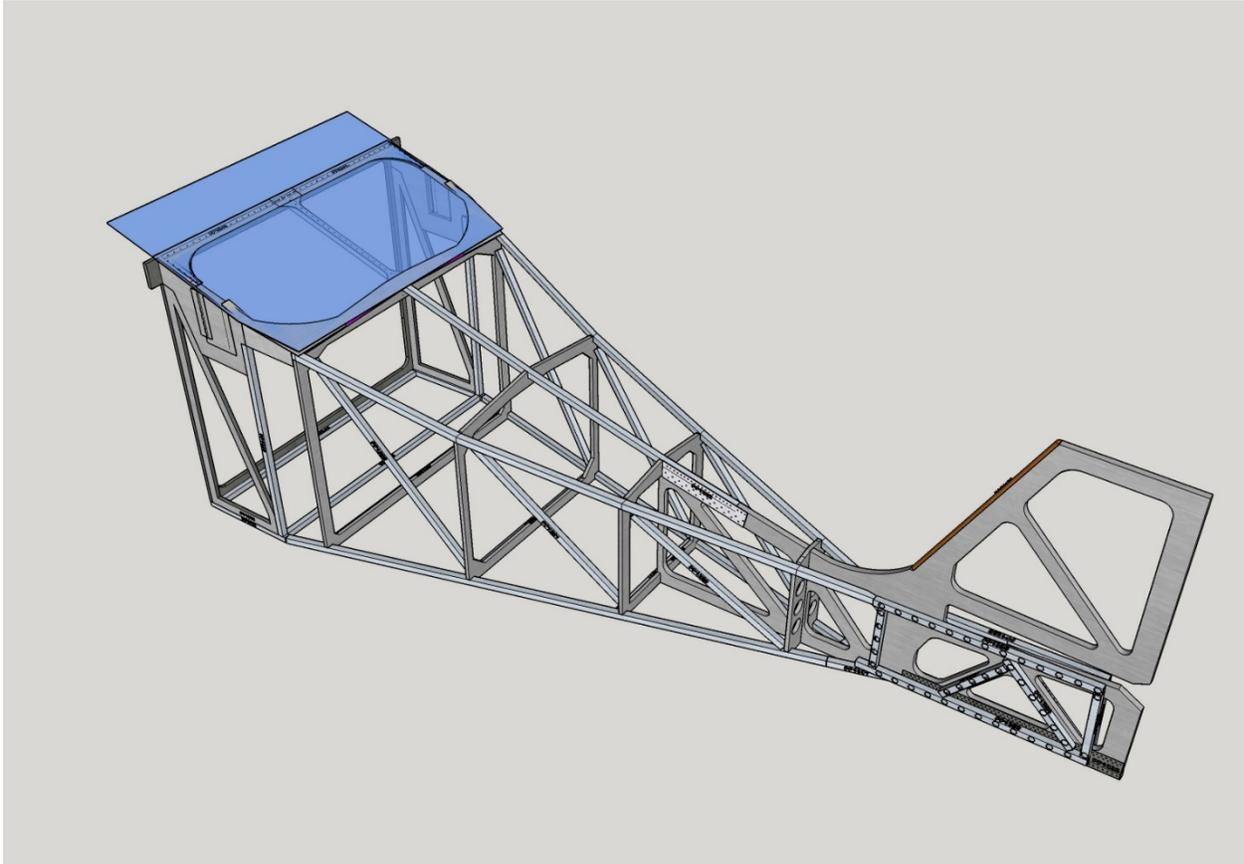


Rear Fuselage Revised Sep 19 2017

By James Wiebe



1: View of Rear Fuselage Assembly for Chipper

The rear fuselage is built from the bottom upwards. You will need to have a flat table to build this part. The dimensions of the table should be 10' long (12' preferable) with a width of 48".

You will be occasionally be drilling and clecoing parts through the bottom skin, into the table. Therefore, to protect your table and allow a flat build as clecos are inserted into bottom skin, you may wish to build on sheets of foam on top of the table (these sheets are not supplied with kit).

The following rear fuselage BOM is provided for guidance only. Check the updated BOM which came with your kit for exact part information.

Required parts for assembly of rear fuselage:



REAR FUSELAGE ASSEMBLY PROCEDURE

Rear Fuselage											
1	Rear Fuse	PP1301	A Former 1	Rear Fuselage FW 8 27 2017	1	1 Honeycomb - aluminum		326.40	Sq In	21.03	1.31
2	Rear Fuse	PP1302	A Former 2	Rear Fuselage FW 8 27 2017	1	1 Honeycomb - aluminum		208.14	Sq In	13.41	0.84
3	Rear Fuse	PP1303	A Former 3	Rear Fuselage FW 8 27 2017	1	1 Honeycomb - aluminum		131.70	Sq In	8.49	0.53
4	Rear Fuse	PP1304	A Former 4	Rear Fuselage FW 8 27 2017	1	1 Honeycomb - aluminum		98.00	Sq In	6.32	0.39
5	Rear Fuse	PP1305	A Former 5	Rear Fuselage FW 8 27 2017	1	1 Honeycomb - aluminum		64.20	Sq In	4.14	0.26
6	Rear Fuse	PP1306	A Angle Setter	Rear Fuselage FW 8 27 2017	2	2 Honeycomb - aluminum		100.10	Sq In	6.45	0.81
7	Rear Fuse	PP1307	A Short Rib Spanner	Rear Fuselage FW 8 27 2017	2	2 Honeycomb - aluminum		70.70	Sq In	4.56	0.57
8	Rear Fuse	PP1308	A Rib End	Rear Fuselage FW 8 27 2017	2	2 Honeycomb - aluminum		28.80	Sq In	1.86	0.23
9	Rear Fuse	PP1309	A Vertical Stabilizer spine	Rear Fuselage FW 8 27 2017	1	1 Honeycomb - aluminum (0.75" thick)		647.44	Sq In	69.78	4.36
10	Rear Fuse	PP1310	A Wood Leading Edge (0.75" square dowel)	Rear Fuselage FW 8 27 2017	1	1 Poplar		5.50	Cu In	1.27	0.08
11	Rear Fuse	PP1311P	A Parent for PP1311 - PP1314 (7.5 sticks of 73" length)	Rear Fuselage FW 8 27 2017	7.5		611.6				
12	Rear Fuse	PP1311	Child - A Square 0.82 73" stock length	Rear Fuselage FW 8 27 2017		5 73.00	365.0	73.00	In	10.10	3.16
13	Rear Fuse	PP1312	Child - A .032 wall square .82"	Rear Fuselage FW 8 27 2017		2 39.25	78.7	39.40	In	5.45	0.68
14	Rear Fuse	PP1313	Child - A .032 wall square .82"	Rear Fuselage FW 8 27 2017		2 14.80	29.6	14.80	In	2.05	0.26
15	Rear Fuse	PP1314	Child - A .032 wall square .82"	Rear Fuselage FW 8 27 2017		1 36.4	36.4	36.40	In	5.04	0.31
16	Rear Fuse	PP1315	Child - A .032 wall square 1.0" (20" raw length)	Rear Fuselage FW 8 27 2017	1	2 8.00	16.0	8.00	In	1.11	0.14
17	Rear Fuse	PP1316P	A Parent for PP1316 - 1318 (1 Stick of 73" length)	Rear Fuselage FW 8 27 2017	1		61.3				
17	Rear Fuse	PP1316	Child - A .032 wall square .82"	Rear Fuselage FW 8 27 2017		1 26.00	26.0	26.00	In	3.60	0.22
18	Rear Fuse	PP1317	Child - A .032 wall square .82"	Rear Fuselage FW 8 27 2017		1 15.75	15.8	15.75	In	2.18	0.14
19	Rear Fuse	PP1318	Child - A .032 wall square .82"	Rear Fuselage FW 8 27 2017		1 19.52	19.5	19.50	In	2.70	0.17
20	Rear Fuse	PP1319	A Bottom rear reinforcement (24" length)	Rear Fuselage FW 8 27 2017	1	1 0.75" square x 24 x .049" wall	6061T6	24.00	In	3.32	0.21
21	Rear Fuse	PP1320P	A Parent for PP1320 - PP1331 (7 sticks of 73" length)	Rear Fuselage FW 8 27 2017	7		561.1				
22	Rear Fuse	PP1320	Child - A .032 wall square .82"	Rear Fuselage FW 8 27 2017		2 23.67	47.3	23.70	In	3.28	0.41
23	Rear Fuse	PP1321	Child - A .032 wall square .82"	Rear Fuselage FW 8 27 2017		2 27.25	54.5	27.25	In	3.77	0.47
24	Rear Fuse	PP1322	Child - A .032 wall square .82"	Rear Fuselage FW 8 27 2017		2 32.58	65.2	32.60	In	4.51	0.56
25	Rear Fuse	PP1323	Child - A .032 wall square .82"	Rear Fuselage FW 8 27 2017		2 30.07	60.1	30.10	In	4.16	0.52
26	Rear Fuse	PP1324	Child - A .032 wall square .82"	Rear Fuselage FW 8 27 2017		2 19.60	39.2	19.60	In	2.71	0.34
27	Rear Fuse	PP1325	Child - A .032 wall square .82"	Rear Fuselage FW 8 27 2017		2 25.50	51.0	25.50	In	3.53	0.44
28	Rear Fuse	PP1326	Child - A .032 wall square .82"	Rear Fuselage FW 8 27 2017		2 11.95	23.9	12.00	In	1.66	0.21
29	Rear Fuse	PP1327	Child - A .032 wall square .82"	Rear Fuselage FW 8 27 2017		2 9.97	19.9	10.00	In	1.38	0.17
30	Rear Fuse	PP1328	Child - A .032 wall square .82"	Rear Fuselage FW 8 27 2017		2 27.05	54.1	27.10	In	3.75	0.47
31	Rear Fuse	PP1329	Child - A .032 wall square .82"	Rear Fuselage FW 8 27 2017		2 9.45	18.9	9.50	In	1.31	0.16
32	Rear Fuse	PP1330	Child - A .032 wall square .82"	Rear Fuselage FW 8 27 2017		2 9.18	18.4	9.20	In	1.27	0.16
33	Rear Fuse	PP1331	Child - A .032 wall square .82"	Rear Fuselage FW 8 27 2017		2 7.53	15.1	7.60	In	1.05	0.13
34	Rear Fuse	PP1332	A Gusset	Rear Fuselage FW 8 27 2017	2	2 0.040 sheet aluminum	6061T6	1.08	Cu In	1.69	0.21
35	Rear Fuse	PP1333	A Gusset	Rear Fuselage FW 8 27 2017	2	2 0.040 sheet aluminum	6061T6	60.66	Sq In	3.80	0.48
36	Rear Fuse	PP1334	A Side Skin Main	Rear Fuselage FW 8 27 2017	2	2 0.016 sheet aluminum	2024T3	2403.00	Sq In	60.29	3.77
37	Rear Fuse	PP1335	A Side Skin Small	Rear Fuselage FW 8 27 2017	2	2 0.016 sheet aluminum	2024T3	290.80	Sq In	7.30	0.46
38	Rear Fuse	PP1336	A Bottom Skin	Rear Fuselage FW 8 27 2017	1	1 0.016 sheet aluminum	2024T3	2241.70	Sq In	56.24	3.51
39	Rear Fuse	PP1337	A Top Skin 1 - obsolete	Rear Fuselage FW 8 27 2017	0	0 0.016 sheet aluminum	2024T3	1485.00	Sq In	0.00	0.00
40	Rear Fuse	PP1338	A Top Skin 2	Rear Fuselage FW 8 27 2017	1	1 0.016 sheet aluminum	2024T3	960.00	Sq In	24.08	1.51
41	Rear Fuse	PP1339	A Top Skin 3	Rear Fuselage FW 8 27 2017	1	1 0.016 sheet aluminum	2024T3	690.00	Sq In	17.31	1.08
42	Rear Fuse	PP1340	A Top Skin 4	Rear Fuselage FW 8 27 2017	1	1 0.016 sheet aluminum	2024T3	306.40	Sq In	7.69	0.48
43	Rear Fuse	PP1341	A Angle 0.625" x 0.625" x .050" (supplied as single length 72")	Rear Fuselage FW 8 27 2017	1	2 19.50	6061T6	1.22	Cu In	1.91	0.24
44	Rear Fuse	PP1342	A Left and right honeycomb pieces	Rear Fuselage FW 8 27 2017	2	2 Honeycomb - aluminum		96.96	Sq In	6.25	0.78
45	Rear Fuse	PP1343	A Left and right inset honeycomb pieces	Rear Fuselage FW 8 27 2017	2	2 Honeycomb - aluminum		27.88	Sq In	1.80	0.22
46	Rear Fuse	PP1344	A .040" polycarbonate	Rear Fuselage FW 8 27 2017	1	1 0.400 polycarbonate		446.12	Sq In	12.39	0.77
47	Rear Fuse	PP1345	A .040" aluminum gusset for turtledeck area	Rear Fuselage FW 8 27 2017	2	2 0.040 sheet aluminum 6061T6		1.61	Cu In	2.52	0.32
48	Rear Fuse	PP1346	A .040" spine gusset	Rear Fuselage FW 8 27 2017	1	1 0.040 sheet aluminum 6061T6		1.36	Cu In	2.14	0.13
49	Rear Fuse	PP1347	A .040" Flap door	Rear Fuselage FW 8 27 2017	2	2 0.040 sheet aluminum 6061T6		1.32	Cu In	2.07	0.26
50	Rear Fuse	PP1348	A Turtledeck window trim	Rear Fuselage FW 8 27 2017	1	1 0.025 sheet aluminum 6061T6		5.74	Cu In	9.00	0.56
51	Rear Fuse	PP1349	A Turtledeck window	Rear Fuselage FW 8 27 2017	1	1 0.040 polycarbonate		924.92	Sq In	25.69	1.61
52	Rear Fuse	PP1350	Child - A Angle 0.625" x 0.625" x .050" (supplied as single length with PP1344; Rear Fuselage FW 8 27 2017)		0	2 8.00	6061T6	0.36	Cu In	0.57	0.07
53	Rear Fuse	PP1351	Child - A Angle 0.625" x 0.625" x .050" (supplied as single length with PP1344; Rear Fuselage FW 8 27 2017)		0	2 3.00		0.19	Cu In	0.29	0.04
54	Rear Fuse	PP1352	Child - A Angle 0.625" x 0.625" x .050" (supplied as single length with PP1344; Rear Fuselage FW 8 27 2017)		0	2 6.20		0.39	Cu In	0.61	0.08
55	Rear Fuse	PP1353	A Hinge, supplied as 13" raw, each piece is 6.5"	Rear Fuselage FW 8 27 2017	1	2 Aluminum piano hinge 2" wide		13.00		2.55	0.32
56	Rear Fuse	--	A 1/8 Rivet, .063 - .125 Grip (Box Z50) 97447A015	Rear Fuselage FW 8 27 2017	500	500 97447A015		--		--	0.50
57	Rear Fuse	--	NA Glue	Rear Fuselage FW 8 27 2017							36.11
			End Rear Fuselage								

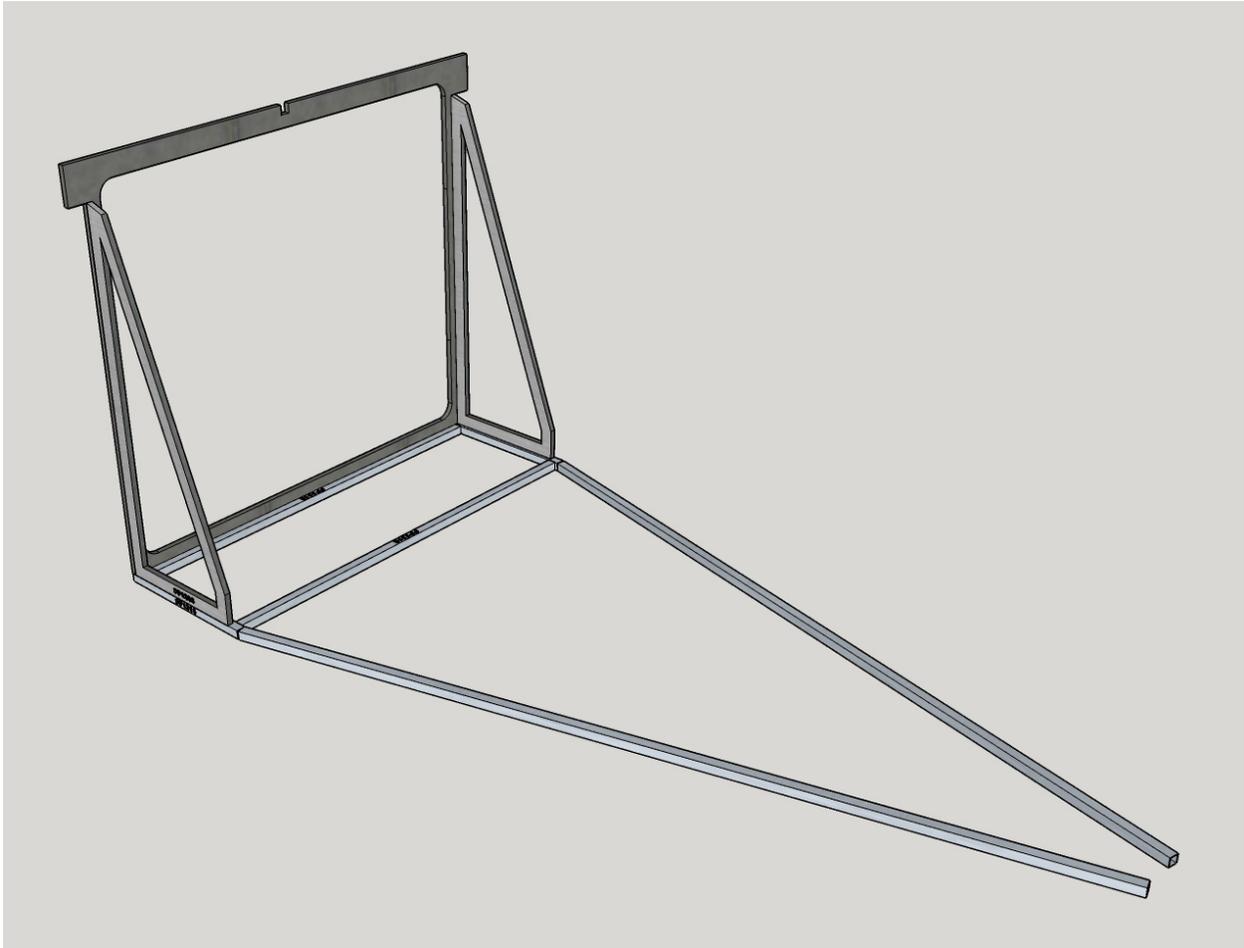
2: Elevator Bill of Materials

Assembly steps:

- Verify Sub-kit inventory.
- Review and understand all instructions before proceeding, completely down to the last instruction.

