then input all these measurements into my handy dandy "CG Calculation by Weight" spreadsheet, and the resulting initial CG location was calculated as shown in Figure 60.

Figure 59 – Full-up Fit Check & CG Measurement

OA-1K Skyraider II CG Calculation by Weight (Initial)

Model			Details			Weight:	3.02	lbs.
OA-1K Skyraider II			**Tail Dragger**	**Imperial**				
D	520.0	mm	Distance between center point of MLG and tail wheel	20.5				
CG(s)	75.7	mm	Distance of specified CG location from MLG axles	3.0				
W(p)	620.0	g	Measured weight at left wheel	21.9				
W(s)	591.0	g	Measured weight at right wheel	20.8				
W(t)	159.0	g	Measured weight at tail wheel	5.6				
W(total)	1370.0	g	Total weight of plane: W(p) + W(s) + W(t)	48.3				
CG(a)	60.4	mm	Actual CG location from MLG: W(t) x D / W(total)	2.4				
W(t)	199.4	g	Weight required at tail wheel for balanced CG: W(total) x CG(a) / D	7.0				
W(delta t)	40.4	g	Delta from weight required at tail wheel	1.4				
CG(diff)	-15.3	mm	Difference between actual and specified CG: CG(a) - CG(s)	-0.6				
Legend:			Aircraft-specific; enter once and do not alter for this aircraft					
			Measured weights; change with every weight session					
			Calculated values; do not edit these fields					

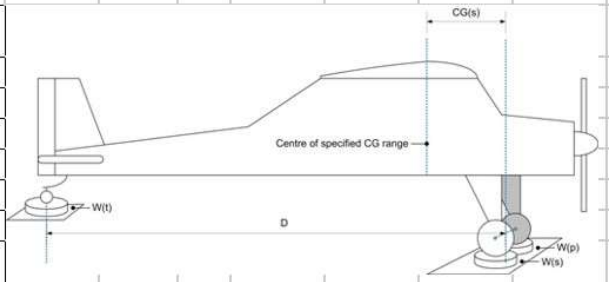


Figure 60 – OA-1K Initial CG Location Calculations

So, my model is ***currently nose heavy*** with a CG difference of -15.3mm, or 0.6" forward of the required location, and currently she comes in at an initial total weigh of 1,370.0 grams or 3.0 lbs. (48.3 oz.). Given the LiPo is all the way forward in the battery bay with approx. 1" available to move aft, and the Koverall fabric covering/paint will add weight primary aft of the required CG, I think we are ok for now. Once I have finished everything I will run through another CG check to determine if any ballast will be needed in the tail to obtain the correct ***final*** CG location.

Using a second method of CG calculation based on "aerodynamic" areas, I plugged the required measurements of my OA-1K model into an online eCalc CG calculator (https://www.ecalc.ch) to calculate the ***"required"*** CG range based on a measurement from the leading edge of the wing. The various measurement entries and results of the eCalc calculator are shown in Figures 61.

eCalc

cgCalc - Center of Gravitiy (CG) Calculator

Full Member Version

1'691'477 simulated Center of Gravitiy

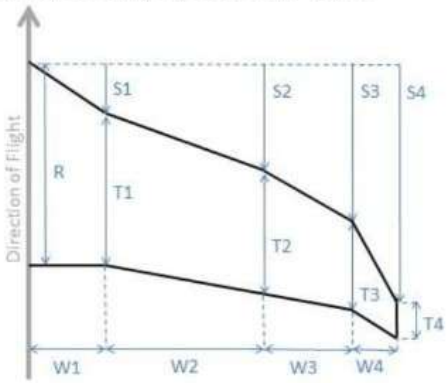
The cgCalc of eCalc.ch not only calculates and evaluates the center of gravity (CG), neutral point (NP) and mean aerodynamic chord (MAC) but also visualizes your design of conventional aircraft, flying wing, delta or canard. Approximate complex wing design with **5 trapezoidal wing panels**. For further instructions see below...

Never ever exceed Center of Gravity on maiden flight!
Select always the more conservative CG of the manufacturer and cgCalc for your maiden flight and read the limitations below.

Aircraft or Project Name:	OA-1K Skyraider II						
Wing:	Monoplane						
Root Chord [R]:	177.8	mm					
Tip Chord [T1-T5]:	177.8	- 0	- 0	- 0	- 0	mm	
Sweep [S1 - S5]:	0.0	- 0	- 0	- 0	- 0	mm	
Panel Span [W1 - W5]:	645.5	- 0	- 0	- 0	- 0	mm	
Tail:	std. Stabilizer (80%)	(Tail Effectivness)					
Root Chord [R]:	102.5	mm					
Tip Chord [T1-T5]:	102.5	- 0	- 0	- 0	- 0	mm	
Sweep [S1 - S5]:	0.0	- 0	- 0	- 0	- 0	mm	
Panel Span [W1 - W5]:	224.0	- 0	- 0	- 0	- 0	mm	
Distance LE Wing to Tail [D]:	426.0	mm (use negative value for canard)					
AC Position:	25	% of MAC (default: 25%)					
Static Margin:	12.5 ... 7.5	% of MAC (recommended: 12.5...5%)					
Fuselage:	Motor Airplane						
Width:	103.2	mm					
Length:	704.0	mm					
Nose Overhang:	211.0	mm					

Units: mm Deutsch | Login

Datum is the leading edge of the center chord R



(if less than 5 half wing panels are required, define the panel Chord, Sweep and span as 0 starting from the far right with W5)

delete all Segments 2-5

calculate

Results: Link to recall OA-1K Skyraider II

Aircraft CG range [▪]:	**46.89 ... 55.78** mm (@ 26.37 ... 31.37% of MAC)	Aircraft NP [▪]:	69.11 mm (@ 38.87% of MAC)
Wing AC [▪]:	44.45 mm (@ 25% of MAC)	Tail AC [▪]:	25.63 mm (@ 25% of MAC)
Wing MAC @ Distance	177.80 mm @ 322.75 mm	Tail MAC @ Distance	102.50 mm @ 112.00 mm
Wing Sweep @ MAC:	0.00 mm	Tail Sweep @ MAC:	0.00 mm
Wing Span:	1291.00 mm	Tail Span:	448.00 mm
Wing Area:	**229539.80** mm²	Tail Area:	**45920.00** mm²
Wing Aspect Ratio:	7.26	Tail Aspect Ratio:	4.37
Fuselage influence:	-5.41mm (= -3.04% of MAC)	Stabilizer Volume (V_{bar}):	0.46

Figure 61 – eCalc OA-1K Measurement Entries & CG Range Results

Using the eCalc method with the static margin set at 12.5 – 7.5% of MAC and an AC position of 25% of MAC, the calculated model CG range works out at 1.85 – 2.2" aft of the wing leading edge. The required CG location given on the original AT-802 plan is 2.19" aft of the wing leading edge, or 3" aft of the MLG axles. Therefore, I need to make sure my ***final CG*** is located somewhat forward of the CG location on my OA-1K plans.

OA-1K Covering and Final Finishing

Well, I'm finally ready to prepare for covering and final finishing. After I completely disassembled the model, I took 320 grit sandpaper and sanded all surfaces on the wing, fuselage, and tail feathers. If there were any dents, scratches, gaps, or open spaces I filled them using Deluxe Materials Model Lite (https://deluxematerials.co.uk/collections/building-finishing-products/products/model-lite-balsa) lightweight filler and then finished sanding those areas. I then vacuumed all the surfaces and finished up by wiping everything down with a painter's tack cloth to remove any remaining sanding dust.

