

# Parts & Materials Callout

## Chapter 1



**NOTE: BOLD DENOTES PART MADE FROM RAW MATERIAL**

DWG. REF. NO.	DESCRIPTION	QUANTITY	MATERIAL IDENTIFICATION	MATERIAL DESCRIPTION
□FU1	BULKHEAD	1	MBD5FU1	.025 2024T42
□FU3	DOOR L.H.	1	MBD5FU95	.025 2024T42
□FU4	DOOR, R.H.	1	MBD5FU96	.025 2024T42
□FU6	BULKHEAD	1	MBD5FU6	.025 2024T42
□FU7	HAT SECTION	1	<b>BD-0006</b>	<b>.025 2024T3</b>
□FU8	REINFORCEMENT PLATE	2	<b>BD-5-0028</b>	<b>.032 2024T3</b>
□FU9	STOP BLOCK	1	<b>BD-5-M-0075</b>	<b>.750 X .625 2024T3 BAR</b>
□FU10	SPLICE STRIP	1	<b>BD-5-M-0028</b>	<b>.032 2024T3</b>
□FU11	SPLICE STRIP	1	<b>BD-5-M-0028</b>	<b>.032 2024T3</b>
□FU12	TEE SPLICE	1	<b>BD-0008</b>	<b>.078 X 1.00 X 1.50 2024T EXTRUSION.</b>
□FU13	BELLY DOUBLER	1	<b>BD-5-M-0030</b>	<b>.063 2024T3</b>
□FU14	BULKHEAD	1	<b>BD-5-M-0027</b>	<b>.025 2024T3</b>
□FU17	LONGERON,W.L. 23.50	1	MBD5FU17	.025 2024T42
□FU18	LONGERON,W.L.23.50	1	MBD5FU18	.025 2024T42
□FU21	ANGLE,L.H.	1	MBD5FU21	.025 2024T42
□FU22	ANGLE,R.H.	1	MBD5FU22	.025 2024T42
□FU23	LONGERON,W.L. 41.50	1	MBD5FU23	.025 2024T42
□FU24	LONGERON,W.L. 41.50	1	MBD5FU24	.025 2024T42
□FU25	CLIP,L.H.	1	<b>BD-0003</b>	<b>.032 X 2.00 X 2.00 2024T3 ANGLE</b>
□FU26	CLIP,R.H.	1	<b>BD-0003</b>	<b>.032 X 2.00 X 2.00 2024T3 ANGLE</b>
□FU27	DOUBLER,INSIDE	1	<b>BD-5-M-0027</b>	<b>.025 2024T3</b>
□FU28	DOUBLER,INSIDE	1	<b>BD-5-M-0027</b>	<b>.025 2024T3</b>
□FU29	DOUBLER,OUTSIDE	1	MBD5FU29	.090 2024T3
□FU30	DOUBLER,OUTSIDE	1	MBD5FU30	.090 2024T3
□FU31	ANGLE,L.H.	1	<b>BD-0013</b>	<b>.063 x 1.00 x 1.00 2024T3 ANGLE</b>
□FU32	ANGLE,R.H.	1	<b>BD-0013</b>	<b>.063 x 1.00 x 1.00 2024T3 ANGLE</b>
□FU33	ANGLE,L.H.	1	<b>BD-007</b>	<b>.125 X 1.50 X 2.00 2024T3 ANGLE</b>
□FU34	ANGLE,R.H.	1	<b>BD-0007</b>	<b>.125 X 1.50 X 2.00 2024T3 ANGLE</b>
□FU35	TUBE	1	<b>BD-5-M-0031</b>	<b>.38 O. D. X .058 WALL 2024T3 TUBING</b>
□FU36	ANGLE CLIP	3	<b>BD-5-M-0028</b>	<b>.032 2024T3</b>
□FU37	SPLICE STRIP	1	<b>BD-5-M-0028</b>	<b>.032 2024T3</b>
□FU38	BULKHEAD	1	<b>BD-5-M-0027</b>	<b>.025 2024T3</b>
□FU39	SKIN, AFT UPPER	1	MBD5FU39	.025 2024T3
□FU40	SKIN, AFT UPPER	1	MBD5FU40	.025 2024T3
□FU41	SKIN,AFT,LOWER	1	MBD5FU41	.020 2024T3
□FU42	SKIN,AFT,LOWER	1	MBD5FU42	.020 2024T3
□FU43	SPLICE STRIP,L.H.	1	<b>BD-5-M-0028</b>	<b>.032 2024T3</b>
□FU44	SPLICE STRIP,R.H.	1	<b>BD-5-M-0028</b>	<b>.032 2024T3</b>
□FU45	ANGLE	1	<b>BD-0002</b>	<b>.032 X 1.00 X 1.00 2024T3 ANGLE</b>

# Parts & Materials Callout

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DWG. DESCRIPTION REF. NO.	QUANTITY	MATERIAL IDENTIFICATION	MATERIAL DESCRIPTION
<input type="checkbox"/> FU46 SHIM	2	BD-5-M-0030	.063 2024T3
<input type="checkbox"/> FU47 SHIM	2	BD-5-M-0025	.016 2024T3
<input type="checkbox"/> FU48 GUSSET	2	BD-5-M-0027	.025 2024T3
<input type="checkbox"/> FU49 ANGLE CUP, L.H.	1	BD-0002	.032 X 1.00 X 1.00 2024T3 ANGLE
<input type="checkbox"/> FU50 ANGLE CLIP,R.H.	1	BD-0002	.032 X 1.00 X 1.00 2024T3 ANGLE
<input type="checkbox"/> FU51 DOOR FRAME,FWD.	1	MBD5FU51	.025 2024T3
<input type="checkbox"/> FU52 DOOR FRAME,FWD.	1	MBD5FU52	.025 2024T3
<input type="checkbox"/> FU53 DOOR FRAME,AFT.	1	MBD5FU53	.025 2024T3
<input type="checkbox"/> FU54 DOOR FRAME,AFT.	1	MBD5FU54	.025 2024T3
<input type="checkbox"/> FU55 DOUBLER	2	BD-5-M-0030	.063 2024T3
<input type="checkbox"/> FU56 BULKHEAD	1	BD-5-M-0025	.016 2024T3
<input type="checkbox"/> FU57 SPLICE STRIP	1	BD-5-M-0028	.032 2024T3
<input type="checkbox"/> FU58 SPLICE STRIP	1	BD-5-M-0028	.032 2024T3
<input type="checkbox"/> FU59 SPLICE STRIP	1	BD-5-M-0028	.032 2024T3
<input type="checkbox"/> FU60 BULKHEAD	1	BD-5-M-0026	.020 2024T3
<input type="checkbox"/> FU61 BULKHEAD	1	BD-5-M-0025	.016 2024T3
<input type="checkbox"/> FU62 BULKHEAD	1	BD-5-M-0025	.016 2024T3
<input type="checkbox"/> FU63 BULKHEAD	1	BD-5-M-0025	.016 2024T3
<input type="checkbox"/> FU64 BULKHEAD	1	BD-5-M-0025	.016 2024T3
<input type="checkbox"/> FU65 DOUBLER	2	BD-6-M-0028	.032 2024T3
<input type="checkbox"/> FU66 BULKHEAD	1	MBD5FU66	.032 6061T6
<input type="checkbox"/> FU67 FORE SKIN,L.H.	1	MBD5FU67	.032 2024T42
<input type="checkbox"/> FU68 FORE SKIN R.H.	1	MBD5FU68	.032 2024T42
<input type="checkbox"/> FU69 LONGERON,L.H.	1	MBD5FU69	.032 2024T42
<input type="checkbox"/> FU70 LONGERON,R.H.	1	MBD5FU70	.032 2024T42
<input type="checkbox"/> FU72 SPLICE STRIP	1	MBD5FU72	.032 2024T42
<input type="checkbox"/> FU73 SKIN,NOSE CAP, L.H.	1	MBD5FU73	.032 2024T42
<input type="checkbox"/> FU74 SKIN,NOSE CAP,R.H.	1	MBD5FU74	.032 2024T42
<input type="checkbox"/> FU95 SKIN,MID,L.H.	1	MBD5FU95	.025 2024T42
<input type="checkbox"/> FU96 SKIN,MID,R.H.	1	MBD5FU96	.025 2024T42
<input type="checkbox"/> FU97 SKIN,MID,L.H.	1	MBD5FU97	.025 2024T42
<input type="checkbox"/> FU98 SKIN,MID,R.H.	1	MBD5FU98	.025 2024T42
<b>TOTAL PARTS COUNT</b>	<b>79</b>		
<b>TOTAL PARTS FROM RAW STOCK</b>	<b>47</b>		

# **FUSELAGE**

THE DRAWING ON THE FACING PAGE ILLUSTRATES LOCATION AND IDENTIFICATION OF PARTS IN CONSTRUCTION OF THE BD-5 FUSELAGE. THE DRAWING ON THE PAGE FOLLOWING ILLUSTRATES LOCATION OF PARTICULAR CONSTRUCTION DETAILS OF THE FUSELAGE ASSEMBLY.