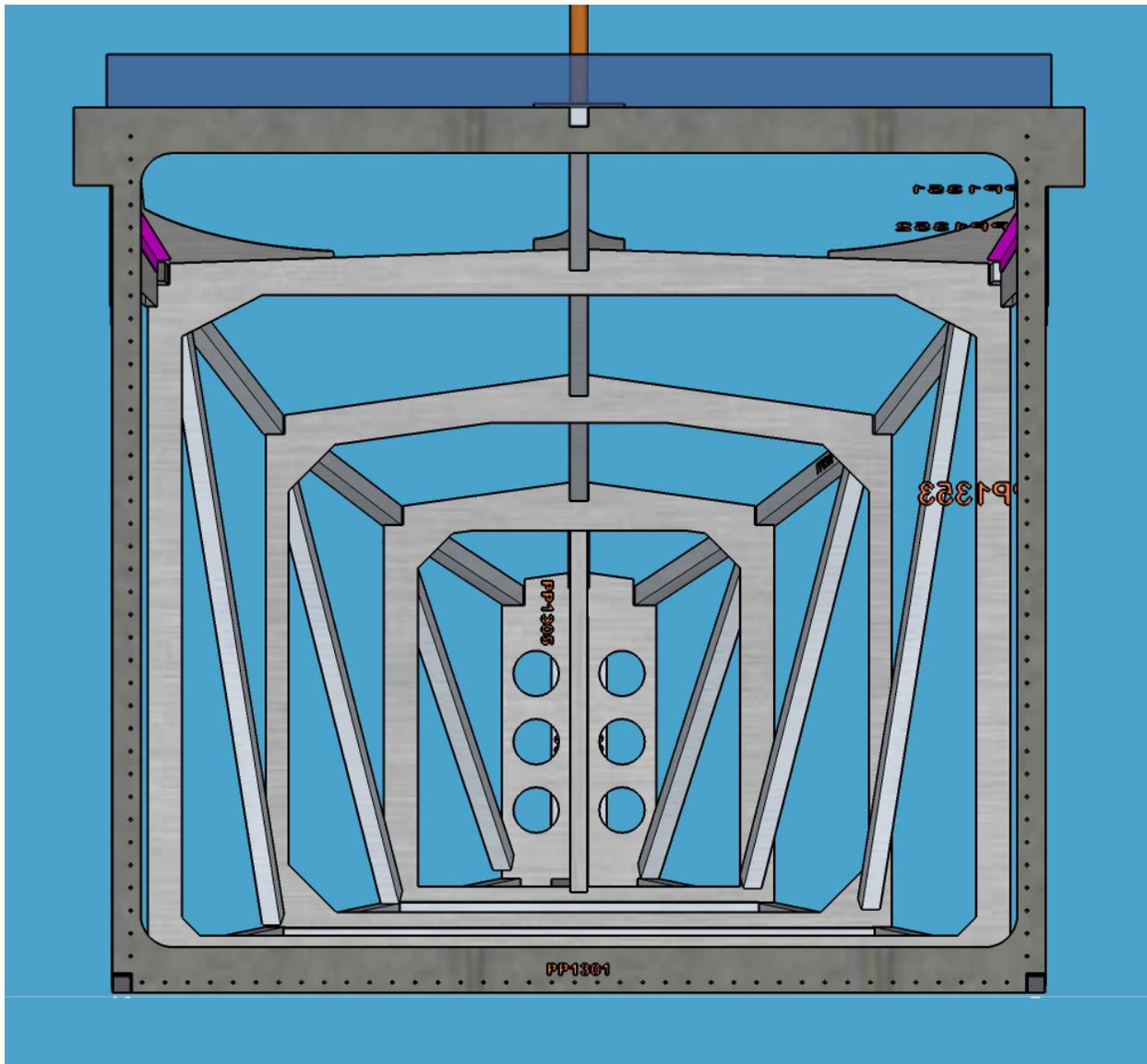
NOTE: Great planning at the highest level is a part of understanding how to do a good job. While not called out in this subkit assembly document, BE AWARE AND PLAN for the placement of the following: dual push/pull cables to elevator; rudder cables to each side; electrical cabling to elevator trim servo, and perhaps electrical wires to a tail light. Also be aware that future steps at final assembly may cause removing some rivets which the instructions cause you to place here: a good example is the joiner plates which connect the cabin to the rear fuselage. In the building of our first prototype, we had to drill out many rivets. We want this manual to be perfect; but it is not, and we appreciate you being thoughtful and observant, with us. Thanks for your understanding! ----- James

- Now place aluminum honeycomb PP1301 (former 1) and PP1306 angle setters in position. Glue PP1301 to square tubing using Gorilla glue. Glue PP1306 to square tubing and to PP1301 using gorilla glue. Note that the angle setters are not 90 degrees – they are setting the correct angle for the upwards incline of the bottom of the rear fuselage.



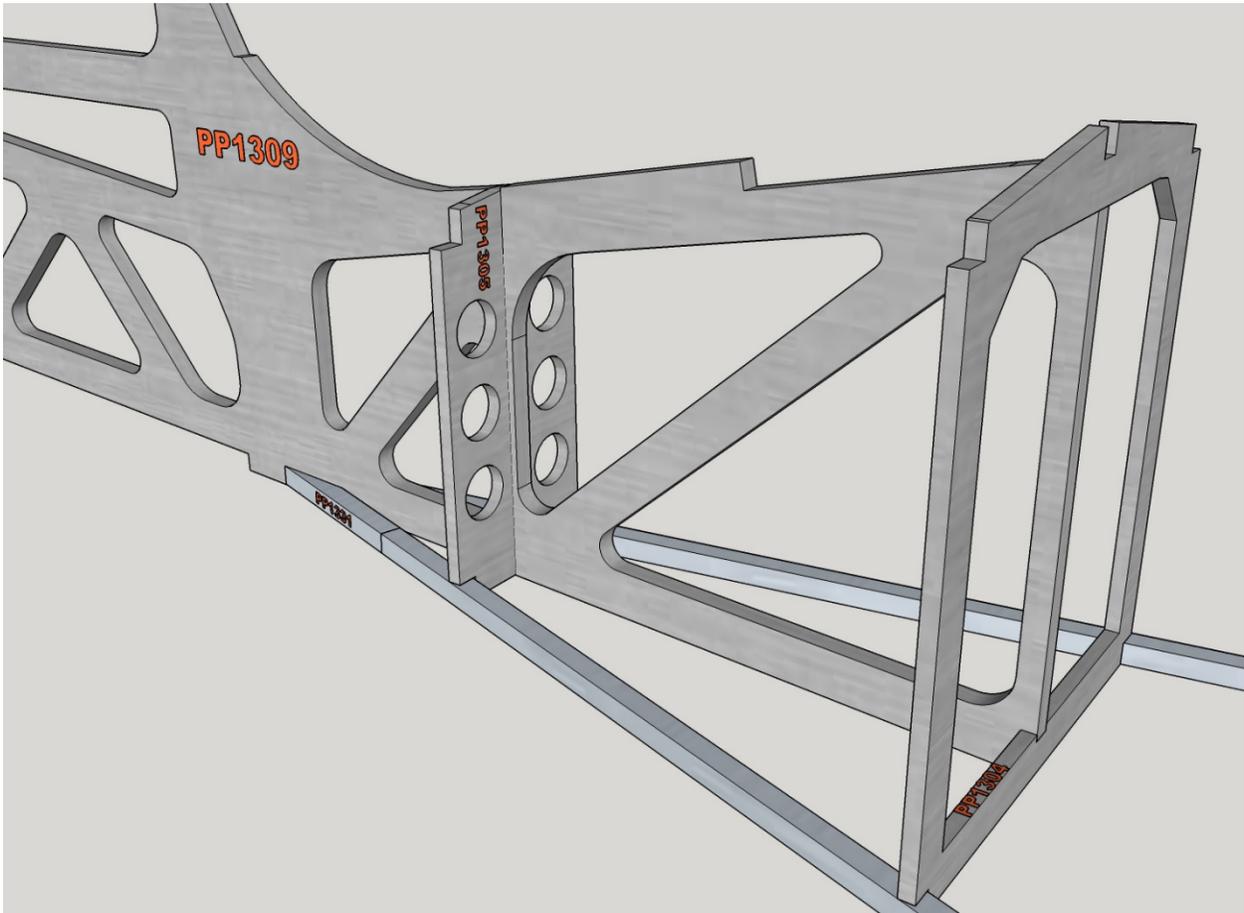
4: PP1301 and angle setters. Bottom skin not shown.

- Cut 37" angle PP1353 for left and right side. Install in place using LONG rivets on 1" centers through PP1301.
- Also rivet PP1301 to square tube using long rivets. Use 1" spacing. The rivet locations for PP1301, into both the angle and the bottom square tubing are as shown in the following illustration.