For this model I decided to try a different method than I have used in the past to cover my RC balsa models. Given I needed a matte or flat finish, and I have 3D printed parts that need painted the same finish color, I ordered some SIG Heat Shrinkable Koverall (https://sigmfg.com/products/sig-koverall), a lightweight polyester based fabric that has high strength and is easy to apply. It accepts all common model paints like dope, enamel or epoxy and weighs 1.25 oz. per sq yd. SIG Koverall is an uncoated, heat shrinkable plain fabric which has no glue on it. To adhere Koverall to a model, you can either dope it on ala the traditional silk-and-dope method, or as I did, use SIG Stix-It heat activated covering adhesive (https://sigmfg.com/products/sig-stix-it-covering-adhesive). All I had to do was brush a coat of Stix-It on the OA-1K surfaces, let it dry, then iron-on the Koverall just like I would a much more expensive iron-on heat shrink covering such as Ultracoat. Once the Koverall was stuck down around the edges, I was then able to shrink the covering tight with my covering iron or a heat gun.

Figure 62 shows what I use to do my RC model covering. The "pink" (no comments please) cotton sheet over my worktable helps to hold pieces in place and reduces marking up the covering. Tools I use are a good covering iron with a cotton head cover, a smaller trim sealing iron, good sharp scissors, #11 knife, ruler, and a sand or lead shot filled sock to hold parts while I'm trying to apply the covering along edges and curves. I initially use 250 degrees for my iron to attach the covering, bottom surface of each part first, followed by sides (as on the fuselage), and then finish with the upper surface. Once ***all covering has been installed on a given part***, I raise the covering iron temp up to 325 degrees and go back over all the seams and edges first and then work the entire surface to get the covering to shrink up to a nice drum like surface. **Note** - Doing this final step before having covering on all sides of a model structure can lead to warping the structure.

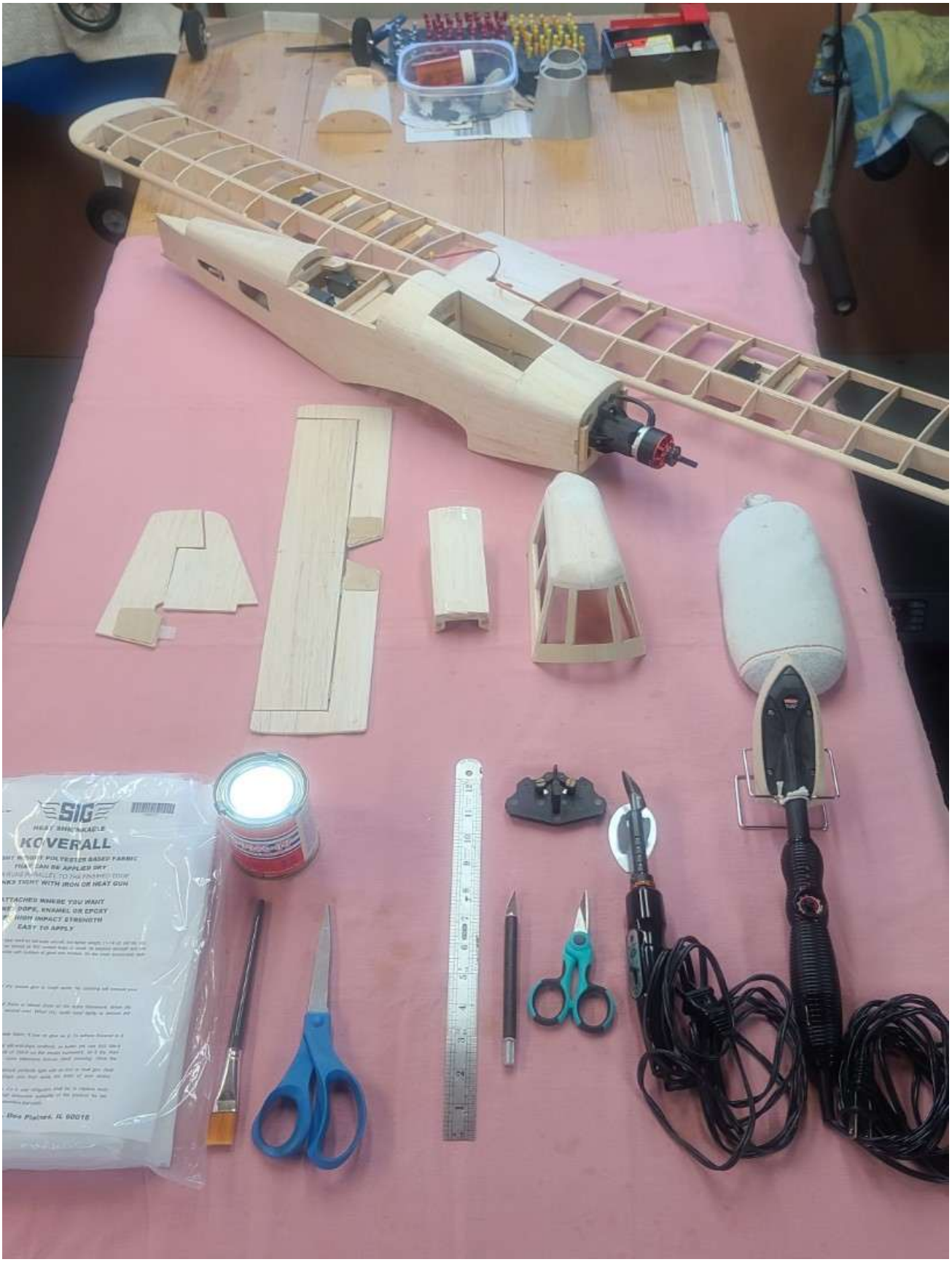


Figure 62 – OA-1K Covering Set-Up, Required Tools & Materials

I started covering my OA-1K with the tail feathers first. Given I had not used SIG Koverall before, if I were to mess something up it would be better to mess up something small and easy to replace. I started on one side of each part, brushed on some Stix-It, let that dry, and then applying the Koverall fabric with just enough overhand to go around the parts edges, but not onto the other side. Once all the tail feather parts had the first side done I repeated the process for the other side. **Note** – Remember to apply some Stix-It on the Koverall fabric that was wrapped around the edges from the first side so the opposite side of Koverall will stick down.

I found the Koverall fabric easy to work with as long as I used a new sharp X-Acto knife blade and good sharp scissors. I liked the fact that Koverall wraps around curved surfaces easier that Ultracoat with no wrinkles, and the part surfaces turned out very smooth. Figure 63 shows the OA-1K tail feathers covered with SIG Koverall.