**①** Before Beginning Construction, Note The Following:

- 1.** The center portion of the fuselage should be assembled first.
- 2.** Pay particular attention to where flush rivets and dome head rivets are used.
- 3.** Pay particular attention to Water Line references on the detail drawings. These help to accurately locate the respective parts.
- 4.** Do not finally rivet one side of the aft section of the fuselage. (One side is left open for later installation of the drive system).
- 5.** Should a discrepancy in overall size between two preformed fuselage skins occur, always trim the larger part to match the smaller part in size.
- 6.** When cutting aluminum, make sure all sharp edges are removed and cleaned of all burrs and roughness.
- 7.** When drilling holes, make sure all burrs and roughness are removed from the edges of the holes before dimpling, bolting or riveting in place.

# **Chapter 1 Fuselage Construction:**

## **Beginning Construction**

**SPECIAL NOTE: AFTER EACH PART IS MADE IT SHOULD BE MARKED WITH PART NUMBER WITH A SHARPIE OR OTHER SUITABLE MARKER.**

**SPECIAL NOTE: BONDING SEALANT SHOULD BE APPLIED TO ALL PARTS IMMEDIATELY PRIOR TO FINAL ASSEMBLY AND RIVETING.**

- 1 Trim off all "tabs" from fuselage skins, making sure that all edges are trimmed straight and all roughness is removed.
  
- (i) Note: The "tabs" should be trimmed even with the existing straight edges of each skin. Lay a straight edge to align with the edges of a section and mark across the tabs.**
  
- 2. After trimming, clean and deburr all roughness from the edges of the sections.
  
- 3. Lay out Water Line 25.00 on both FU1 and FU6 using dimensions shown in (Detail A).
  
- (i) Note: On FU6 the lower tooling hole is centered on Water Line 25.00 you can clamp a piece of aluminum angle across the bottom edge of FU6 Measure up to the center of the tooling hole and use this measurement to mark Water Line 25.00 across FU6.**
  
- (i) Note: On FU1 the lower tooling holes are centered .38" below Water Line 25.00, you can measure up .38" from the center of the lower tooling holes in FU1 and mark Water Line 25.00 across FU1.**
  
- 4. Trial-fit sections FU97 and FU98 on formed bulkheads FU1 and FU6. Note that there is a "joggle" in the side edges of both FU1 and FU6 bulkheads - side skins FU97 and FU98 have corresponding "joggles". These will help in alignment of the skins with the bulkheads. (Detail A).
  
- (i) Note: The angle of FU1 from Vertical is 75°, the angle of FU6 from Vertical is 87°**
  
- (i) Note: FU97 and FU98 are most likely trimmed correctly in your kit but do not assume this to be fact (Do Not use the edge of formed panels instead use the Water Line, Butt Line and Station Position for these measurements)**
  
- (i) Note: Joggles are not designed to be tight. Clearance was allowed so that the skin can be shifted slightly during the fitting process.**
  
- 5. Insure distance from bottom centerline of bulkheads to top edges of both FU97 and FU98 are identical each side of bulkhead and that the top edges are on W.L. 25.00 at both ends.
  
- 6. Cut FU13 strap from .063" 2024-T3 aluminum (Detail B) deburr and mark a centerline along its whole length.
  
- 7. Place FU13 along bottom edge of FU98 and clamp in place. Mark hole centers as shown in Detail B and pilot drill (No.39 or 40 drill) both parts.

**ⓘ Note: FU13 ends at forward side of bulkhead FU14 location (STA.91.15)**

- ❑ 8. Cleco FU13 and FU98 together.
- ❑ 9. Locate FU97 on FU13 and mark hole centers and drill as directed in Detail D.
- ❑ 10. Cleco FU97 to FU13.
- ❑ 11. Fabricate one FU27 and one FU28 doubler from .025" 2024-T3 aluminum (Detail G).
- ❑ 12. Locate FU97/FU98 assembly on FU1 and FU6 bulkheads with FU27 and FU28 doublers between skin and FU1 bulkhead. Mark rivet hole centers as instructed in Details E . Pilot drill (No or 40 drill) and cleco assembly in place.

**ⓘ Note: It will be more convenient to leave the area covered by FU29 (FU30) blank at this time and drill later when FU29 (FU30) is being fitted. (See Detail E)**

- ❑ 13. Make parts FU31 and FU32 from BD-0013 material. (Detail G)
- ❑ 14. Make FU11 and FU59 from .032" 2024-T3 aluminum.

**ⓘ Note: FU11 and FU59 - no template drawings are provided for these parts as they are simple straps. They are 1.44" wide and run from a position .6" forward of bulkhead FU14, rearward along the bottom centerline to short of the aft end of fuselage sections FU41 and FU42. Further note that FU11 and FU59 joins at bulkhead FU6. (Detail V)**

- ❑ 15. Make FU12 from BD-0008 extrusion. Trim the upstanding leg on forward and aft ends as shown in Detail D. The internal radius on the forward cut should be .12" minimum.

**ⓘ Note: The horizontal part of the "T" extends further forward than the upstanding leg.**

- ❑ 16. Remove FU13 from parts FU97 and FU98 and position FU12 on FU13. Clamp FU12 and FU13 firmly together and drill holes(No.39 or 40 drill), as shown in Detail D.
- ❑ 17. Cleco FU12 and FU13 together and position FU31 and FU32. Bolt FU31 and FU32 to FU12 and clamp these two parts to FU13, inserting shims FU46 and FU47 first. Drill as shown in Detail D (using existing holes in FU13 as a guide).
- ❑ 18. Assemble FU12/FU13/FU31 and FU32 at bottom centerline of FU97 and FU98 and cleco in place.
- ❑ 19. Angles FU17 and FU18 can now be cut to length from MBD5FU17 and MBD5FU18. These angles form part of the inside framework of the engine compartment doors.
- ❑ 20. FU17 runs from .80" behind skin trim of FU97 (.05" behind bulkhead FU1) to .60" past the aft edge (trim line) of FU97 See Details E and I respectively.

**ⓘ Note: FU17 is installed so that 1.50" is below the top edge of FU97. This leaves .75" above the top edge of FU97. (The same applies to FU18 - See Detail H) Refer to Detail I for Dimensions.**

- ❑ 21. See Detail H also for rivet spacing detail and general angle location. Cleco angles FU17 and FU1 in place as they are drilled.
- ❑ 22. Drill OUT all rivet holes to full size. Disassemble all parts. Make sure all holes and edges are smooth and free of burrs. Seal and rivet FU11, FU12, FU13, FU17, FU18, FU31, FU32, FU46, FU47, FU97 and FU98 parts to each other and to FU1 and FU6.
- ❑ 23. Next, position FU95 and FU96 on bulkheads FU1 and FU6. Set these top fuselage sections flush with FU97 and FU98 and insure accurate alignment on bulkheads FU1 and FU6.
- ❑ 24. Trim to fit, if necessary, along the top centerline.
- ❑ 25. Remove FU96 (right side) and clamp FU95 firmly in place on the two main bulkheads and drill at one inch intervals as depicted in Details I , N, T and U and cleco FU95 in place.
- ❑ 26. Fabricate FU10 from .032" 2024-T3 aluminum. 1.44" Wide Drill to fit FU95 skin.

**i** **Note: Splicing strap FU10 should be located at the top centerline of FU95 as shown in Main Plans Drawings. See also Detail J, which shows forward end of FU10 ending .10" behind the canopy arm channel. Do not drill last two aft holes in the splicing strap at this time (where it laps under FU6 bulkhead flange), as this is done when FU39 and FU40 are installed.**

- ❑ 27. With FU95 held in position with clecos; parts FU23, FU51, and FU53 (FU24, FU52 and FU54 right side) should be trimmed out from the pre formed material furnished. See Detail H for dimensions and location of these parts.