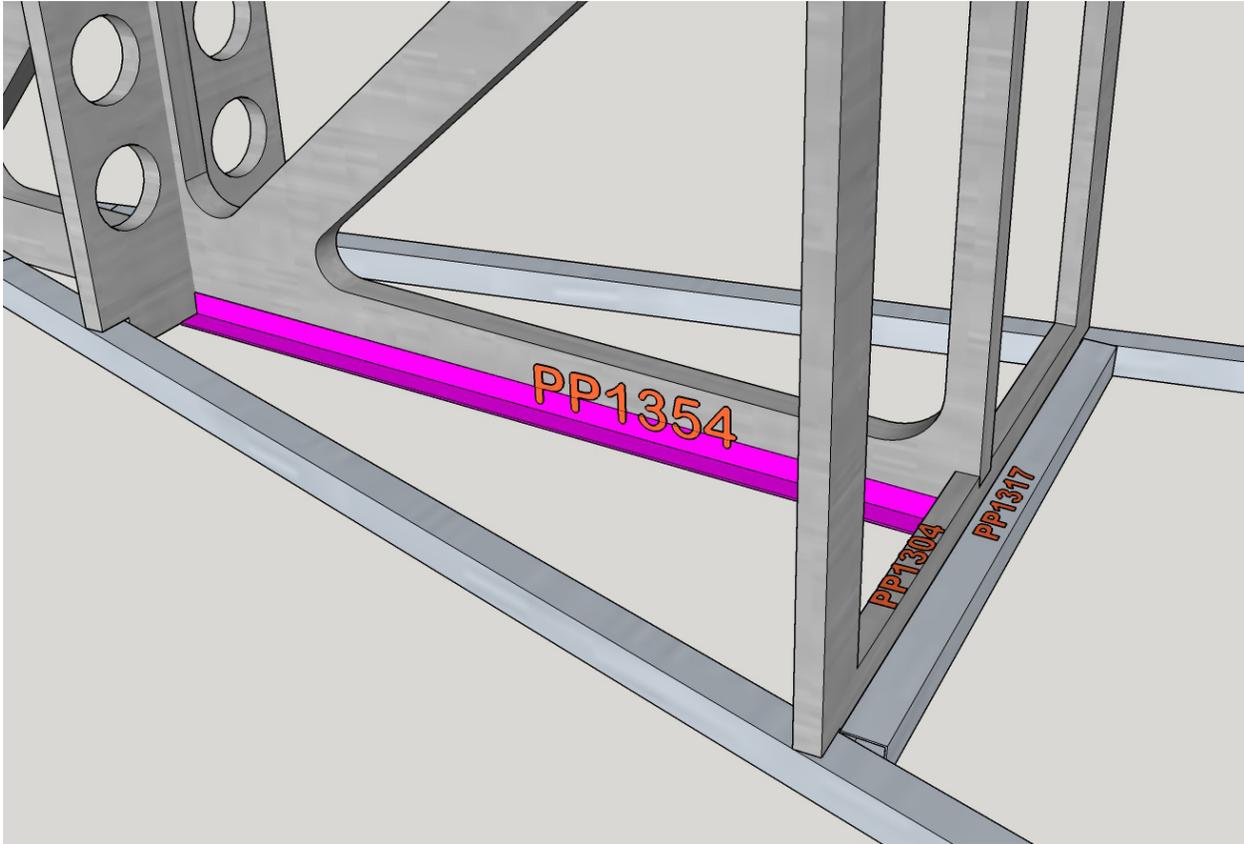
5: PP1301 LONG rivet locations on left, right, and bottom.

- Test fit and trim PP1309, PP1304, PP1305. Also cut and fit PP1331 on each side (aluminum square tubing).



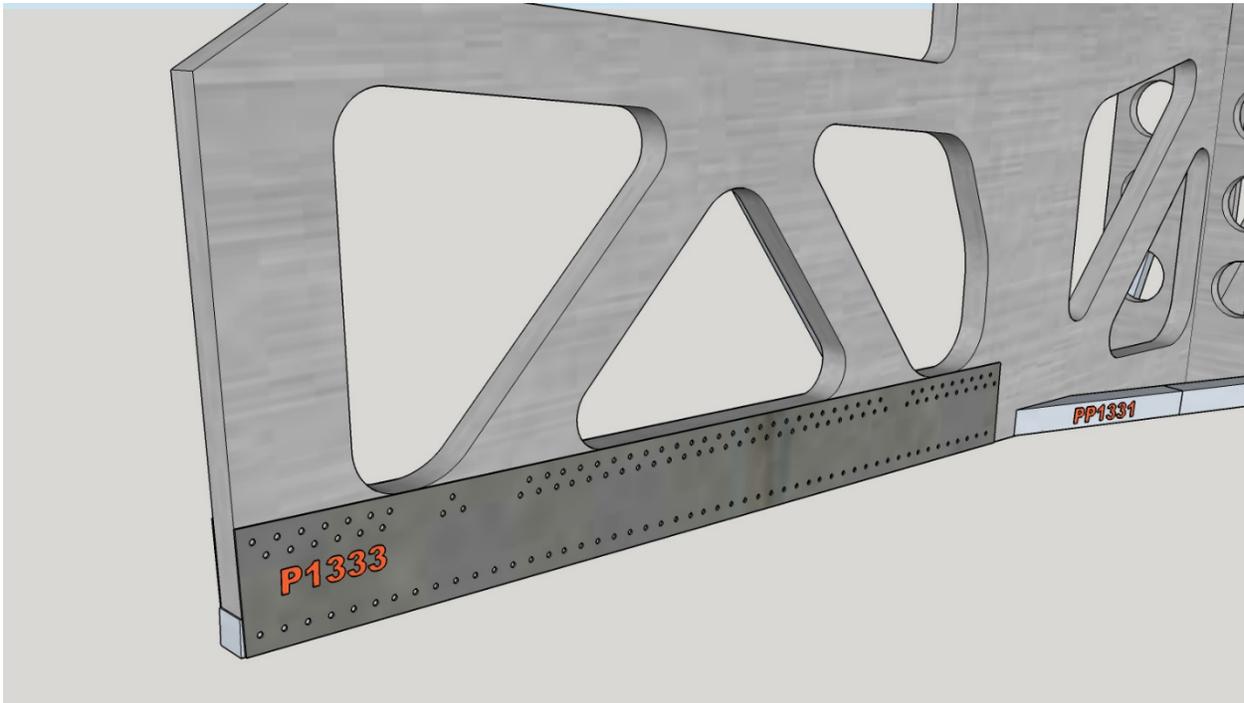
6: PP1309 (vertical stabilizer), PP1304, PP1305 and PP1331

- Final bond PP1305 to PP1309 using 2216 bonding epoxy. Also use bonding epoxy for PP1309 to PP1305, top and bottom.
- Glue PP1331 on each side to bottom skin using Gorilla glue.
- Install angle PP1354, 19.25" long, using short rivets through honeycomb on 1" spacing. (Honeycomb is $\frac{3}{4}$ " thick and rivet through only the facing side.) Drill and CLECO angle through bottom skin, also on 1" spacing. This angle is one on each side of PP1309 only.
- Install square tubing PP1317 in place with Gorilla glue to bottom skin
- Further install PP1317 using LONG rivets through back of honeycomb PP1304. The square tubing will eventually be drilled and riveted from the bottom side as well, but that can't be done now.



7: PP1354 angle and PP1317 square tubing

- Install 24" 0.75" square aluminum tubing PP1319 along with associated gussets PP1333 on each side. Final rivet in place using short rivets throughout. See figure 8, below.

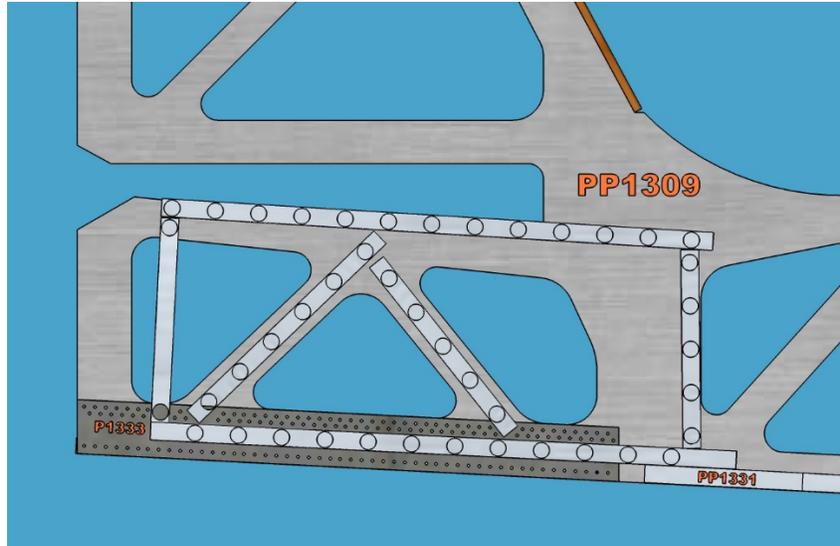


8: PP1333 and PP1319 in place.

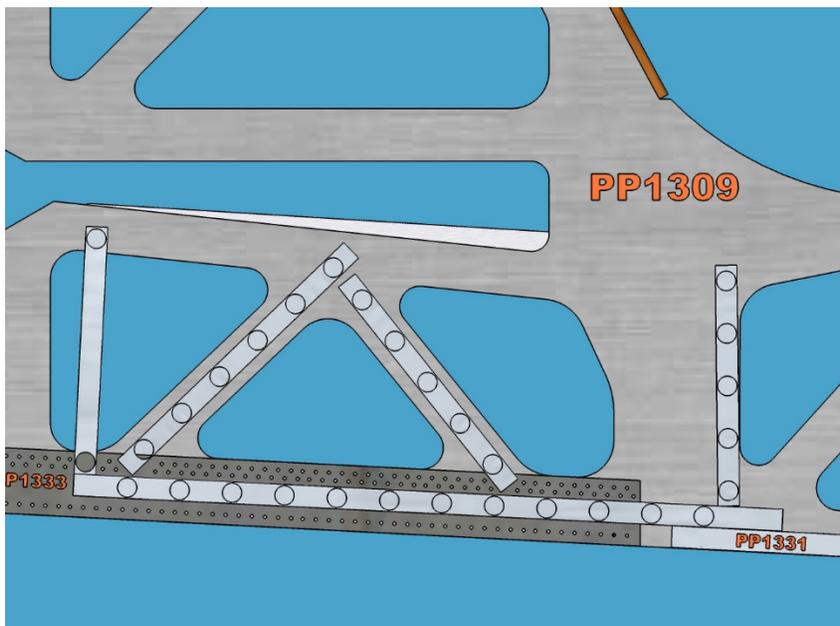
- Fit PP1325, PP1326, PP1327, PP1328, PP1329, PP1330 on both sides of rear fuselage. All require drilling clearance holes on one side of tubing so that tubing may be riveted in place. All holes are on 2" centers unless otherwise shown. Clearance holes are best drilled with pilot hole followed by step drill. Step drill bits are sold by all large hardware stores and retailers such as Walmart. You are doing this so that the rivet gun may fit through clearance hole and allow riveting of other side of square tubing to honeycomb.