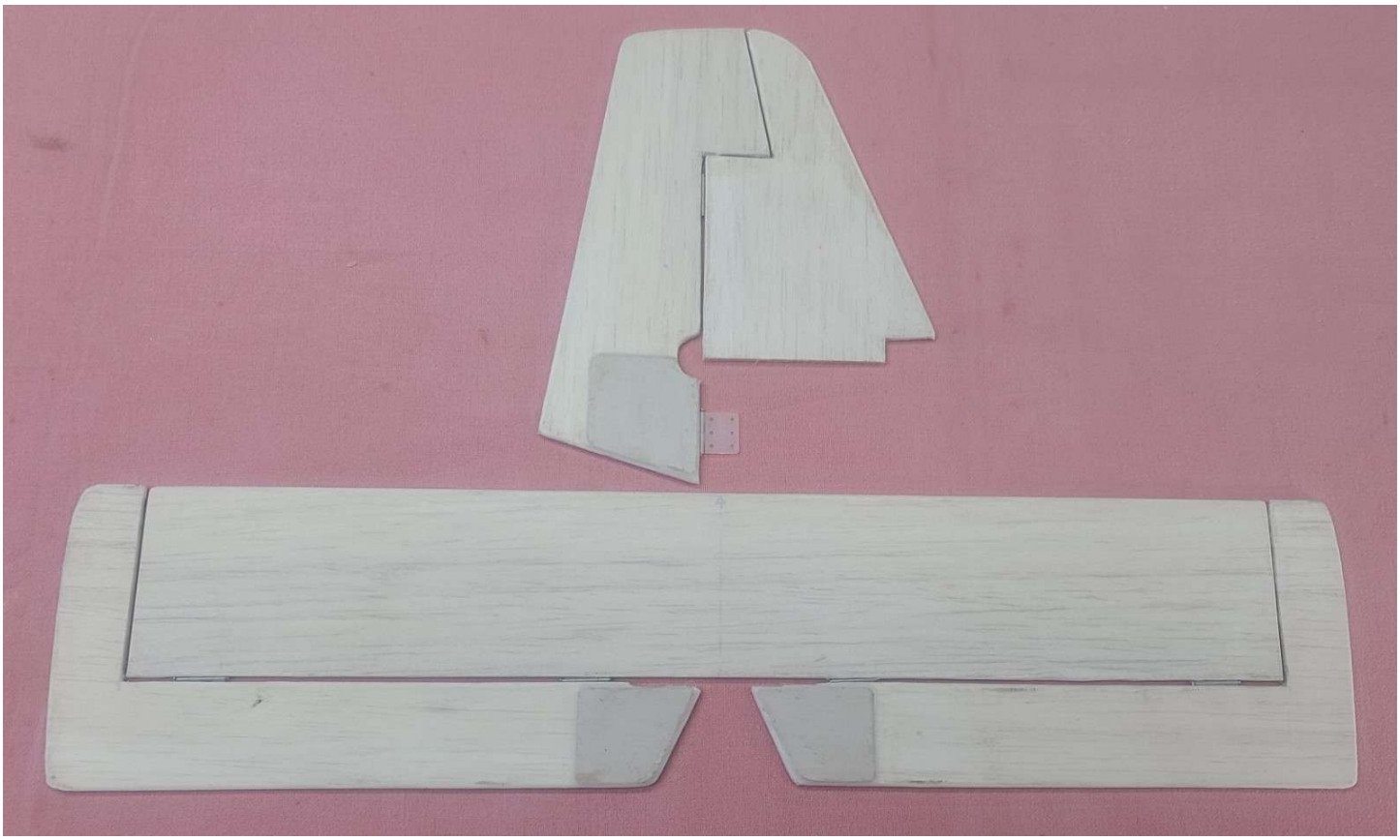


Figure 63 – OA-1K Tail Feathers Covered with SIG Koverall

Well, I thought everything was coming along ok, but I'm going to have to backup on my covering methodology. Before I did any more covering I decided to see how well the Koverall would take acrylic spray paint, ***and I was not impressed***. Even after sanding the first coat and applying a second coat, I still did not like the way the covering looked. So, it's back to using Ultracoat and then see if I can find some spray paint to match the color for the PLA parts. If I want a matte finish, I'll consider using a clear acrylic spray over the Ultracoat, which would also help seal down any decals I put on the model.

I re-accomplished all the steps listed on pages 29-31 above to make another set of tail feathers and then pressed forward covering them with Lite Gray Ultracoat. Next was the fuselage. I decided to first cut the three holes in the fuselage for the air vents/ducts. With those finished I then covered the fuselage, starting on the bottom, then working up the two sides, and finishing with the top surfaces. I finished the fuselage by covering the tail feather servos and LiPo bay access covers.

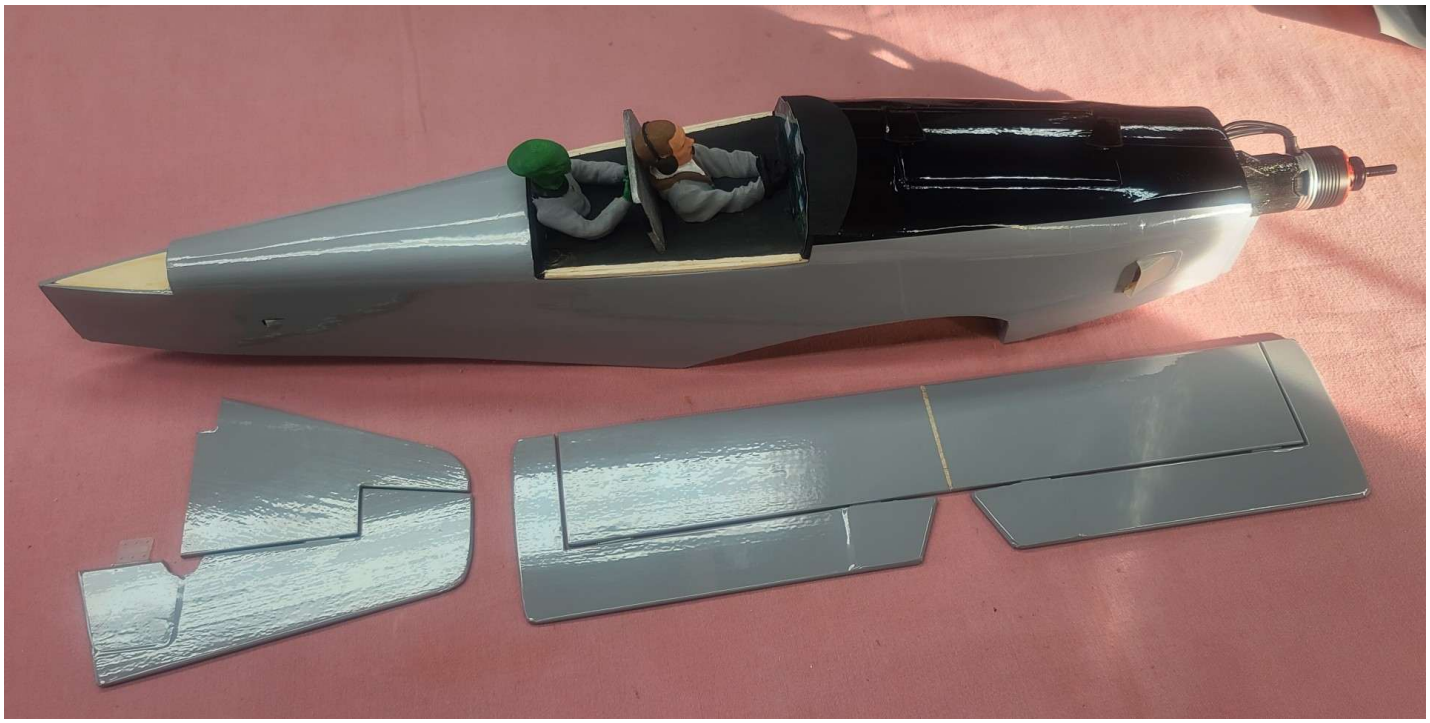


Figure 64 – OA-1K Covered using Light Gray & Black Ultracoat

I held off on covering the canopy just in case I had some kind of breakthrough on my 3D canopy modeling effort. So, next up was covering the wing. First I removed the aileron servos from the wing and wiped down all the wing surfaces to remove any dust. To help the Ultracoat adhere to the wing leading/trailing edges, ribs, and around all the pylon mounting rail openings, I applied a light coating of Deluxe Materials Cover-Grip (https://deluxematerials.co.uk/products/cover-grip) to the wood surfaces.