**i** **Note: Install FU23 before FU51 and FU53.**

- ❑ 28. Detail L shows that FU23 ends .80" aft to skin trim line (.05" short of FU1 bulkhead). FU23 goes on top of FU48 doubler.
- ❑ 29. Detail I shows that FU23 extends aft .60" past the joint between FU95 and FU41.
- ❑ 30. Refer to Detail H for exact position of FU51 and FU53 in relation to FU17 and FU23.
- ❑ 31. Detail K shows specific rivet layout on parts FU17 and FU21. (See Also Callout on Detail H)
- ❑ 32. When installing FU23, remember that doubler plate FU48 will be installed at the forward end of FU95 (Detail N) and located between FU95 and FU23. Particularly note that FU51 goes over FU23 at this position.
- ❑ 33. After FU23, FU51 and FU53 have been positioned on side skins FU95 and FU97 using clecos, complete installation of the opposite equivalent parts on the right side skins FU96 and FU98. Next mark and cut out top center of FU95/FU96 as shown in Detail J for installation of FU7 hat section.

**i** **Note: A part of the forward top end of side skins FU95 and FU96 has to be cut out at the centerline, .30" wide by 16.08" long in order to provide a channel opening of .60" wide when FU95 and FU96 are together.**

- ❑ 34. Make FU7 hat section from BD-0006 material.
- ❑ 35. Make FU10 splice strip from .032" 2024-T3 aluminum.

- ❑ 36. Fabricate three FU36 brackets from .032" 2024-T3 aluminum. (Detail J)
- ❑ 37. Fabricate FU8 (two parts) from .032" 2024-T3 aluminum, and FU9 from .750" X .625" 2024-T3 aluminum bar material. (Detail J)
- ❑ 38. Cut opening in FU1 for forward end of FU7.
- ❑ 39. Clamp FU7 in place on skins and mark rivet hole centers and drill holes with No.39 drill.
- ❑ 40. Remove FU7 and install FU8 and FU9 in FU7 hat section, as shown in Detail J.
- ❑ 41. Dimple, finish drill and deburr all holes in fuselage skins FU7 and FU10.

**ⓘ Note: Remember to #12 drill the pivot pin hole through both FU7 and FU8 at this time. Note particularly that it must be located and drilled at 90 degrees to the centerline and on a W.L.. The hole should be drilled through both FU7 and FU8 simultaneously.**

- ❑ 42. Reposition FU7 assembly in the fuselage and cleco in place.
- ❑ 43. Position two FU36 brackets at the front sides of FU7, mark hole centers and drill and cleco in onto FU1 bulkhead. Check position and alignment (Details J and M).
- ❑ 44. Do not apply bonding sealant to the sides of the FU36 brackets at this time. (Detail M)
- ❑ 45. Position FU36 bracket below FU7 inside fuselage and drill and cleco in place.
- ❑ 46. Finally install splicing strap FU10, first dimpling, finish drilling and deburring holes in both fuselage skins and strap. Leave out four aft rivets which will later go through FU6 bulkhead. Do not rivet FU36 clips to FU1.
- ❑ 47. Finally install FU7 hat section assembly, first dimpling, drilling and deburring all rivet holes. Leave out two forward rivets which will later go through FU1.

**ⓘ Note: FU10 and FU7 do not have to be final riveted at this time. but it will save clecos to do so. Otherwise the riveting may be done later when the skins are being riveted to the bulkheads.**

- ❑ 48. Reinstall FU95/FU96 skin assembly with clecos on FU1 and FU6.

**ⓘ Note: ALL engine compartment frame angles must be in place when this is done.**

## **CUTTING OUT ENGINE COMPARTMENT DOORS**

- ❑ 49. At this time, mark engine compartment door outline on the outside of FU95 - See Detail H for dimensions.

**ⓘ Note: The easiest way to scribe the door opening accurately is to cut the exact opening (including the upper corner radii ) from a piece of scrap metal approximately 22" x 31". You will then have a rectangular piece of metal in the shape of an upside down "U". Tape this to the fuselage tightly in the proper location and scribe against the inside edges. Do not scribe into the backup structure or into the skin beyond the opening. Thin strips of metal may be inserted between the door frame angles and the skin, if desired, to prevent scribe marks on the under structure.**

- ❑ 50. Remove all angles from around engine compartment door opening and deburr and sand smooth the door opening in the skin. Save the skin cut outs as they will be used to make FU3 and FU4 doors.
- ❑ 51. Cut out FU4 engine compartment door from the right side of the fuselage. Repeat procedures in paragraphs 49 and 50.
- ❑ 52. Dimple and deburr all rivet holes in FU95 and FU96 skins and bulkheads FU1 and FU6.
- ❑ 53. Dimple and deburr all rivet holes in all engine compartment door frame angles.
- ❑ 54. Finally install FU23, FU24, FU51, FU52, FU53 and FU54 angles around engine compartment door openings, and FU95/FU96 skin assembly to FU1, FU6, FU23 and FU24 using flush rivets.

**ⓘ Note: Do not rivet extreme fore and aft ends of FU17/FU18 and FU23/FU24 at this time. See Details I and N.**

- ❑ 55. Install one FU36 clip to the aft side of FU1, sealing and riveting it to both FU1 and FU7. Install two FU36 clips on the forward side of FU1. Seal and rivet these clips to FU1 but seal them only to FU7. Rivets at this location will interfere with the canopy pivot arm when it is installed later.
- ❑ 56. Sand or file edges of FU3 and FU4 doors smooth.
- ❑ 57. Place FU3 door in opening in FU95. Tape in place, if necessary.
- ❑ 58. Lay out holes for door fastening screws and nut plates. (Detail H)
- ❑ 59. Pilot drill (No.39, No.40 or No.30 depending on cleco size) all holes through FU3 door skin and frame FU23, FU51 and FU53. Install clecos as you drill out the holes.
- ❑ 60. Remove clecos and door. Lay door aside.
- ❑ 61. Drill out the nut plate center holes in the door frame angles with a No.19 drill.
- ❑ 62. Position nut plates on the outside of the fuselage assembly by inserting a short 8-32 round head screw through the sheet metal into the nut plate.

**ⓘ Note: Pay particular attention to positions of nut plates and make sure they have threads in them.**

- ❑ 63. With nut plates properly positioned, drill through the nut plate mounting holes with a No.40 drill.
- ❑ 64. Dimple the nut plate rivet holes with a 100° dimple die ( or a rivet head).
- ❑ 65. Either dimple the screw holes with a 100° dimple die or drill the holes out to 5/16" diameter to allow clearance for the dimples on the door.
- ❑ 66. Clean and deburr all holes. Install nut plates with CCR264SS-3-1 rivets.
- ❑ 67. Dimple the screw holes in FU3 door with a 100° dimple die using a pilot diameter to match the pilot holes used (or re drill the holes) Drill to finished size (No.19) if necessary and deburr.
- ❑ 68. Fit FU4 door on right hand side using the procedure described in paragraphs 56 through 66.



- ❑ 69. Fabricate FU14 from .025" 2024-T3 aluminum . (Detail C)
- ❑ 70. After fabrication, trial-fit FU14 in position 15.88" to the rear of the forward trim lines of FU97 and FU98. (See Main Plans Drawings -Page 12)

**i** **Note: This measurement is taken along the contour of the fuselage skins - NOT in a direct horizontal plane from the point mentioned. (See Introductory Section, Page VI)**

- ❑ 71. Drill and install FU14, using clecos (hole spacing 1.00" apart Detail D).
- ❑ 72. Make FU21 and FU22 from MBD5FU21 and IVIBD5FU22 angle material, cutting these to length on assembly. Refer to Details D and E for location and trim details. Note particularly the details of the integral tab on the aft end of the angles. Be sure the parts fit properly between FU1 and FU14.

**i** **Note: FU21 is located 5.00" A.C. below the top edge (trim line) of FU97. See Detail E.**

- ❑ 73. Mark hole centers along inside of FU21 and FU22 angles, spacing holes as called out in Detail E (See also Detail K for relationship of FU21 to FU17).

**i** **Note: Drill the No.19 holes in the forward end of the angles only to pilot hole size at this time.**

- ❑ 74. Trial-fit FU21, then hold in place while drilling holes through it and FU14. Cleco in place on FU14
- ❑ 75. Drill holes through length of FU21 and FU97 and cleco in place.
- ❑ 76. Repeat procedure for FU22. See Detail K for rivet hole pattern on FU21 (same for FU22).
- ❑ 77. Dimple holes, deburr and make final installation of FU21 and FU22. Use clecos in the forward holes to hold parts in contact while sealant sets up.