9: Typical step drill bit

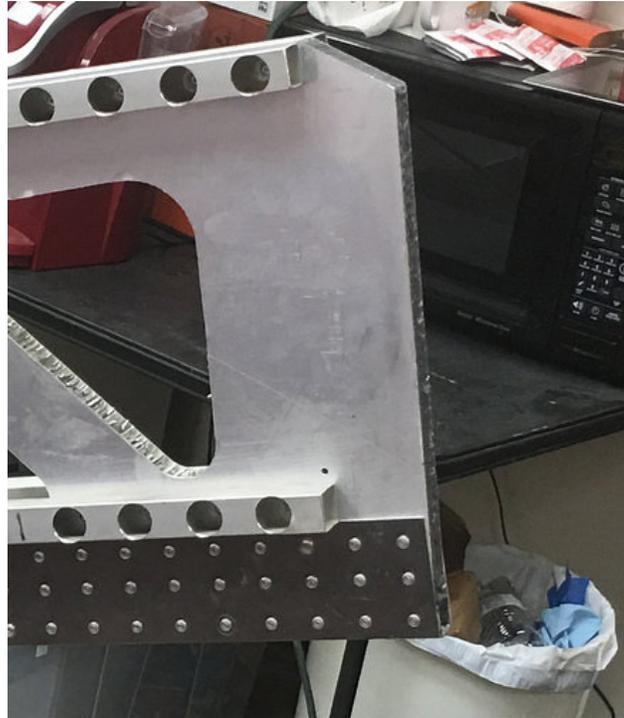


10: Square tubing placement at rear



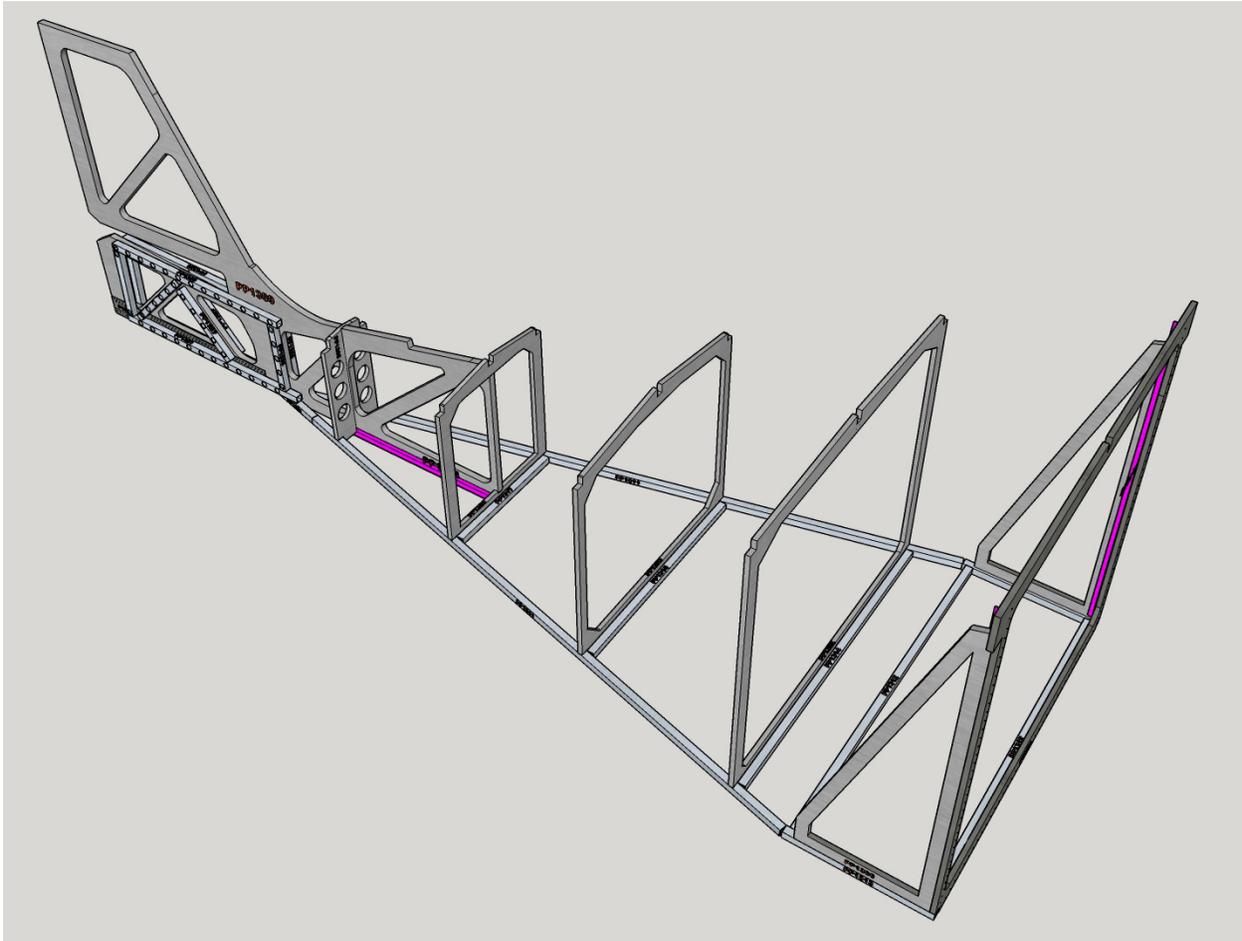
11: Same view with one tube removed for clarity. Note angle relationship of top tube to PP1309!

- Final rivet PP1325, PP1326, PP1327, PP1328, PP1329, PP1330. Use SHORT rivets. Ensure grip length of rivets is long enough on PP1328, as rivet must go through bottom face of square tubing, then gusset, then facing of honeycomb.



12: Typical clearance holes in square tubing, with rivets barely visible at interior base of tubing

- Fit formers PP1302 and PP1303, along with square tubing PP1314 and PP1316.
- Gorilla glue PP1314 and PP1316 to bottom skin.
- Final rivet PP1302 and PP1303 to square tubing using LONG rivets.



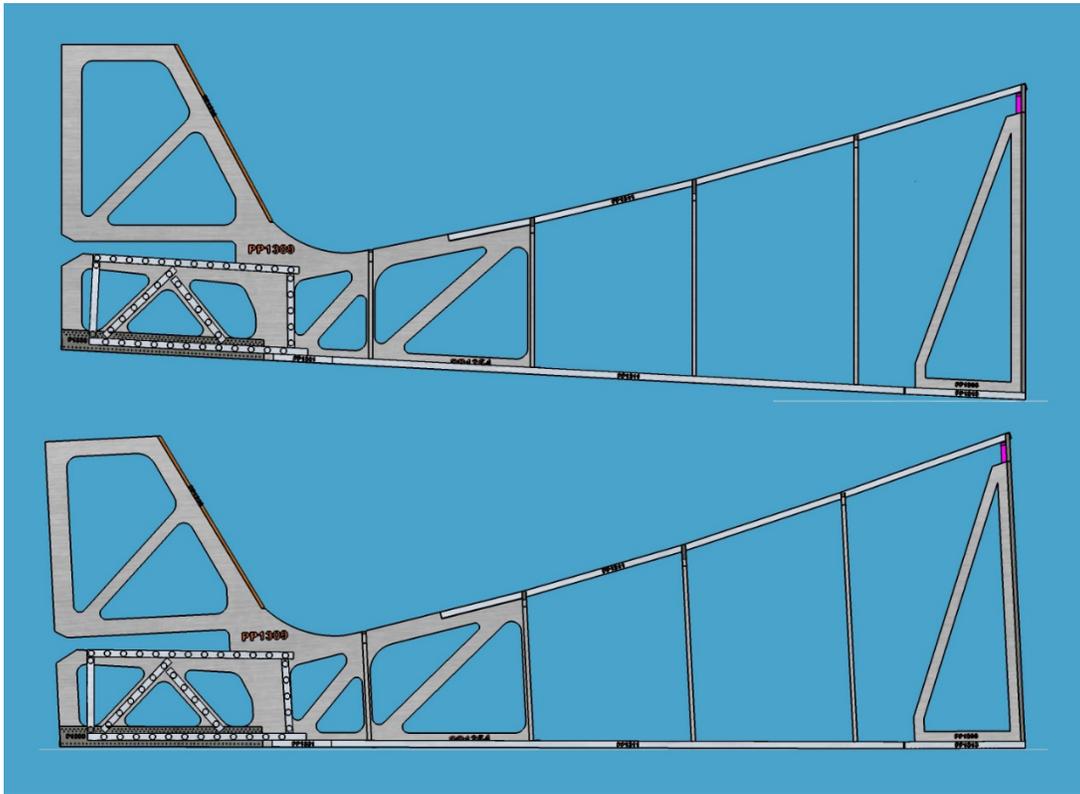
13: All formers in place.

- Test fit top spine square tubing PP1311 (73" piece). You'll need clamps, perhaps weights, perhaps helpers.