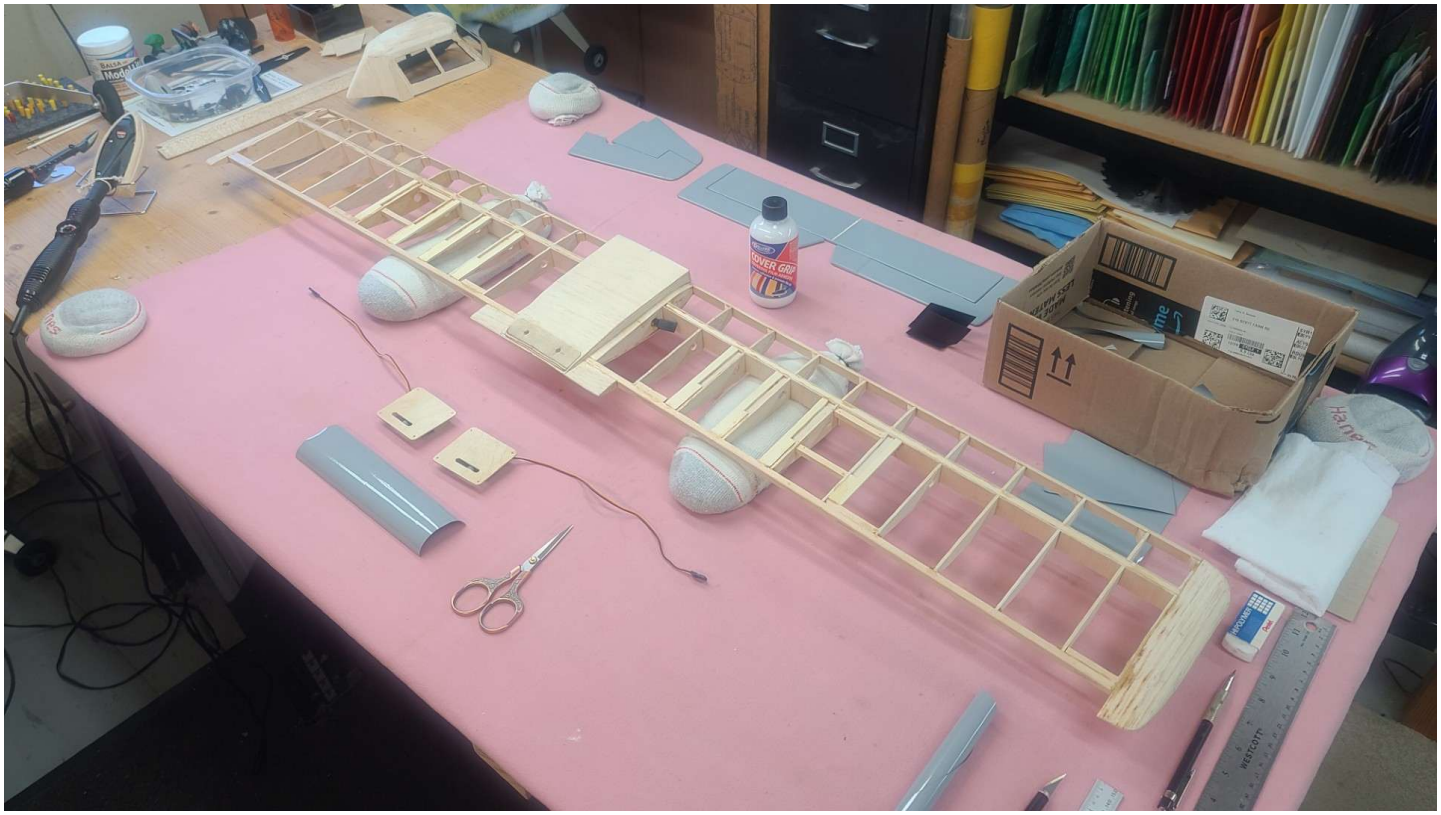


Figure 65 – OA-1K Wing Bottom Prepping for Ultracoat Covering

After that was dry, I started my wing covering by applying Light Gray Ultracoat to the bottom of the wing in three sections, each of the outer wing panels first, followed by the wing center section. The wing bottom covering was applied right up to all the outer edges but not wrapped around them. With that finished I covered each of the two aileron servo mounting plates and then re-installed the servo's back into the bottom of the wing using #1 x 5/16" pan head screws, and ran the servo leads thru the ribs and out the holes in the wing center section upper surface.

Light Gray Ultracoat was next applied to the wing top surfaces, again in three sections, wrapping the covering around the outer edges and overlapping the bottom covering by 1/8 – 1/4". Once all the wing covering was applied I raised the covering iron temp up to 325 degrees and went back over all the seams and edges first, then worked the entire surface to get the covering to shrink up to a nice drum like surface.

The next step for the wing covering was to cover both full wingspan ailerons. Here again I started on the bottom surface followed by the top. The final step was to place some black Ultracoat strips on the wing top surface next to the fuselage. These represent the wing walk strips. Figure 66 shows the covered OA-1A wing.

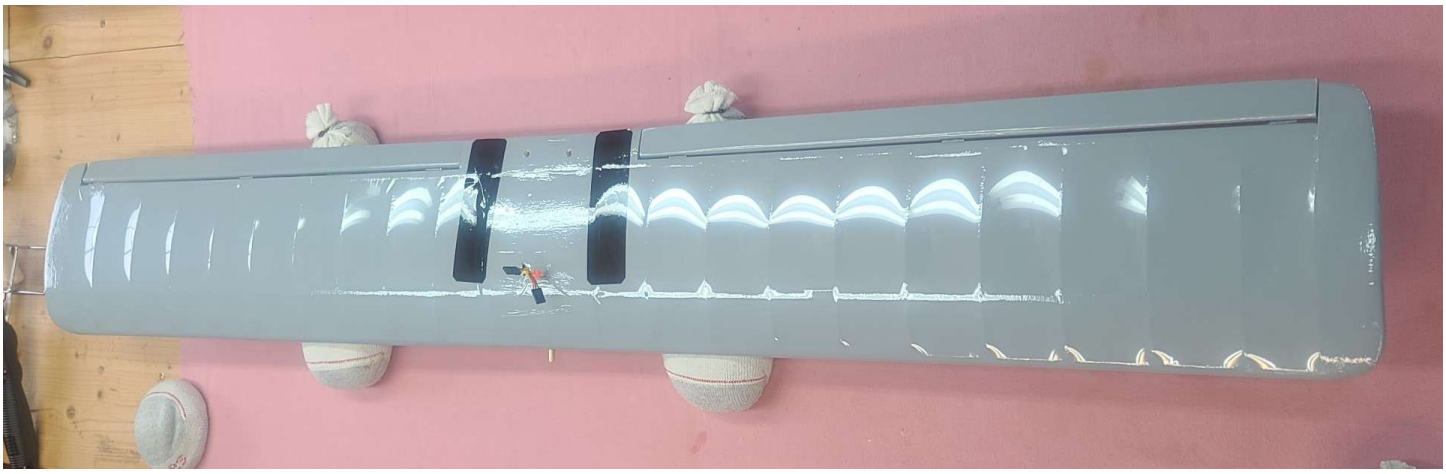


Figure 66 – OA-1K Wing Covered using Light Gray Ultracoat

Only major part left to cover was the canopy, so I finished sanded, dusted, and applied a coat of Cover Grip to the outside surfaces. I then applied flat black acrylic model paint to the inside surfaces. After applying Light Gray Ultracoat to all the outside surfaces, I carefully cut-out the seven canopy window openings in the Ultracoat. Using the pieces of balsa & ply I had cut-out earlier to make the window openings, I used these as templates to cut clear plastic windows and then glued them in place with clear canopy glue and some 1/8" black stripping tape. Last step was to glue the canopy to the cockpit floor plate which is then attached to the fuselage using four 5x2mm Neodymium disc magnets.