## CONSTRUCTION OF THE FUSELAGE AFT SECTION

**i** **Note: Before beginning actual assembly of fuselage skins FU39, FU40, FU41 and FU42, all internal bulkheads and doublers should be fabricated. In respect of parts FU56 and FU61, it will be noticed that the template drawings have had to be printed in two parts, each part on a separate page. Fabrication of the parts themselves is, of course, each in one piece.**

- ❑ 78. Make template and fabricate FU56 from .016" 2024-T3 aluminum (Detail O)
- ❑ 79. Make template and fabricate FU61 from .016" 2024-T3 aluminum (Detail P)
- ❑ 80. Make templates and fabricate parts FU62, FU63, and FU64 from .016" 2024-T3 aluminum. (Detail Q)
- ❑ 81. Make templates and fabricate parts FU58 and FU65 from .032" 2024-T3 aluminum (Detail F)  
Mark hole centers.
- ❑ 82. Make template and fabricate FU60 from .020" 2024-T3 aluminum (Detail S)

- ❑ 83. Trial-fit FU41 and FU42 to bulkhead FU6. Check for good alignment all around, with first align being made with the side skins already installed on FU6 (i.e. FU95, FU96, FU97 and FU98).
- ❑ 84. First install FU41 in place on bulkhead FU6, mark hole centers 1.00" apart - except at the position where FU17 and FU23 join FU6 (Details T and U). Drill No.39 all holes.
- ❑ 85. Note that in Detail V the aft end of FU11 splicing strap (shown ending on top of the FU6 bulkhead flange) is finally drilled when FU41 is in place (two holes).
- ❑ 86. Dimple FU6, FU11 and FU41 and cleco parts together.
- ❑ 87. Drill (No.39 drill) all holes through FU41 and FU6 bulkhead
- ❑ 88. Cut from .032" 2024-T3 aluminum FU59 splicing strap. No template is provided for this strap as it is a simple strip of aluminum, 1.44" wide and running from FU6 rearwards to within 2.5" of the extreme aft end of fuselage skins FU41 and FU42. (Detail W)
- ❑ 89. Note that FU59 is tapered slightly at its aft end to fit inside skin contour. It must also be hand formed in a slight "Vee" to fit inside the skins.
- ❑ 90. Draw a centerline down complete length of FU59 and position strap on FU41. Clamp in place. Mark hole centers (1.00" spacing) along its entire length, then drill holes through both FU59 and FU41 with No.39 drill.
- ❑ 91. Cleco FU59 to FU41.
- ❑ 92. Position FU64 inside FU41 at 7.10" A.C.. from extreme trailing edge of FU41. Clamp in place, mark hole centers and drill No.39 holes at 1.00" intervals (Details W and X).
- ❑ 93. Next, mark hole centers along outside of FU41 for installation of FU61.

**ⓘ Note: Hole centers for this part are 1.5" apart, with the exception of the area where FU65 is installed (See Detail X).**

- ❑ 94. Holes can be drilled in FU41. DO NOT drill holes at this time in the area where FU65 is to be installed.
- ❑ 95. Reposition FU61 inside FU41 and, using the holes drilled in FU41 skin as a guide, drill FU61.
- ❑ 96. Cleco FU61 to FU41.
- ❑ 97. Drill holes through FU61 and FU6 bulkhead 1.5" apart. (Detail T)

**ⓘ Note: Holes in FU61 and the top flange of FU64 can be drilled and FU61 fastened to FU64 with clecos. Hole centers will be the same as those in the bottom flange of FU62 as shown in Detail X.**

- ❑ 98. Position FU62 on FU61 and, removing clecos holding FU61 to FU64, mark hole positions in bottom flange of FU62 with a felt tip marker.
- ❑ 99. Remove FU62 and drill holes with No.29 drill. (Detail X)

**i** **Note: It is important to insure that both FU64 and FU62 are accurately located inside FU41 (Detail X). It is especially important to insure that FU62 is located the same distance forward of the trailing edge on BOTH sides as this determines whether the horizontal stabilizer pivot will be straight across the fuselage.**

□100. Mark hole centers on FU41 skin for riveting FU62 and, with FU62 clamped firmly in place, drill both FU41 and FU62 at the same time.

**i** **Note: Do not drill holes as indicated in Detail X.**

□101. Remove necessary clecos so that FU65 can be installed.

□102. Position FU65 between FU41 skin and bulkheads FU61, FU62 and FU64.

**i** **Note: The cut out shown in FU65 for installation of the horizontal stabilizer is the nominal size required. Variations in individual airplanes may require slight trimming during the stabilizer rigging process.**

□103. With FU65 held firmly in position, the top hole through FU64 and FU41, the fifth hole along FU61 forward of FU64, and the first hole along FU61 rearward of FU64 can be used as guides to drill holes at these positions in FU65. (Detail X)

□104. Cleco FU65 in place.

□105. From inside FU41, mark remaining hole centers on FU65 and drill No.39 holes as shown in Detail X.

□106. Finish cleco FU65 in place.

□107. Position FU63 bulkhead on FU62 and FU41. Mark hole centers in FU62 and FU41 and drill No.39 holes. (Detail X)

□108. Position FU56 along the top of FU41 as shown in Detail X.

□109. Mark hole centers as shown and drill No.39 holes 1.00" apart. (Detail X) Hole centers in FU6 bulkhead for installation of FU56 are 1.50" apart (Detail U).

□110. See Detail X for hole spacing, and position on top flange of FU62 on FU56.

□111. After all bulkheads have been drilled and fastened in place with clecos, use FU65 as a template and draw cutout outline on inside of FU41.

□112. Remove all bulkheads and FU41 from FU6 and cut out hole for horizontal stabilizer installation. (Detail X)

□113. Dimple all holes in parts where flush rivets are to be used, drill out all holes for 1/8" rivets to No.2 and reassemble all bulkheads in FU41 and attach to FU6 using No.30 (1/8") clecos.

□114. Assemble FU42 in position, mark all holes centers following procedure as with FU41. Drill this part and dimple and deburr all holes.

□115. Cleco FU42 in place and double check general alignment and good fit.

□116. Position FU60 on FU56. Mark hole centers in bottom flange of FU60 and drill both FU60 and FU56 simultaneously (No.39 drill). Cleco FU60 to FU56. (Detail Y)

- i** **Note: FU60 is installed parallel to the forward trim line of skin FU41 (FU42) and 15.00" from it. (See Detail Y and main plans view on Page 1-3)**
- 117. Shape FU58 to fit contour of FU39/FU40 skins. (Detail Z)
- 118. Position FU39 in place. Mark hole centers around trim lines and drill holes. Details X and Y)
- 119. Position FU57 splicing strap along inside top of FU39. Mark hole centers and drill holes. Cleco in place on FU39.
- i** **Note: Forward end of FU57 is bent downward .60" and this end is riveted to FU6 bulkhead with Avex dome head rivets (Detail J). This can be riveted to FU6 just prior to final installation of FU40.**
- 120. Position FU66 in FU39. See special note in Detail Z.
- 121. Position FU40 in place, mark hole centers for parts FU60, FU57 and FU58 and drill holes.
- 122. Remove all parts, dimple, finish drill and deburr holes.
- i** **SPECIAL NOTE: Final assembly of one side only of the aft end of the fuselage should be carried out at this time. That is, final riveting of FU40 and FU42 only can be completed (and the inside bulkheads where they attach to these skins at this time. The complete left side of the aft end of the fuselage should be left open for installation of drive system and control system.**

## CONSTRUCTION OF THE FORWARD FUSELAGE SECTION

- 123. Position side skins FU67 and FU68 on bulkhead, FU1, insuring good centerline alignment. (See Main Plans Drawing - Page 12 ) Drill No.39 holes through skins and FU1 bulkhead (Detail E). Cleco skins to bulkhead.
- i** **Note: It man help to maintain alignment of FU67 and FU68 skins to cleco or rivet them together using FU37 splice strip prior to drilling holes in FU1 bulkhead. Leave the aft end of FU37 loose as FU13 must slip between it and the skins. If desired her nose cap assembly consisting of FU72,FU73, FU74 may also be joined to FU67 and FU68 skins before fitting the skins to FU1 bulkhead.**
- i** **Note: Leave out the holes which will be under FU29 and FU30 doublers.**
- 124. Make FU37 splicing strip from .032" 2024-T3 aluminum and mark hole centers as called out in Detail AA.
- i** **Note: See Detail AA for splicing strap FU37 installation. With holes in FU13 already drilled, use these as a guide to drill FU67 and FU68 skins along bottom centerline. FU37 should be cut to end at the trim line of FU67 and FU68 with FU73/FU74.**
- 125. Drill (No.39) FU37 and side skins FU67 and FU68 and cleco splicing strip in place.
- 126. Assemble nose cone by joining FU73 and FU74 with FU72 splicing strip (which, in this case, is a pre formed part from .032" 2024-T3 aluminum - Bede Aircraft Part No.BD5FU72). (Detail AE)