NOTE: This is a critical step. As the tube is tensioned into the slots, you'll need to ensure that you keep all formers in correct relationship to the floor.

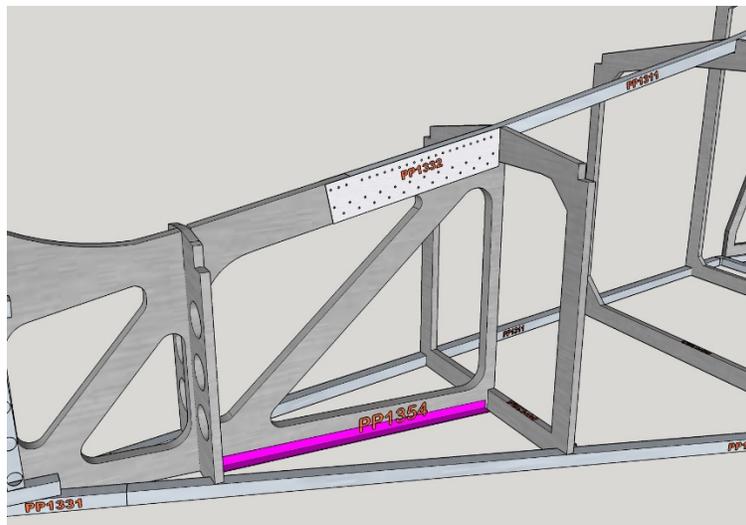
- Bond top spine to formers using 2216 glue. Clamp in place. Double check fit, ensure that formers are in correct position. Allow to thoroughly set before moving on (usually overnight).

NOTE: The bottom portion of the next picture shows the angles of the formers relative to the tabletop. The top portion of the pic shows the rear fuselage as it will attach to the cabin; at an approximate flight angle.



14: Bottom of pic: Rear fuselage as built on table, from side.

- Fit and install two gussets PP1332 on both sides using short rivets.

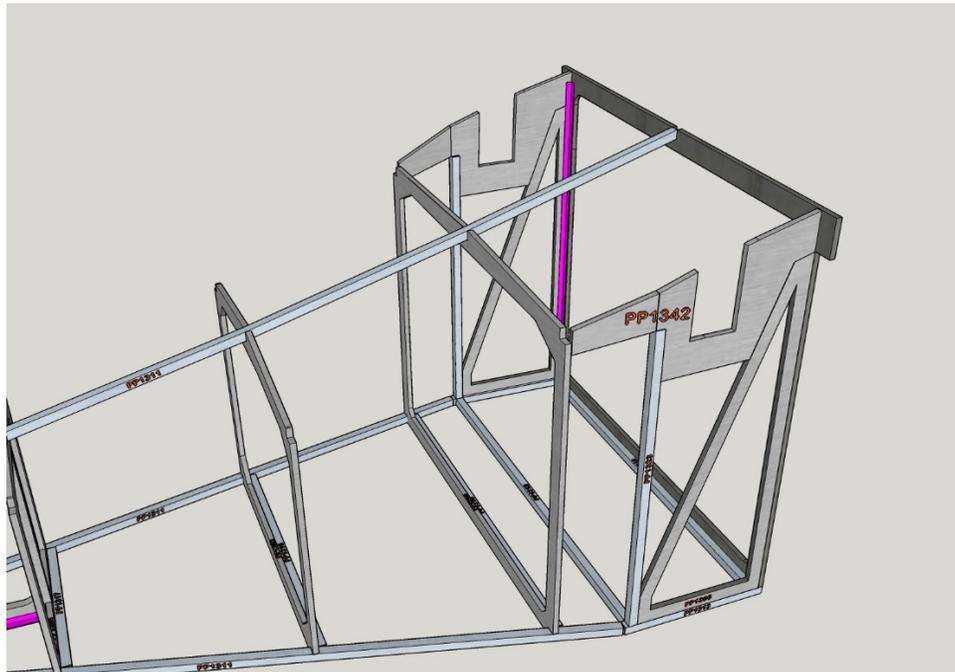


15: PP1332 gusset installation with short rivets.

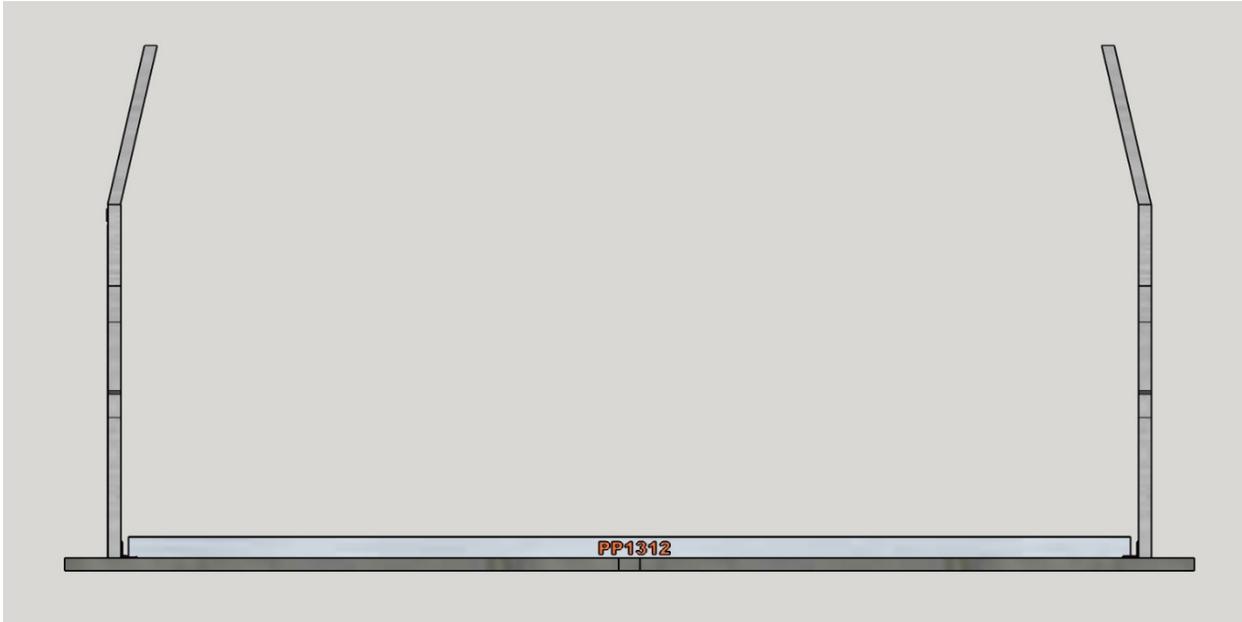


16: Clamping PP1332 in place in order to help ensure fit, prior to riveting.

- Cut a slit in PP1342 (remember, two pieces: one for left, one for right). The slit allows the part to bend slightly. The next two CAD photos explain the bend in the part by showing an ISO view and a top view with other components removed.



17: PP1342 showing bend line between numerals ONE and THREE in "PP1342".



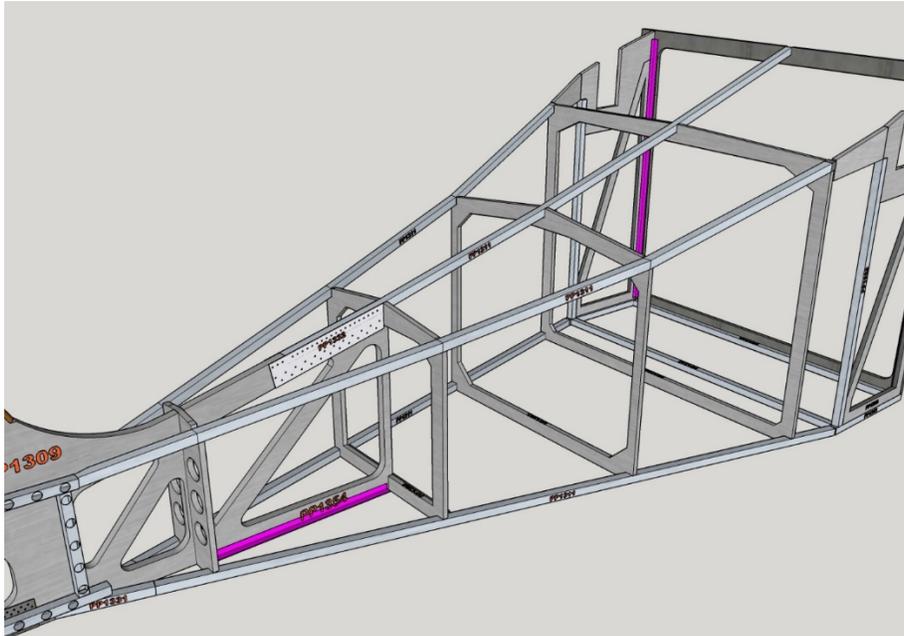
18: Rear Fuselage from top, showing left and right bends in PP1342.

- Cut PP1323 square tubing to fit each side.
- Using 2216 epoxy, bond PP1342 to PP1306 angle setter and to PP1323 tubing and to PP1301 front former. Also ensure PP1323 tubing is attached to PP1306 using 2216 epoxy at bottom.

NOTE: This is difficult to setup and keep square. The purpose of the 2216 isn't for a structural bond, it is to ensure that a rigid structure is created that is easier to rivet to when the aluminum skins are attached.