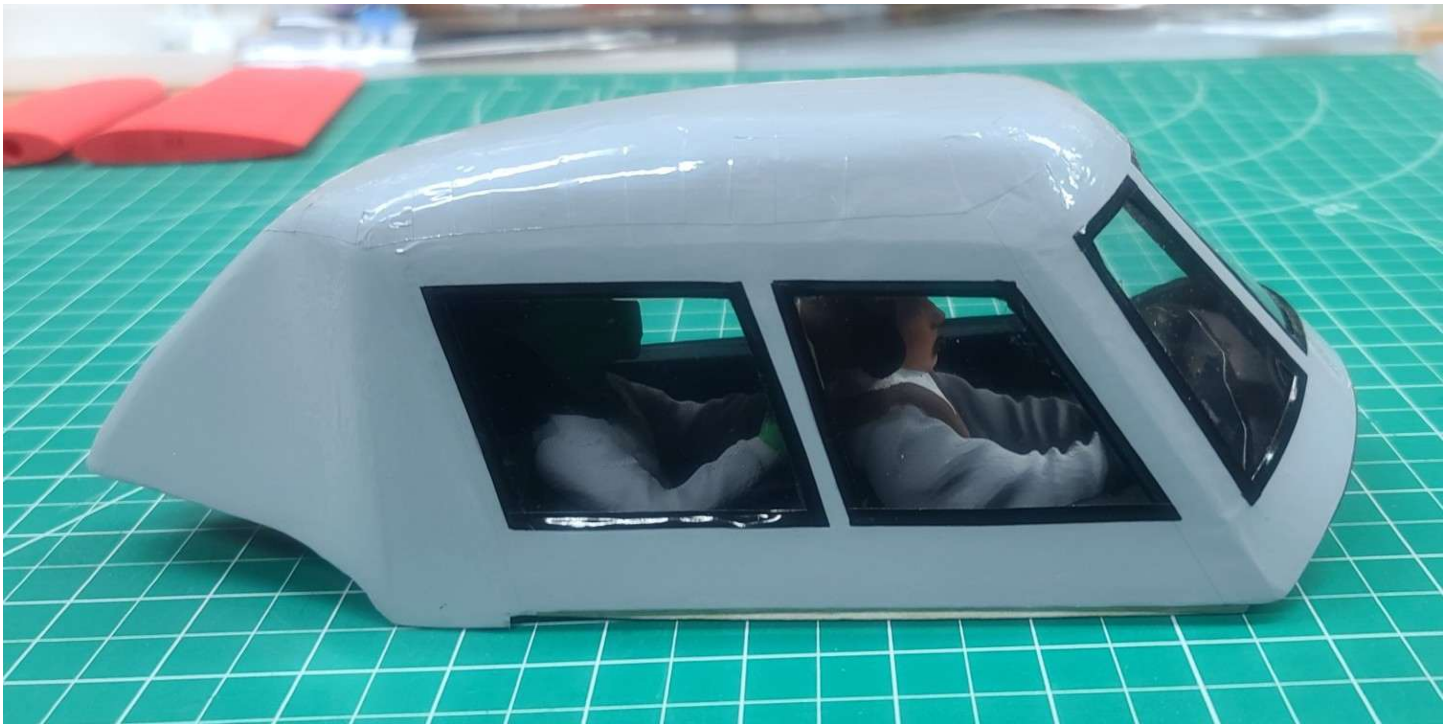
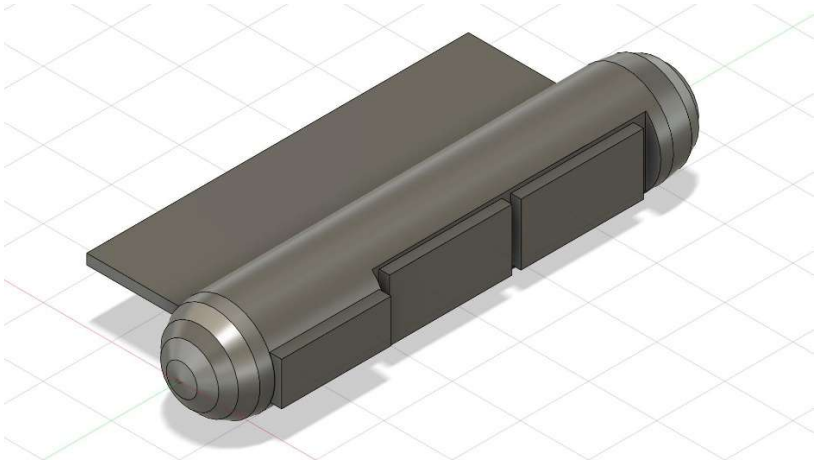


Figure 67 – OA-1K Canopy Covering

Other 3D Modeling Efforts for OA-1K

While looking through some 3D images on the web of the OA-1K I came across one that showed some small Airborne Countermeasures Dispenser Pods mounted along the bottom of fuselage aft of the wing and forward of the horizontal stabilizer. I thought these looked pretty cool, so I decided to try and see if I could model a 3D pod using Fusion 360.

Since the pod is basically a grouping of basic shapes, I was able to build the 3D model shown in the left image below. Using this model, I exported the STL file and then used Creality Print 7.0 (new latest version) to print out two pods using Gray Hyper-PETG filament with a 0.4mm nozzle and 0.15mm layer height. The resulting two Countermeasures Dispenser Pods are shown in the right image below. I will need to paint these before installing them on my OA-1K.



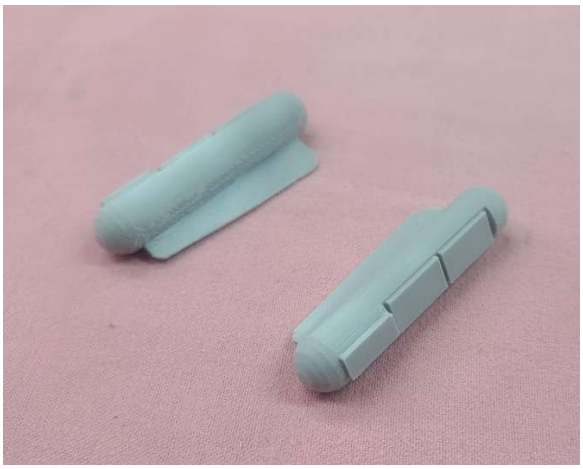


Figure 68 – OA-1K Airborne Countermeasures Dispenser Pods

Another armament I wanted to make a 3D model of and hang under the wing of my OA-1K was the GAU-19 gatling gun, or Mini-Gun. I found a **free** 3D Sketchup (SKT) file on the Sketchup website

(https://3dwarehouse.sketchup.com/model/186dbddd-8e63-46fa-92bc-00483f8b86dd/gau-19b?hl=en) for the three-barrel version that is shown in several actual OA-1K images, and converted that to a STL file. Using the STL file and Fusion 360, I scaled it to 1/15th scale, added an ammo drum, modified the assembly so it could be attached directly to an OA-1K wing hardpoint, and then produced the 3D model in the left image below. Using this 3D model, I exported an STL file and then used Creality Print 7.0 to print the ammo drum using Gray Hyper-PETG filament with a 0.4mm nozzle and 0.15mm layer height. I then printed the GAU-19 using Black Hyper-PETG filament with a 0.2mm nozzle and 0.08mm layer height. The resulting GAU-19 3D model is shown in the right image below. I think it looks awesome.