- 127. Make two parts FU43 and FU44 from .032" 2024-T3 aluminum (Detail AB)
- 128. Make template and fabricate FU38 from .025" 2024-T3 aluminum (Detail AC)
- **Note: A Form Block will have to be made in order to form FU38 Form the complete bulkhead with no cutout in the web at this stage.**
- 129. Cut FU45 from BD-0002 material.
- 130. Position nose cone assembly (FU73/FU74) against FU67 and FU68 and locate side straps FU43 and FU44. Clamp these parts together and mark hole centers. (Detail AD).
- **Note: Locate hole centers at top end of FU43 and FU44 carefully so they do not conflict with FU69 and FU70 longerons later. Detail AD illustrates hole centers at these locations.**
- 131. Remove nose cone and finish drill, countersink and deburr all holes.
- 132. Reassemble the nose cone on FU67/FU68 side skin.
- 133. Position FU45 behind FU38 (Detail AF) and mark hole centers and drill No.29 holes as indicated.
- 134. Cleco FU45 to FU38 to stiffen the bulkhead while it is being fitted.
- 135. Mark hole centers for installation of FU38 and drill holes. (Details AD and AE).
- 136. Remove FU38 and finish drill, countersink and deburr all holes in this bulkhead and FU73/FU74.
- 137. Remove FU45 angle from FU38.
- 138. Next, cut out center of FU38 as shown in Detail AF and deburr edges.
- 139. Position FU45 behind FU38 and rivet in place with dome head rivets.
- 140. Relocate FU38 inside fuselage nose cone and cleco in place.
- 141. FU72, FU73, FU74 and FU38 can now be finally riveted together using flush rivets.
- 142. Cleco completed nose cone assembly in place on FU67 and FU68 with FU43 and FU44 side strips in position.
- 143. Final rivet nose cone assembly to FU67 and FU68 using FU43 and FU44 splice strips.
- ⓘ **Note: Install only those rivets below the level of FU69 and FU70.**
- 144. Make two FU55 parts from .063" 2024-T3 aluminum. (Detail AB)
- 145. Cut out FU1 on both sides to allow FU69 and FU70 to be inserted. (Detail N)
- 146. Make FU69 and FU70 from MBD5FU69 and MBD5FU70. Trim upper and lower flanges to width. (See Detail AD)
- ⓘ **Note: Upper flange is .60" wide and lower flange is .50" wide.**
- 147. Trial fit FU69/FU70 before cutting to final length.

**i** **Note: The hat section should overlap the nose skin by 3.00" at the top flange and extend back to FU51 (FU53) at the aft end. This part will appear to shorten as the fuselage skin is spread in a following step so do not over trim at this time.**

- 148. Trim the aft ends of FU69 and FU70 to the proper angle to be parallel to FU51 and FU52.
- 149. Clamp FU69 and FU70 flush with the upper edge of FU67 and FU68 skins. Details N and AD. The aft ends should be within .05" of the flange on FU51/FU52.
- 150. Drill the four holes in each hat section that will pick up rivets in FU1 bulkhead and the skins. Install clecos.

**i** **Note: Do not drill any other holes in the longerons at this time**

- 151. Measure 15.12" from the forward trim lines of FU67/FU68 aft along the contour at the top edge of the skins. Detail AI. Make a mark on each skin at this point.
- 152. Insert a temporary spreader (wood strip or other suitable material) to spread the fuselage, longerons and all. After spreading, the fuselage skins should be 20.18" apart (outside to outside) at the points where the marks were made.

**i** **Note: This operation will cause the longerons to slip with relation to the skin. Ease up pressure on any clamps to let this take place. No slippage should take place where the clecos are in the aft end.**

- 153. With the fuselage spread to the proper width, transfer the marks on the skin (per paragraph 151) onto the hat sections. This establishes a locating reference for installation of FU33 and FU34 angles.
- 154. From this point on, the FU69 and FU70 longerons can be fitted and drilled in using the wooden spacer to maintain fuselage contour or the fuselage size can be held by installing FU33/FU34 angles and FU35 tube. The assembly sequence is written assuming the second method.
- 155. Fabricate FU33/FU34 brackets from BD-0007 angle material as shown in Detail AH. Drill two No.19 holes as indicated. Pilot drill the rivet holes to No.39
- 156. Make one FU35 part from .375" O.D. aluminum tubing to the dimensions given in Detail AH, and drill the two inner holes full size (No.19 drill) as shown. Drill the outside two holes undersize (1/16" or No.40).
- 157. Using the reference lines marked in paragraph 153, (See also Detail AI) locate FU33 and FU34.

**i** **Note: The upper corner of FU33/FU34 should be located on the reference line, but not parallel with it. The aft face of the angle should be approximately vertical when the airplane is in flight attitude.**

- 158. Drill No.29 through the existing holes in FU33/FU34 into the longerons. Cleco FU33/FU34 in place.
- 159. Install FU35 in place and install 8-32 screws in the full size holes.

- ❑160. Drill No.39 through the pilot holes in FU35 into FU33/FU34. After the alignment is checked, drill these holes out with a No.19 drill.
- ❑161. Remove FU33, FU34 and FU35. Deburr all holes.
- ❑162. Finish rivet FU33 and FU34 to FU69 and FU70 with dome head rivets.
- ❑163. Install FU35 with two screws, washers and nuts. Detail AI
- ❑164. Make two FU55 parts from .063" 2024-T3 aluminum. (Detail A)
- ❑165. Clamp FU55 straps along tops of FU69 and FU70, as shown in Section View B - B of Detail AD. Double check alignment of FU69/FU70 with top edge of skins. (Details N and AD)
- ⓘ Note: FU69/FU70 should still be attached with clecos where it crosses FU1 bulkhead.**
- ❑166. Mark hole centers on outside of fuselage skins and drill holes as indicated.
- ⓘ SPECIAL NOTE: Carefully study special drawing in Detail A-G, as well as Details N and AD, before drilling holes. Pay particular attention to double countersink of specific holes for installation of double-flush rivets. Also note No.29 holes for later installation of windshield.**
- ❑167. Cleco canopy hat sections in place during the drilling process.
- ❑168. It will be advantageous to start drilling holes at bulkhead FU1 and work forward on the longerons. Drill a few holes on one side of the fuselage and then drill some on the opposite side. In other words do not drill all the holes on any one side at one time. Keep enough clecos in the holes to prevent slippage.
- ❑169. Make two FU48 gussets from .025" 202473 aluminum. (Detail G)
- ❑170. Insert one FU48 on each side of the fuselage between the longerons and skin.
- ⓘ Note: FU48 also slips between FU23 (FU24) and the skin and between FU1 bulkhead and the skin. (Detail N)**
- ❑171. Drill No.39 all rivet holes necessary to install FU48 (both sides)
- ❑172. Remove FU48, FU69, FU70 and FU55.
- ❑173. Finish drill, countersink and deburr holes for those rivets which will install in .032" skin (FU67 and FU68). Dimple, finish drill and deburr holes for those rivets which will install in .025" skin (FU95 a FU96).
- ⓘ Note: Both the skin and under structure must be dimpled.**
- ❑174. Trim forward end of FU69/FU70 if necessary.
- ❑175. Countersink all rivet holes in FU67, FU68, FU73, FU74 and FU55.
- ⓘ Note: Pay particular attention to the different size and angle of countersink for the Avex 1/8" rivets and the MS 3/32" rivets.**

☐176. Make final installation of FU48 including the rivets which also go through FU69/FU70.

**i** **Note: Make sure to get sealant under the flange of FU23/FU24 and to get complete coverage on the skin contact side of FU48.**

☐177. Make final installation of FU69 and FU70. Use the same technique of working from aft to forward and alternating rivets on each side that was described for the drilling process.

**i** **Note: Be sure to install the rivets previously left out of the top end of FU43/FU44.**

☐178. Trim FU29 and FU30 doublers along the scribe line furnished on the pre formed blank.