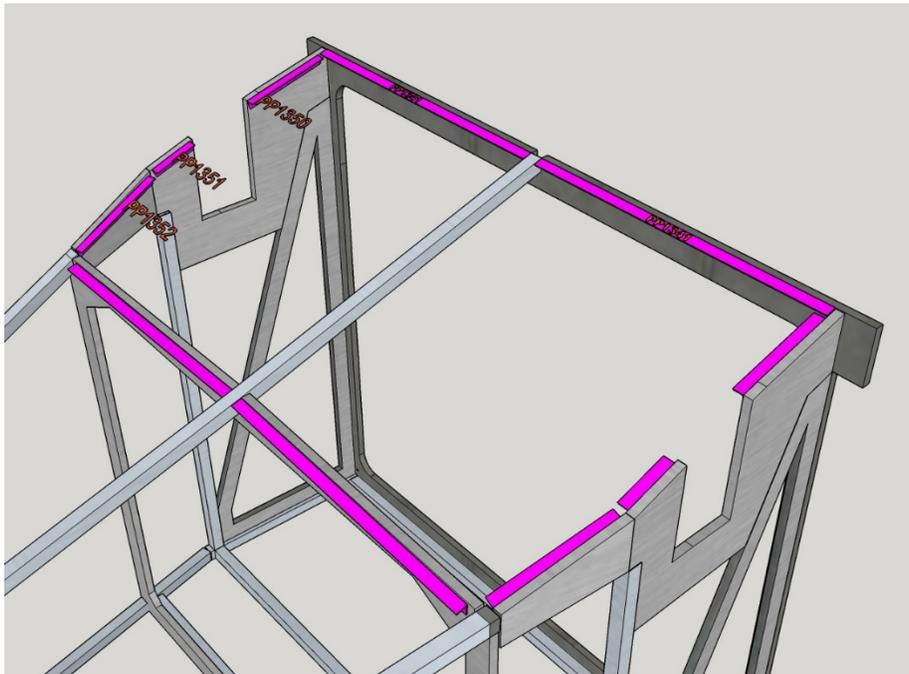
- Test fit PP1311 square tubing each side of top rear fuselage. You may have to enlarge notches in formers. This is two tubes, one on each side.
- Using 2216 epoxy, bond these two PP1311 in place.

NOTE: Use clamps and weights and helpers, as required, to ensure positioning of PP1311 does not cause movement or changes in alignment of rear fuselage formers.



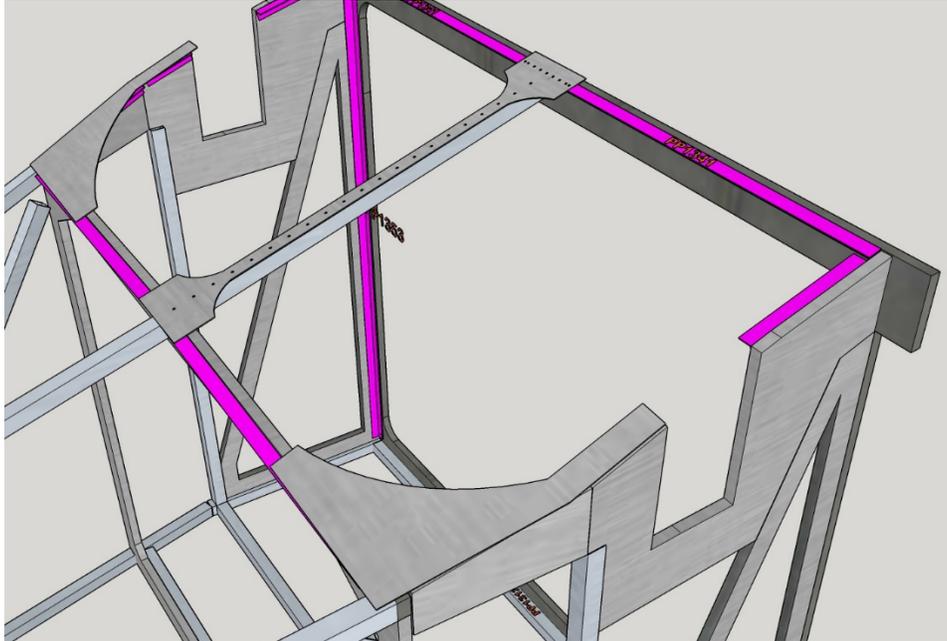
19: PP1311 each side of top bonded in place.

- Cut and fit 10 angle pieces into place in top rear fuselage. Some angles will require bending in order to match slope of roofline.



20: Angles installed in top rear fuselage.

- Cleco gussets PP1345 and PP1346 in place. Do not rivet at this time.



21: Top rear fuselage with gussets.

- Fit rearmost top skin in place, PP1340. Do not rivet or glue yet. Drill holes on 1" centers.



22: PP1340 rearmost top skin, fitted in position.

- Prepare 2216 epoxy. Apply thin coat to flat areas where skin will bond. ADD A LARGE AMOUNT OF CHOPPED COTTON FILLER to remaining epoxy to create what we call “elephant snot” and use this to bond to top of honeycomb former areas.



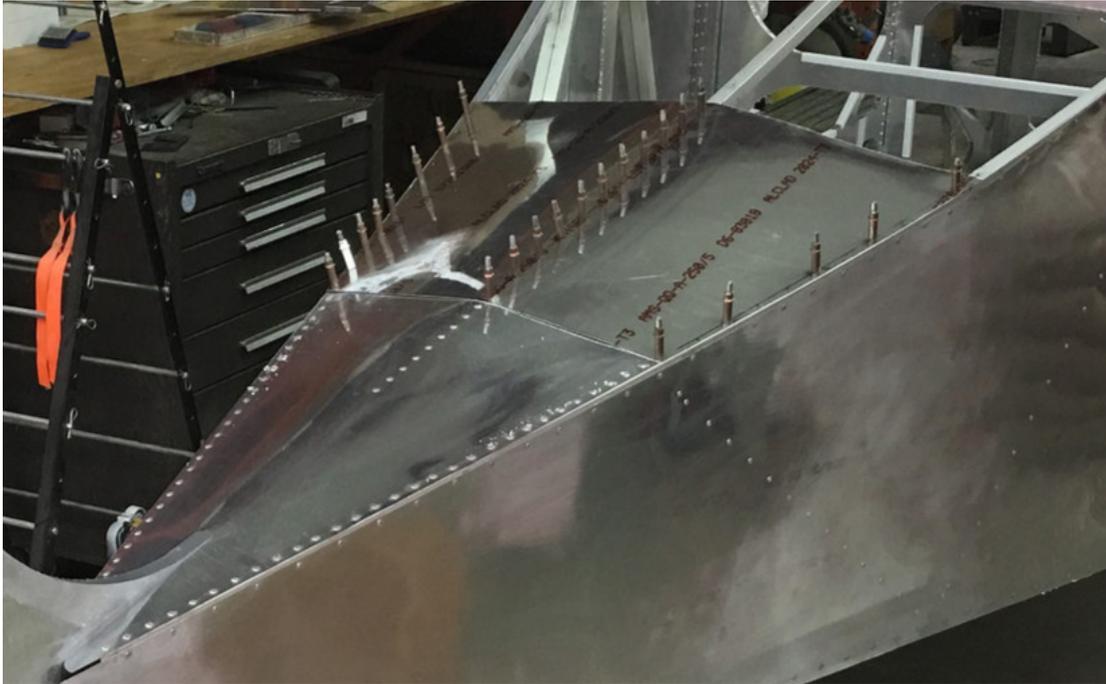
23: Bonding epoxy in place. This photo does not adequately portray thickness of 2216 elephant snot on honeycomb.

- Rivet skin in place. Ensure epoxy filler is mating continuously with skin at honeycomb. Clamp as appropriate. Wipe up excess epoxy.

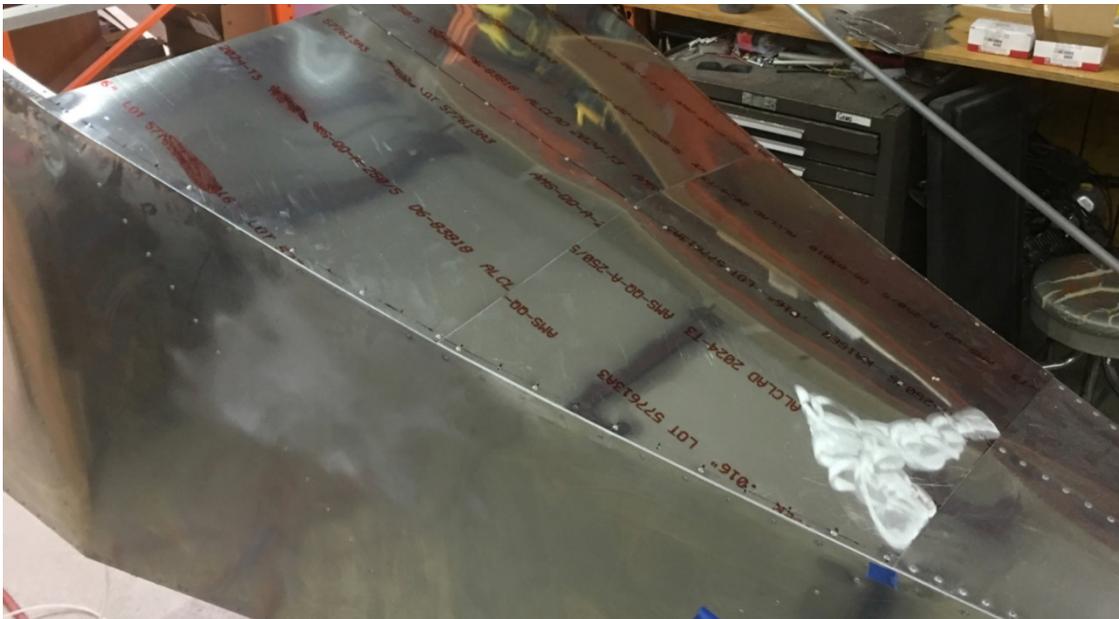


24: Rear skin riveted in place. Clamps to hold skin flush to honeycomb / elephant snot also shown.