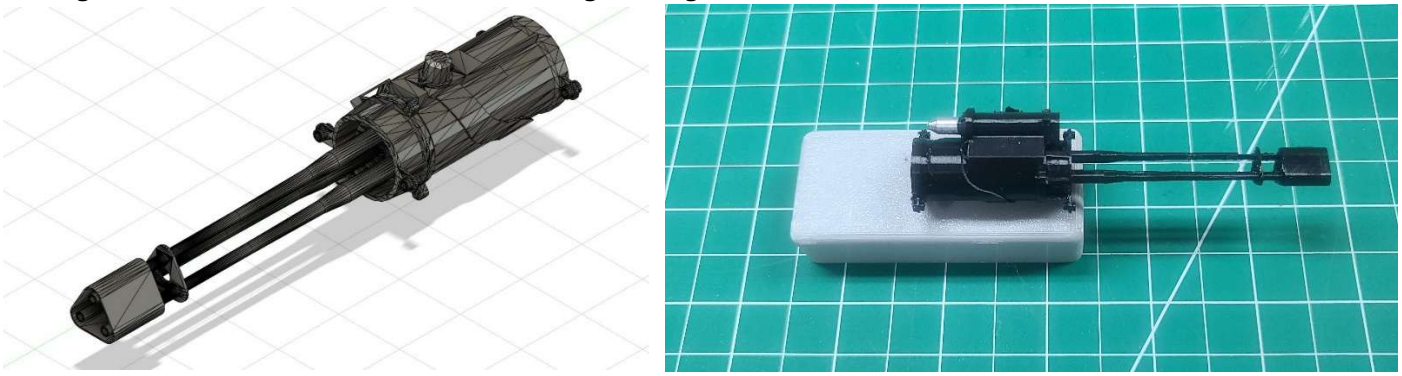


Figure 69 – OA-1K GAU-19 3D Model

OA-1K Final Assembly

With the covering finished it was time to start the final assembly of my OA-1K. I finished the wing with installation of the ailerons using Du-Bro #116 Standard Nylon Hinges (x3 in each aileron), Du-Bro #237 T-style Nylon Control Horns (x2), Du-Bro #600 2-56 Spring Steel Kwik-Link Clevises (x2), Du-Bro #855 E/Z Links (x2), and 6" 2-56 wire control rods (x2). I then epoxied the eight "*Modified*" Freewing "male" pylon mounting rails in the Lite Ply weapon station hardpoints on the bottom surface of the wing. Other than some potential detailing later, this completed the wing assembly.

Next was mounting the tail feathers to the fuselage. I first attached the MLG bracket and wheels to the bottom of the fuselage. I then attached the elevator to the horizontal stabilizer using Du-Bro #116 Standard Nylon Hinges (x4) and the 3/32" music wire elevators joiner with 20-minute epoxy. I used my magnetic building board and a couple fixtures to ensure the horizontal stabilizer was mounted parallel to the plane of the wing. Using two magnetic fixtures that have thumb screws installed, I adjusted their positions such that the stab ends were maintained at the same height from the build board while the 20-minute epoxy cured on the stab/fuselage surfaces. This set-up is shown in Figure 70.

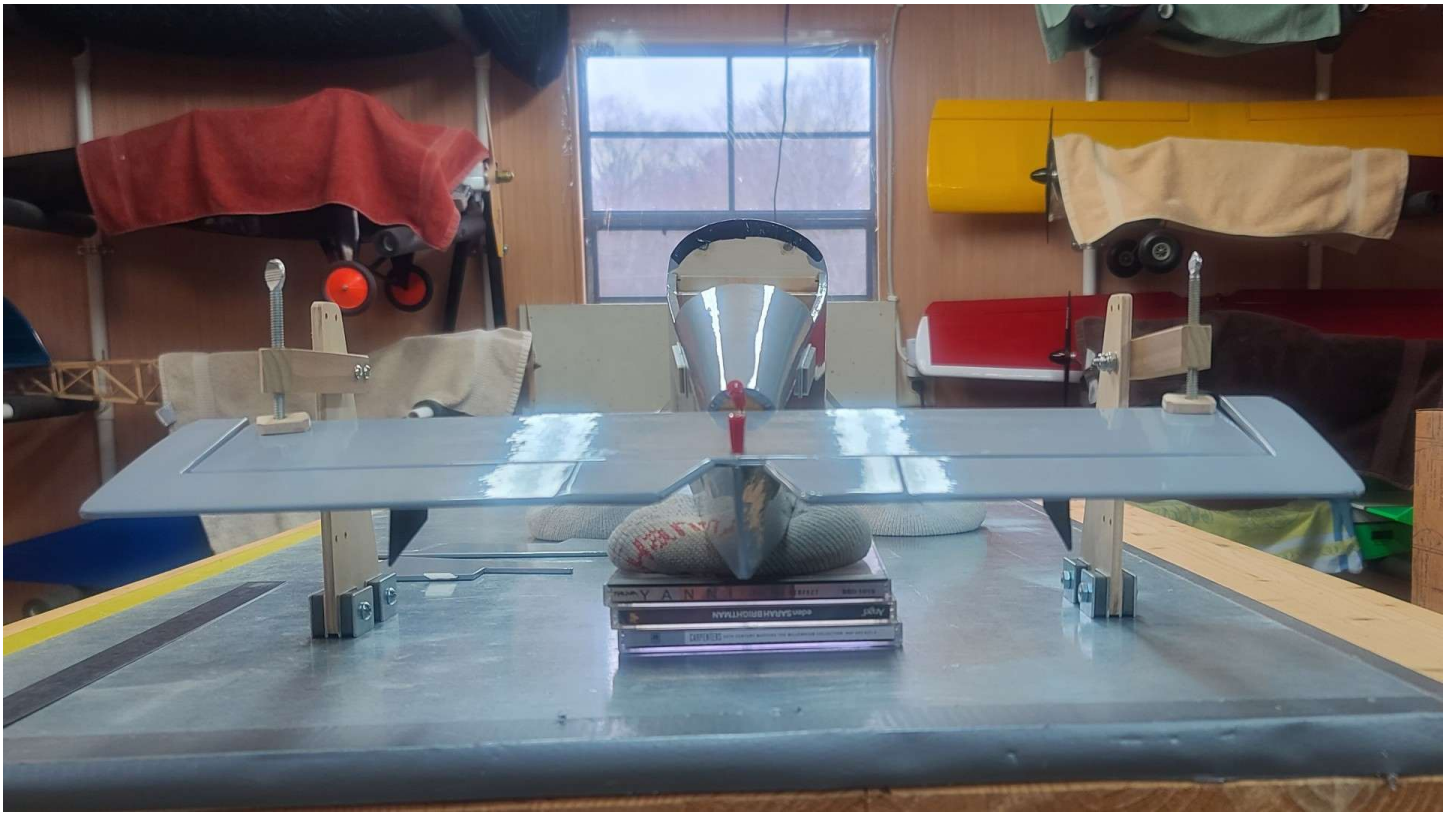


Figure 70 – Horizontal Stabilizer to Fuselage Join

The mag fixtures where then used to hold the vertical stabilizer at 90 degrees to the horizontal stab while its epoxy joint cured. This was also verified using a plastic 30-60-90 triangle. When that epoxy had cured I used some scrap soft balsa to form the two fuselage pieces needed to fill in the open spaces between the fuselage, horizontal, and vertical stabilizers. When satisfied with their fit I glued them in place and covered them with Light Grey Ultracoat.