☐179. File a bevel along the top edge. This bevel should start .25" from the top of the part and taper down to a material thickness of .020" - .040" at the edge.

☐180. Make one each of FU25 and FU26 from VS-0003 angle material

☐181. Locate hole centers for both the rivets and screws on FU29. (Detail E)

☐182. Fit FU29 in proper position on side of fuselage and drill No.29 holes at all hole locations. Cleco in place.

☐183. Fit FU25 in place. Drill to match FU29 four places. Drill No.29 four places into FU1 bulkhead.

☐184. Drill out all rivet holes in FU29 to No.29 drill size and all screw holes to No.19 size. Remove the No.40 clecos and replace with No.30 (in the rivet holes) as holes are drilled out.

☐185. Remove FU25 and FU29.

☐186. Countersink all screws holes in FU29  $100^{\circ}$  X .323" diameter. Countersink all rivet holes  $120^{\circ}$  X .205" diameter.

**i** **Note: The bottom eight(8) rivets through FU27 doubler may be either flush or dome head.**

☐187. Deburr all holes in skins, bulkhead, doublers and clip.

☐188. Make final installation of FU25 and FU29.

☐189. Repeat installation procedure for FU26 and FU30.

☐190. Make FU49/FU50 from BD-0002 material (note that these parts are opposites). (Detail AH)

☐191. Fit FU49 in place and drill No.29 through FU49, FU69 and FU1 on hole centers as shown on Det: N.

☐192. Deburr holes, clean out chips and final rivet FU49 in place with dome head rivets.

☐193. Install FU50 opposite to FU49.

**FURTHER WORK ON THE FUSELAGE IS COVERED**



**IN THE CHAPTERS ON "LANDING GEAR", "CONTROL SYSTEM" AND "COCKPIT & CANOPY".**

# Parts & Materials Callout

## Chapter 1 Nose Gear Box



**NOTE: BOLD DENOTES PART MADE FROM RAW MATERIAL**

DWG. REF. NO.	DESCRIPTION	QUANTITY	MATERIAL IDENTIFICATION	MATERIAL DESCRIPTION
<input type="checkbox"/> FU 71	SHIM	2	BD-5-M-0101	.032" 2024-T3
<input type="checkbox"/> FU 77	BULKHEAD	1	BD-5-M-0027	.025" 2024-T3
<input type="checkbox"/> FU 78	ANGLE TOP	1	BD-5-M-0101	.032" 2024-T3
<input type="checkbox"/> FU 79	FRONT PLATE	1	BD-5-M-0101	.032" 2024T3
<input type="checkbox"/> FU 80	TOP PLATE	1	BD-5-M-0101	.032" 2024 T3
<input type="checkbox"/> FU 81	WHEEL COVER	1	BD-5-M-0025	.016" 2024-T3
<input type="checkbox"/> FU 82	FLOORBOARD BRACE	1	BD-5-M-0101	.032" 2024-T3
<input type="checkbox"/> FU 83	FLOOR SUPPORT BULKHD	1	BD-5-M-0101	.032" 2024-T3
<input type="checkbox"/> FU 84	SIDE PANEL	2	BD-5-M-0025	.016" 2024-T3
<input type="checkbox"/> FU 85	SIDE PANEL	2	BD-5-M-0101	.032" 2024-T3
<input type="checkbox"/> FU 86	SIDE PANEL	2	BD-5-M-0101	.032" 2024 T3
<input type="checkbox"/> FU 87	DOUBLER L.H.	1	BD-5-M-0101	.032" 2024 T3
<input type="checkbox"/> FU 88	DOUBLER R.H.	1	BD-5-M-0101	.032" 2024-T3
<input type="checkbox"/> FU 89	CHANNEL PULLEY BRACE	1	BD-0069	.063" 2024-T3
<input type="checkbox"/> FU 91	SHIM L.H. PULLEY BRACKET	1	BD-5-M-0101	.032" 2024-T3
<input type="checkbox"/> FU 100	SPACER, LOWER PULLEY	1	BD-5-M-0123	.25" O.D. X .028" WALL 2024-T3 ALUMINUM TUBING
<input type="checkbox"/> FU 102	ANGLE R.H, FWD.	1	BD-0002	.032" X 1.00" X 1.00" 2024-T3 ANGLE
<input type="checkbox"/> FU 103	ANGLE TOP L.H.	1	BD-5-M-0101	.032" 2024 T3
<input type="checkbox"/> FU 104	ANGLE TOP R.H.	1	BD-5-M-0101	.032" 2024-T3
<input type="checkbox"/> FU 105	ANGLE BOTTOM L.H.	1	BD-5-M-0101	.032" 2024 T3
<input type="checkbox"/> FU 106	ANGLE BOTTOM R.H.	1	BD-5-M-0101	.032" 2024-T3
<input type="checkbox"/> FU 107	ANGLE L H.	1	BD-0002	.032" X 1.00" X 1.00" ANGLE
<input type="checkbox"/> FU 108	ANGLE R.H.	1	BD-0002	.032" X 1.00" X 1.00" 2024-T3 ANGLE
<input type="checkbox"/> FU 109	ANGLE L.H.	1	BD-5-M-0027	.025" 2024-T3
<input type="checkbox"/> FU 110	ANGLE R.H.	1	BD-5-M-0027	.025" 2024-T3
<input type="checkbox"/> FU 111	HAT SECTION L.H.	1	BD-0004	.032" HAT SECTION 2024-T3
<input type="checkbox"/> FU 112	HAT SECTION R.H.	1	BD-0004	.032" HAT SECTION 2024-T3
<input type="checkbox"/> FU 113	ANGLE L.H.	1	BD-5-M-0101	.032" 2024-T3
<input type="checkbox"/> FU 114	ANGLE R.H.	1	BD-5-M-0101	.032" 2024-T3
<input type="checkbox"/> FU 115	ANGLE L.H.	1	BD-5-M-0027	.025" 2024-T3
<input type="checkbox"/> FU 116	ANGLE R.H.	1	BD-5-M-0027	.025" 2024-T3
<input type="checkbox"/> FU 117	ANGLE TOP L.H.	1	BD-0002	.032" X 1.00" X 1.00" 2024-T3 ANGLE
<input type="checkbox"/> FU 118	ANGLE TOP R H.	1	BD-0002	.032" X 1.00" X 1.00" 2024-T3 ANGLE
<input type="checkbox"/> FU 119	HAT SECTION L.H.	1	BD-0004	.032" HAT SECTION 2024-T3
<input type="checkbox"/> FU 120	HAT SECTION R.H.	1	BD-0004	.032" HAT SECTION 2024-T3
<input type="checkbox"/> FU 121	PULLEY BRACKET L.H.	2	BD-5-M-0088	.040" 2024-T3

# Parts & Materials Callout (Cont.)

## Chapter 1 Nose Gear Box



**NOTE: BOLD DENOTES PART MADE FROM RAW MATERIAL**


DWG. REF. NO.	DESCRIPTION	QUANTITY	MATERIAL IDENTIFICATION	MATERIAL DESCRIPTION
<input type="checkbox"/> FU 123	STIFFENER L.H.	1	BD-5-M-0101	.032" 2024-T3
<input type="checkbox"/> FU 124	STIFFENER R.H.	1	BD-5-M-0101	.032" 2024-T3
<input type="checkbox"/> FU 125	FLOOR SUPPORT L.H.	1	BD-5-M-0027	.025" 2024-T3
<input type="checkbox"/> FU 126	FLOOR SUPPORT R.H.	1	BD-5-M-0027	.025" 2024-T3
<input type="checkbox"/> FU 127	BULKHEAD L.H.	1	BD-5-M-0027	.025" 2024-T3
<input type="checkbox"/> FU 128	BULKHEAD R.H.	1	BD-5-M-0027	.025" 2024-T3
<input type="checkbox"/> FU 129	SPACER	1	BD-5-M-0123	.250" O.D. X .028" WALL 2024-T3 ALUMINUM TUBING
<input type="checkbox"/> FU 130	SPACER	1	BD-5-M-0123	.250" O.D. X .028" WALL 2024-T3 ALUMINUM TUBING
<input type="checkbox"/> FU 131	PULLEY BRACKET L.H.	1	BD-5-M-0101	.032" 2024 T3
<input type="checkbox"/> FU 132	PULLEY BRACKET R.H.	1	BD-5-M-0101	.032" 2024-T3
<b>TOTAL PARTS COUNT</b>		<b>51</b>		
<b>TOTAL PARTS FROM RAW STOCK</b>		<b>51</b>		