- In a similar manner, fit, overlap, trim as necessary, epoxy, clamp and rivet the next two skins. Use thick elephant snot and clamps at each honeycomb former. The third skin fits underneath the gussets PP1345 and PP1346.



25: Overlapping rear fuselage top skins. Ignore side skins in this picture!!!



26: second and third rear top skins being glued and riveted. Ignore side skins in this picture!!!

NOTE: The overlap riveting was NOT shown in the prior pictures.

- After these three skins are riveted, and after glue has set, drill and rivet overlap seams with short rivets on 1" spacing. Include rivets on skin overlap areas of gussets PP1345 and PP1346. Ideal place for rivet penetration is into hardened epoxy at honeycomb former. Wait at least 12 hours but do not wait more than 24 hours for placing these rivets as slight flexibility of epoxy is necessary for highest quality rivet placement. (You may need to place these overlap seam rivet lines as you move up the back skins on consecutive work days.)
- Finish riveting gussets PP1345 gussets.

NOTE: Do you want folding wings? If so, install the small doors as shown in the next step.

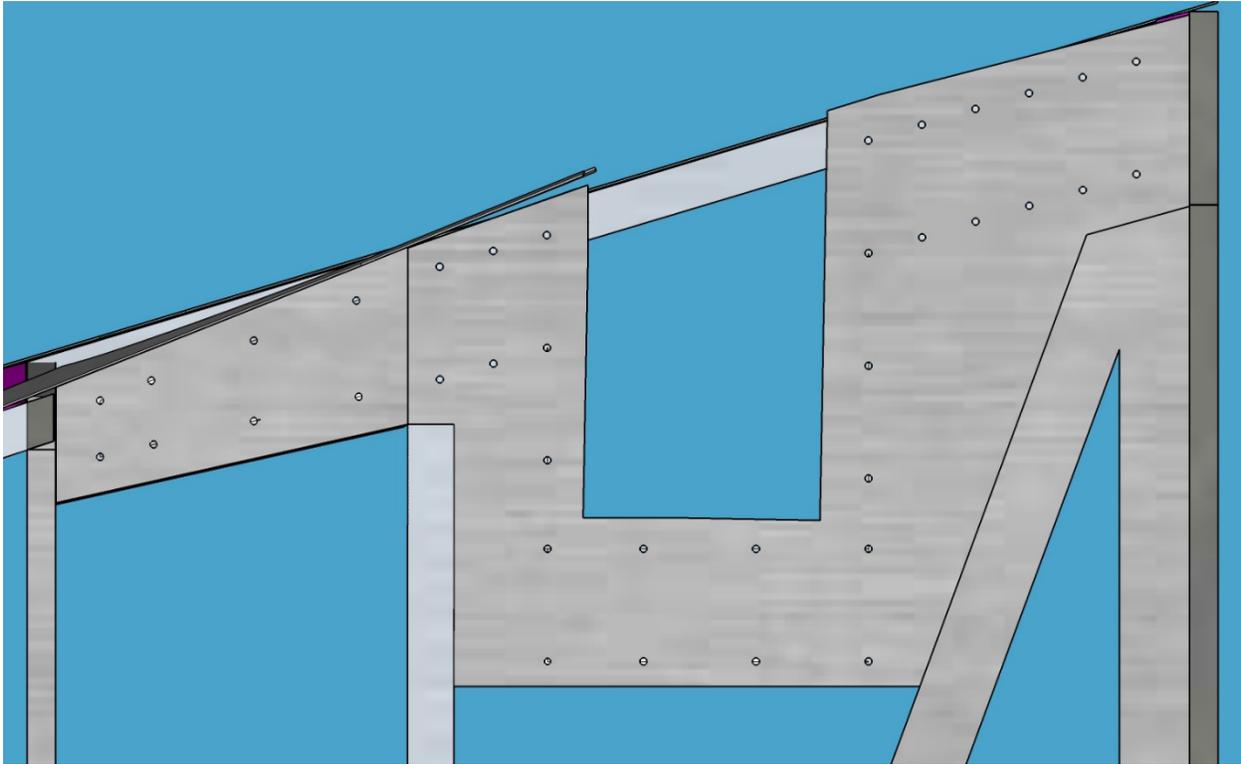
- Fit flap pocket doors using PP1347 doors and PP1345 hinge material and clecos. Mark through this step if not installing folding wings, and discard unused material PP1347 and PP1345. Finish installation of doors after fitting side skin.

NOTE: Do you want folding wings? If you DO NOT want them, install the filler honeycomb piece.

- Install the filler honeycomb piece PP1343 using epoxy 2216. Mark through and IGNORE this step if you ARE installing folding wings, and discard parts inset PP1343.
- Fit side skins on each side and hold in place with clecos. ALL rivet lines are on 2" spacing, with the exception of the front angle line which is 1" spacing (very left side of photo, below). ALL mating areas receive rivet lines. Side skin is oversize and will require trimming.



27: Sideskin fitting. See next photo for assistance with special rivet location.



28: side skin top honeycomb special rivet locations. 1" and 2" spacing with some variation as shown.

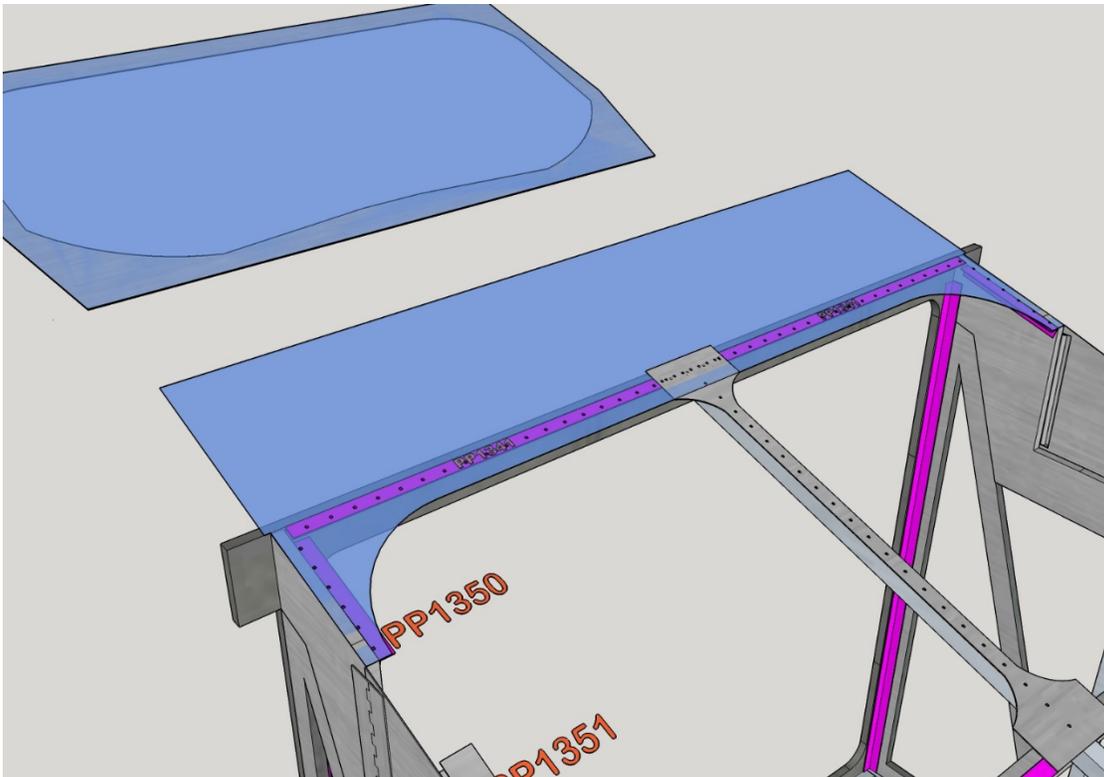
- Fit anti-oil-can square tubing onto interior of each side skin. There are three on each side: PP1320, PP1321, PP1322. Rivet to skins using short rivets.

NOTE: The purpose of these parts is to prevent the metal skin from vibrating. They are not connected to the other other formers and are only attached to the skins.

- Rivet side skins in place using short rivets (when going into tubing or angle) or LONG rivets (when going into honeycomb aluminum). Intermix this work with the requirement to apply 2216 elephant snot to the honeycomb former gaps.
- Mix 2216 with heavy cotton filler and liberally fill seams between honeycomb formers and side skins.
- Rivet flap door hinges in place.
- Turn rear fuselage upside down and rivet bottom skin in place on 2" spacing. Exception: front square tubing line (PP1312) must be on 1" spacing.



- Rivet on very rear skin. All rivet lines are on 1" spacing with the overlap area on a 1" grid (two columns of 1" spacing.)
- Fit top polycarbonate below spine gusset. Cleco on 1" spacing into angles.



29: Top polycarbonate in place.



REAR FUSELAGE ASSEMBLY PROCEDURE

- Rivet polycarbonate in place. Top spine is over polycarbonate and receives rivets at this time..
- Fit turtledeck window to window trim with clecos.

NOTE: If you do not plan to fold your wings, top window and frame are permanently riveted to top of fuselage. Plan riveting steps accordingly in conjunction with top spine and top left / right gussets.

- [Method for attaching turtledeck window for removal will be supplied!]
- [Method for latching flap windows closed will be supplied!]
- Bond the softwood insert to the vertical stabilizer using Gorilla glue. Allow to set, route to round, and sand.

Your rear fuselage is done.