Last parts installation for the tail feathers was the rudder and tail wheel assembly. I temporarily installed the top Du-Bro #116 Standard Nylon Hinge between the vertical stab and rudder to check the alignment of the rudder with the fuselage so I could establish where I needed to cut the lower hinge slot in the fuselage, and the tail wheel wire in the rudder. Once those were done I epoxied the rudder hinges to the vertical stabilizer and fuselage, tail wheel wire to the rudder, and screwed the tail wheel wire brace to the bottom of the fuselage.

Finally, using Du-Bro #237 T-style Nylon Control Horns (x2), Du-Bro #600 2-56 Spring Steel Kwik-Link Clevises (x4), and Du-Bro #500 36" Lazer Rod Pushrods (x2), I connected the rudder and elevator to their respective servo arms.

Figure 71 – Vertical Stabilizer & Tail Wheel Installation

During the tail feathers installation, I realized I had to come up with some Horizontal Stabilizer Struts similar to those used on the actual OA-1K as shown in Figure 55. So, I took several measurements off my 1/15th Semi-Scale model and then used those to draw up a 3D model of a strut in Fusion 360. The left image in Figure 72 shows the resulting 3D model. This basically is a 2mm thick by 5mm wide strut with 1.0mm hole on the fuselage end, and a 1.0x2.0mm pin on the stab end. The ends are angled so they can be attached to the underside of the horizontal stab and bottom of the fuselage. After exporting the STL file from Fusion 360, I loaded the file up in Creality Print 7 and printed the struts using Black Hyper-PETG with a 0.4mm nozzle and 0.15mm layer thickness. The resulting 3D struts are shown in the right image of Figure 72. These were attached to my OA-1K using #1x1/4" pan head screws and CA glue.

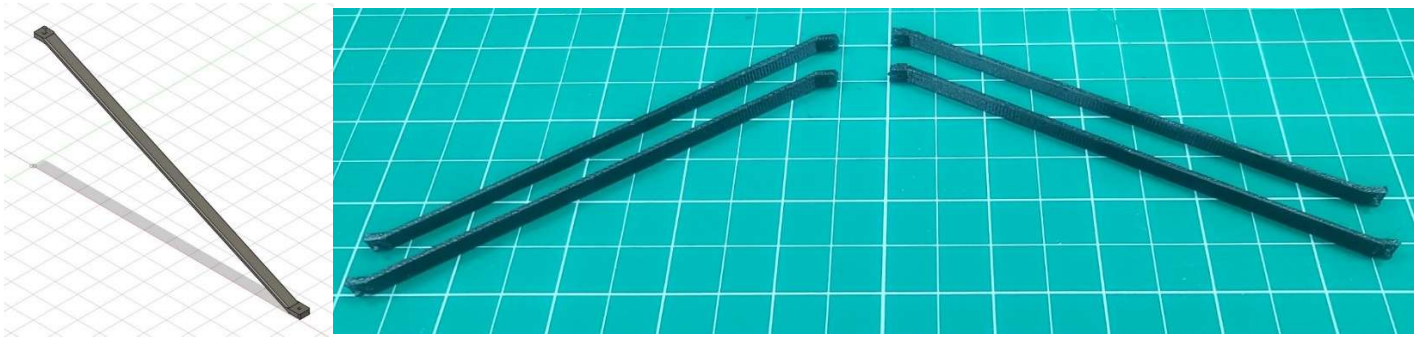


Figure 72 – Horizonal Stabilizer Struts

While on the subject of 3D models, how about an update on the external stores that can be hung from the underside of the wing on my OA-1K. As shown below in Figure 73, I finally have everything painted and ready to hang on the pylons. *These turned out pretty nice I think.*