# **NOSE GEAR BOX CONSTRUCTION**

## **Before Beginning Construction, Note The Following:**

- 1 A jig has been designed to insure torsional rigidity of the nose gear box during final construction. This will prevent any twist and insures that the strut travel is not off center,**
- 2 Pay particular attention where flush rivets and dome rivets are used and their direction.**
- 3 Prior to final assembly, remove all sharp edges and deburr all holes.**
- 4 Thoroughly read and familiarize yourself with the prints before construction.**
- 5 All critical dimensions are noted on drawing. Other dimensions can be taken from full scale drawings.**
- 6 When drilling holes, hold the drill as close to 90° to the material as possible.**
- 7 Before permanently installing nose gear box into aircraft, the type of pitot static system must be determined and installed.**
- 8 It is assumed that the builder is experienced enough at this point of construction to know that when locating parts, that he periodically installs clecos to hold the parts in their proper location after opening holes.**

# Beginning Construction

- 1 Cut out all flat patterns, Detail A-J, Page 1-48, through Detail A-R, Page 1-54 and identify with felt tip pen using drawing reference numbers. All parts may be formed at this time with the exceptions of FU86's and FU119 and 120. No bending should be done with these four parts at this time. Also, the large hole in FU77 should not be cut out at this time, a 1/4" hole should be drilled in the center of this hole location.
- 2. Cut angles FU101, 102, 107, 108 and 118 from BD-0002 material, Detail A-S, Page 1-55. Note shape of FU117 and 118 angles (Detail A-U, Page 1-57 and Detail A-S, Page 1-55) FU107 - FU108 (Detail A-S, Page 1-55 and Detail A-X, Section AA Page 1-59).
- 3. Make full size drawing of left hand FU85 showing reference line and bearing block location, Page 1-60, Detail A-Y. Glue this drawing to the left hand FU85 and tape or clamp both FU85's together so that all edges are flush and both parts are exactly the same size and shape (this may require some filing).
- 4. With FU85's still taped together, lay them on a flat work surface with the left hand side up. Tape FU86's together with all edges flush and position them on top of FU85's using reference line on FU85. The reference line on FU85 is to be lined up with the top edge of FU86 along its entire length (Detail A-S, Page 1-55).
- 5. Counting from top edge of FU86's, locate the drill with No.40 drill rivet holes 1, 2, and 4 through FU86's and FU85's. (Note that rivet hole No.4 is hidden below FU119, Detail A-S).
- 6. Lay out and drill the eight No.40 holes through one of the LG69 bearing blocks using the dimensions scaled from Detail A-Y, Page 1-60. IDENTIFY THIS R/H.
- 7. Clamp both LG69 bearing blocks together with the flat portion back to back. Using the bearing block that has already been drilled as a drill guide, drill the eight No.40 holes through the other LG69 bearing block (it is best to install a snug fitting 3/4" O.D. tube through the upper and lower bushings of both bearing blocks to insure perfect alignment).
- 8. Lay the right hand bearing block on top of the left hand FU85 and locate it by matching it to the drawing that is glued to the FU85. (The three bushing holes in LG69 must match drawing).
- 9. Using the eight No.40 holes in the right hand bearing block, drill through both FU85's using the bearing block as a drill guide.
- 10. Tape both FU84's together and lay on flat working surface with left side up.
- 11. Locate and drill FU123 on FU84's as in Detail A-S (No.40 drill).
-  Note: Omit the three rivet holes that are covered by FU89 at this time. Also locate rivet holes on FU84 that attach FU81 and open with No.40 drill. (Do not open holes in FU81 at this time).
- 12. Locate and drill FU84's onto FU86's using No.40 drill as in Detail A-S.
- 13. Remove the FU123 and place it back to back with the FU124 and using the FU123 as a drill guide, drill all 40 holes through FU124.
- 14. With both FU85's taped together and both FU86's taped together and clecoed to the FU85's (left hand side up, right hand side flat on working surface) locate and drill through angles and both FU85's or FU86's with No.40 drill the following parts in this order: FU101, FU 103, FU111, FU 105 and FU 113. These angles are then to be placed back to back with the

corresponding right hand parts and used as a drill guide to drill out the right hand parts. Locate and drill with No.40 drill the FU 108 and FU 118 angles on FU85's and FU86's.

- i** **Note:** Although these two angles are right hand parts, it is necessary to lay them on the left hand side of the FU85's and FU86's for drilling. They are then placed back to back with the FU 107 and 117 angles and used as drill guides.
- 16. Position FU125 on the FU86's and locate and drill with a No.40 drill the four rivet holes common to the FU86's only. Do not drill those rivet holes that are covered by FU119 and FU 113. The FU125 can then be placed back to back with the 126 and used as a drill guide to drill the 126.
  - 17. Lay out all holes to be drilled in FU79 and drill with No.40 drill, reference Detail A-X. It should be understood that the holes should be drilled in the FU79 only at this time.
  - 18. Lay out and drill with No.40 drill all rivet holes common to FU 117 and 118 and FU80. These holes are to be drilled in FU80 on , at this time. Do not drill FU 117 and 118. (Detail A-U, Page 157).
  - 19. Remove all clecos and tape and separate all parts. Deburr all holes and edges of parts.
  - 20. Cleco FU111 to left hand FU85 and FU112 to right hand FU85. Using FU85's as a drill guide, drill the eight No.40 holes common to the LG69 bearing block through FU111 and FU112, (Be sure to cleco FU111 and FU112 to outside of FU85's).



### **THE FOLLOWING INSTRUCTIONS ARE FOR LOADING THE NOSE GEAR BOX ONTO THE JIG FIXTURE.**

- 21. Install bearing block jig between bearing blocks as shown on jig drawings with 3/4" O.D. tubes through bushings. Apply a small amount of contact cement between the bearing blocks and the jig and clamp together until the cement dries.
- 22. Cleco bearing blocks in place between left hand and right hand FU85's making sure to place the right hand block on the right hand side and the tops of the blocks toward the top of the FU85's. It is also necessary to install the FU111 and FU112 on the FU85's at this time.
- 23. Install the FU85 assembly on the wheel well jig. The forward edge of the FU85's must be located exactly flush with the forward edge of endplate A and positioned so that the reference line in the FU85's matches the reference line on the endplate. Check to make sure that the reference line on the aft side of the FU85's is flush with the top edge of the "T" section of the jig.
- 24. With the FU85 assembly held firmly in place, drill through the top and bottom No.40 holes at the forward end of each FU85. These holes should go into the endplate A approximately 1/4"- 1/2".
- 25. Remove FU85's from jig and enlarge these top and bottom holes in the FU85's to a No.30. Reinstall the FU85's on jig using four small No.5 wood screws through the forward top and bottom holes on each side of the FU85 assembly (before tightening screws, recheck alignment of reference line forward and aft),
- 26. Locate the exact center line of FU80 (B.L. 0.00"). Drill two No.40 holes on center line 1" aft and 1" forward from ends of part. Place FU80 in jig so that it rests on top of the "T".
- 27. Cleco FU107 and FU108 angles in place onto FU85's, Detail A-X, Section H-H, Page 1-59.
- 28. Move FU80 aft until flange contacts FU107 and 108 angles, Detail A-S, Page 1-55. Carefully

locate the two No.40 holes in FU80 over the center line of the "T" section and drill through these holes approximately 1/4" - 1/2" into the jig. Raise aft end of FU80 and open the two No.40 holes in FU80 to a No.30.