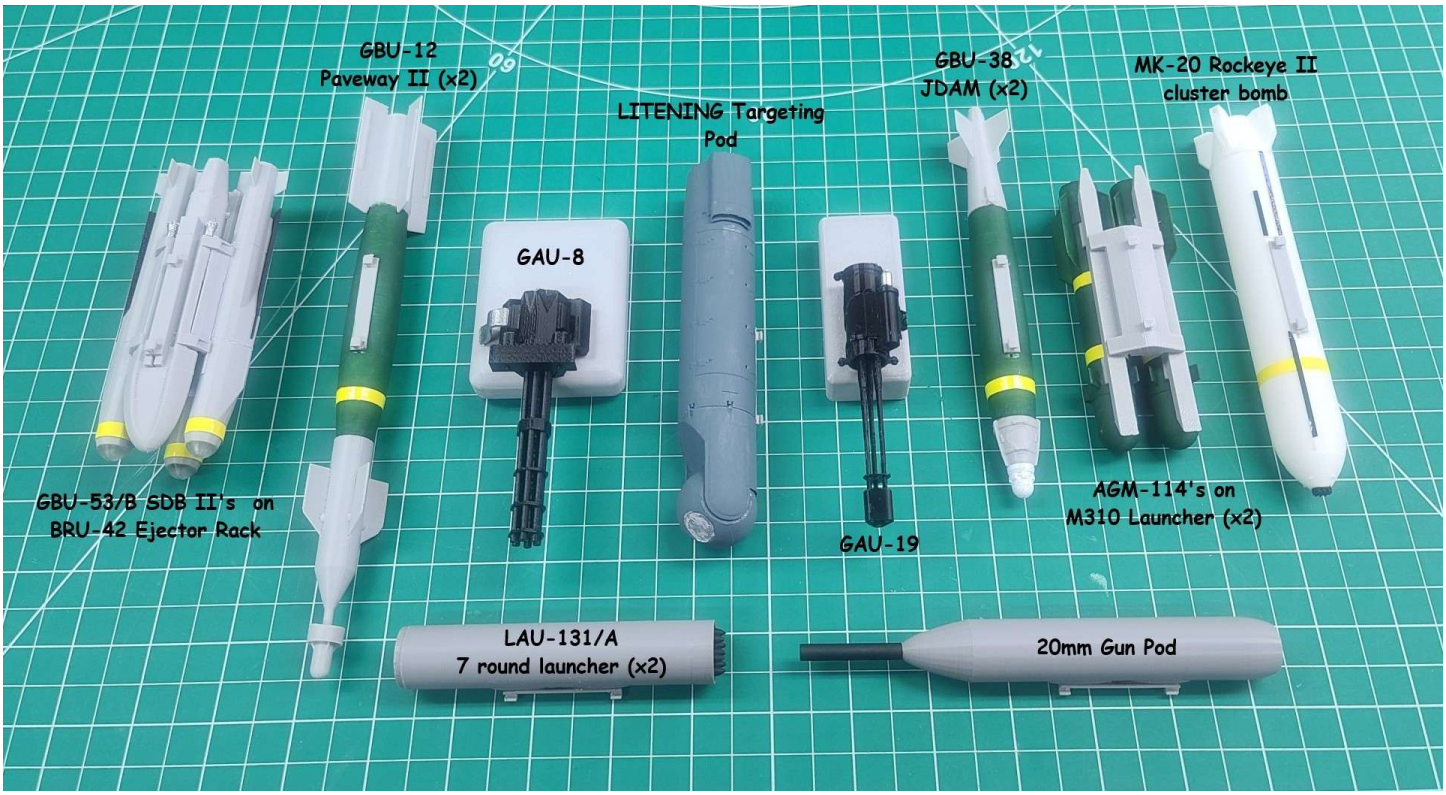


Figure 73 – OA-1K External Stores Ready to Hang under the Wing

Continuing with the final assembly, I installed two disk shaped UHF SATCOM antennas (Figure 58) on the top and bottom centerline of the aft fuselage, another near the left wingtip, and two other communications short whip antennas on each side of the vertical stabilized. I then cut slots along the bottom edge of the aft fuselage on each side and attached the two Airborne Countermeasures Dispenser Pods using CA glue. I also installed 3D printed pitot static tubes on the wing leading edge near each wingtip.

Next I reinstalled the 3D printed nose cone, spinner, and MAS 9x7 3-Blade Propeller. I found I needed to place an additional 2mm spacer on the motor mount so there would be enough clearance between the spinner backplate and the nose cone. I hooked up my power analyzer multi-meter for a system check. Using a 4S LiPo battery at storage voltage, my power system pulled 400 watts and 28 amps at full throttle. It will be interesting to see what values I get using a fully charged LiPo.

Since I hope to eventually replace my balsa built cockpit canopy with a 3D printed canopy and KU SATCOM dome, I did not want to glue the cockpit to the fuselage. Therefore, I used the four pairs of magnets installed earlier, plus I ran a narrow strip of black pin stripe tape along the bottom sides of the canopy to join the canopy to the fuselage. To ensure the canopy would not leave the model during flight, I also installed a #1x3/4" button head screw at the centerline of the front canopy edge down into the top of the fuselage.

Now for a few decals. Using clear water slide decal paper, I placed black standard USAF "Star & Bar" insignia on each side of the aft fuselage, one on the top side of the left wing, and another on the bottom side of the right wing. Then I put small "OA-1K Skyraider II" labels on each side of the fuselage just below and forward of the canopy front corners. To adhere with AMA and FAA rules I placed my AMA number on one side below the "OA-1K Skyraider II" label, and my FAA registration number on the other side. I then put the aircraft serial number, base ID letters, and the AFSOC logo on each side of the vertical stabilizer/rudder. My cell phone number and home address were written inside the fuselage at

the wing saddle so that should my OA-1K decide to "fly-away" hopefully someone would contact me should they find her. I do this for all my RC models. I might look into some additional decals for added details later.

Last item required for final assembly was to reinstall the wing, hooking up the flaperon servo leads to support control system checks. Results of all my efforts up to this point are now displayed in Figure 74.

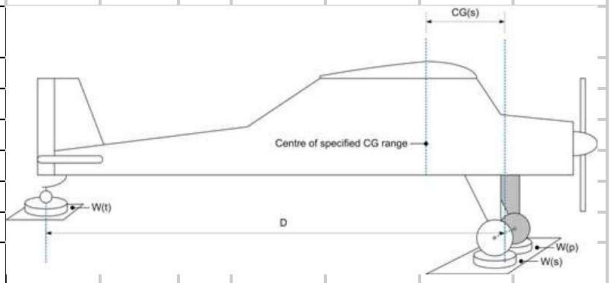
Figure 74 – My OA-1K Skyraider II

OA-1K Final CG Measurement & Control System Set Up

It was now time to run a ***final*** CG measurement and set up the control surfaces. I once again placed my OA-1K model on three digital kitchen scales ***in a normal flying attitude*** (tail raised off the table for a wing zero angle of attack) and recorded the resulting weights. I then input these measurements into my handy dandy "CG Calculation by Weight" spreadsheet, and the resulting CG location was calculated as shown blow in Figure 75.

OA-1K Skyraider II CG Calculation by Weight (Final)

Model			Details			Weight:	3.47	lbs.
OA-1K Skyraider II			Tail Dragger	Imperial				
D	520.0	mm	Distance between center point of MLG and tail wheel	20.5				
CG(s)	75.7	mm	Distance of specified CG location from MLG axles	3.0				
W(p)	676.0	g	Measured weight at left wheel	23.8				
W(s)	662.0	g	Measured weight at right wheel	23.4				
W(t)	237.0	g	Measured weight at tail wheel	8.4				
W(total)	1575.0	g	Total weight of plane: W(p) + W(s) + W(t)	55.6				
CG(a)	78.2	mm	Actual CG location from MLG: W(t) x D / W(total)	3.1				
W(t)	229.3	g	Weight required at tail wheel for balanced CG: W(total) x CG(a) / D	8.1				
W(delta t)	-7.7	g	Delta from weight required at tail wheel	-0.3				
CG(diff)	2.5	mm	Difference between actual and specified CG: CG(a) - CG(s)	0.1				



Legend:		Aircraft-specific; enter once and do not alter for this aircraft
		Measured weights; change with every weight session
		Calculated values; do not edit these fields

Figure 75 – OA-1K CG Location Calculations

So, my model was ***slightly tail heavy*** with a CG difference of 2.5mm, or 0.1" aft of the required location, and she came in at a total weigh of 1,575.0 grams or 3.47 lbs. (55.6 oz.). Given this CG measurement was taken with the LiPo all the way forward in the battery bay I will need to see about first moving the ESC forward, and if needed add some ballast on the motor mount to obtain an acceptable slightly forward ***final*** CG location.

Now for my OA-1K control system set up. I first set up my Spektrum AR610 6-Channel RC Sport Receiver port assignments for a "flaperon" aircraft configuration. Using the recommended set up for an E-Flight 1.5m Air Tractor as a guide, I then set up my NX8 transmitter for the following OA-1K control surface settings:

Control Surface	**Hi Rate (100%)**	**Low Rate (70%)**
Ailerons Deflection	15mm	10mm
Elevator Deflection	15mm	7mm
Rudder Deflection	15mm	10mm
Flaperons Deflection	50%	30%
Aileron Expo	20%	30%
Elevator Expo	20%	30%
Rudder Expo	25%	50%

Flight Timer: 4 minutes using a 2,600mah 4S LiPo

CG Range: 46-55mm aft of wing root chord leading edge

Well, it was finally time to see what this little beast looked like when loaded up for some action. I first set her up in what I call a *"Lite Load Configuration,"* which is made up using a GAU-19, a MK-20 Rockeye II (CBU-100) cluster bomb, AGM-114's on M310 launchers (x2), and LAU-131 rocket launchers (x2). This configuration is shown in Figure 76.

Figure 76 – OA-1K "Lite Load Configuration"

Then I set her up in what I call a *"Heavy Load Configuration,"* which is made up using a GAU-8, the LITENING Targeting Pod, GBU-12 Paveway II's (x2), GBU-38 JDAMs (x2), and GBU-53/B SDB II's hanging on a BRU-42 Triple Ejector Rack. This configuration is shown in Figure 77.

Figure 77 – OA-1K "Heavy Load Configuration"

Well, all I need now is for the North Carolina weather to warm up to melt all the ice and snow on the ground and maybe try and see if I can keep from destroying my OA-1K attempting a first flight. More to come!!