- 29. Install FU80 on jig with two No.5 wood screws.
- 30. Make the proper bends in both FU86's as shown in Detail A-L, Page 150 (this detail shows the bends for FU119 and 120, however, the same measurements apply to the FU86's). Note that the right hand side is to be bent in the opposite direction of the left hand side.
- 31. Cleco FU117 and 118 angles to FU86's.
- 32. Cleco FU86's to FU85's. Locate and drill FU117 and 118 angles onto FU80 using FU80 as a drill guide. Make sure that the FU86's are flush with the FU80 along its entire length.
- 33. Drill a No.40 hole 1" below the top edge of the FU86's making sure that it hits the center line of endplate B. It is important that the top edge of the FU86 is aligned with the reference line and the top of the "T". Drill a similar hole approximately 1 1/2" up from the bottom edge of the FU86's, making sure that it also hits the center line of endplate B. Enlarge these No.40 holes to a No.30 and fasten the FU86's to endplate B with two No.5 wood screws each.
- 34. Cleco FU84's to FU86's and drill a No.40 hole through each FU84 near the top center line of endplate B and attach to jig with a No.5 wood screw.
- 35. Cleco FU1 25 and 126 onto FU86's.
- 36. Locate FU119 and 120 and drill with a No.40 drill all rivet holes through FU85's and FU86's, using FU119 and 120 as a drill guide, also drill all the holes that go through FU111 and 112, FU125 and 126. Note that the top edge of FU119 and 120 is parallel with the reference line (top of FU80). It is necessary at this time to make the bends in FU119 and 120 as shown on Page 1-50, Detail A-L.
- 37. Reinstall FU113 and 114 and drill holes common to FU119 and 120, FU125 and 126.
- 38. Reinstall FU105 and 106 and drill holes common to FU111 and 112.
- 39. Cleco FU123 and 124 to FU84's and drill with No.40 drill all holes common to FU84's, FU119 and 120. (Do not drill the holes covered by FU89).
- 40. Locate and install FU81. Locate forward tab onto FU80 first, then drill No.40 holes into tabs of FU81 starting forward and work around FU84's to the rear.
- 41. Locate FU89 and FU121 onto FU81 and FU123 and 124, (Detail A-S and A-X). Drill to No.40.
- 42. Locate FU87 and FU88 onto FU119, 120, 111, 112 hat sections and drill to No.40. (Mark nutplate locations in hat sections and drill with No.12 drill. These nutplates must be installed before final assembly of the gearbox. (Detail A-U, Section K-K).
- 43. Locate and drill FU115, 116, 109 and 110, Detail A-T, Section K-K and Detail A-U. these parts use holes common to FU105,106 and FU114 and 113.
- 44. Locate FU79 onto angles FU107 and 108. Drill holes per Detail A-X, Section A-A. (The FU71 shims should be located on FU79 with contact cement before FU79 is drilled into place).
- 45. Locate FU78 and drill to No.40, Detail A-X, Page 1-59.
- 46. Position FU77 on FU101, 102 angles (vertically by Detail A-S and laterally by Detail A-U).

Locate rivet holes and open with No.40 d rill. (Note: Do not pro-seal FU77 onto angles until nosegear box is located to fuselage).

- 47. All darkened rivets on FU1 11, 112, 105 and 106 are dimpled and heads are on the inside of nosegear box. Mark these with felt tip pen. Do not open to No.30 at this time.
- 48. Open all rivet holes to No.29. (Except flush rivet holes).
- 49. Note direction of dome rivets in FU84's and FU86's and mark with felt tip pen.
- 50. Disassemble nosegear box and deburr rivet holes . Dimple designated riveted holes.  
 (Note: Direction of rivets and then open with No.29 drill).
- 51. At this time open 3/4" hole in FU85's and FU111, 112 (Detail A-Y, Page 160). Note: This is not a close tolerance hole.
- 52. Install nutplates on FU107, 108, FU78 and FU80. (Detail A-X, Section A-A) and nutplates on hat sections FU111, 112,119 and 120 (Detail A-T, Section K-K).
- 53. Locate onto FU125, 126 (Detail A-S and A-W) the following parts; FU82, 83, 127, 128, 131 and 132. Open rivet holes with No.40 drill, recheck measurements and open holes with No.29 drill. Locate FU91 shim with contact cement to the bottom of FU131. Disassemble and deburr.
- 54. Prepare all surfaces to be sealed and seal when reassembling onto jig. FU103 and 104 and FU111 and 112 should be sealed and riveted to FU85 at this time. Reassemble nosegear box onto jig by using the previous instructions (21 through 47). Do not seal these angles onto nosegear box at this time, FU101, 102, 109, 110, 113, 114, 115 and 116. Cleco these angles onto nosegear box only. These should be sealed after locating nosegear box in aircraft.
- 55. Install clecos or screws in any interfering rivet holes in Plate B of jig. Rivets should be installed after removal of jig. Leave jig installed until you have nosegear box located in aircraft.
-  **Note: Pitot Static System must be installed before nosegear box is permanently installed in aircraft.**
- 56. Upper and lower pulley assemblies may be installed after nosegear box is assembled.



# INSTALLATION OF THE PITOT STATIC SYSTEM

## Parts & Materials Callout



**NOTE: BOLD DENOTES PART MADE FROM RAW MATERIAL**


DWG. REF. NO.	DESCRIPTION	QUANTITY	MATERIAL IDENTIFICATION	MATERIAL DESCRIPTION
<b>CC-56</b>	<b>Pitot Block</b>	<b>1</b>	<b>BD-5-M-0130</b>	<b>1/2"X1 "X1 " Alum.</b>
<b>CC-57</b>	<b>Pitot Tube</b>	<b>1</b>	<b>BD-5-M-0123</b>	<b>.25" O.D.X.028" Wall 2024-T3 Tubing</b>
<b>CC-58</b>	<b>Pitot Line</b>	<b>1</b>	<b>BD-5-M-0131</b>	<b>1/4" Plastic Tubing</b>
<b>CC-59</b>	<b>Pitot Plate</b>	<b>1</b>	<b>BD-5-M-0027</b>	<b>.025" 2024-T3</b>
<b>CC-60</b>	<b>Static Line</b>	<b>1</b>	<b>BD-5-M-0131</b>	<b>1/4" O.D. Plastic Tubing</b>
<b>CC-99</b>	<b>Static Triangle</b>	<b>2</b>	<b>BD-5-M-0030</b>	<b>.063" 2024-T3</b>
<b>CC-100</b>	<b>Static Block</b>	<b>2</b>	<b>BD-5-M-0130</b>	<b>1/2"X1"X1" Alum.</b>
<b>CC-101</b>	<b>Static Line</b>	<b>2</b>	<b>BD-5-M-0131</b>	<b>1/4" O.D. Plastic Tubing</b>
<b>CC-102</b>	<b>Static Line</b>	<b>2</b>	<b>BD-5-M-0131</b>	<b>1/4" O.D. Plastic Tubing</b>



**NOTE:** Care must be taken when installing the tubes into the pitot and static blocks as not to plug them with sealant.

### STATIC SYSTEM

1. Cut out a 2" hole in FU77 (page 165, view AA).
2. Fabricate CC56 pitot block and the two CC100 static blocks and the two CC99 static triangles. Cut to length CC57 pitot tube and the pitot and static plastic tubes to length.
3. Drill the 3/8" diameter hole and the 1/4" hole in CC100 (Note the depth of the 3/8" hole), Also open the two rivet holes with a # 40 drill.
4. Locate the static port using a square lined up with the center of the skin splice at station 30.00 or 9,00" from the intersection of the skins and canopy. Extend the horizontal center line approximately 3/4" aft of the 12.50" dimension, repeat for opposite side. Mark the 12.50" dimension and the 9.00" dimension intersect and using a No. 60 drill, open the static port holes in FU 67 and FU 68.
5. Position the CC100 static block as shown making sure the A" hole is on the top side, and using the # 40 holes in the CC100 as a drill guide, open the rivet holes in FU67 & 68 & CC100 with a # 30 drill. Dimple the holes in FU67 & 68 and countersink the # 30 holes in CC100.
6. The surface of CC100 with a 3/8" hole must be filled to fit the contour of the fuselage.
7. Pro-seal and rivet into place the CC100's: making sure the 1/4" hole is in the up position on both sides.
8. Pro-seal the two CC99's in position (page 164). make sure there is no pro-seal in the static port along the front edge of the CC99 triangles.
9. Install the two CC101 static line tubes into the CC100 static blocks and pro-seal into place.

-  Caution must be taken not to get any pro-seal in the static blocks or the tubes.
- ❑10. The opposite ends of the CC101 tubes slide into the two tee-fittings (BD-0093) and the CC60 tube connects these two tee's together.
  - ❑11. Install the tube fittings (BD-0092) in back of the altimeter and airspeed indicator.
  - ❑12. Slide the tubes CC102 over tube fittings and tee-fittings. Be sure to connect the fitting marked for the static line on the back of the airspeed indicator.
  - ❑13. Cut out the CC59 pitot plate and locate the two 1/4" holes (Note depth of holes). Position CC56 pitot block on the exact center of CC59. Open the rivet holes with a No.30 drill, deburr, pro-seal and rivet these two together.
  - ❑14. Drill the 1/4" hole in the extreme nose of the aircraft.
  - ❑15. The end of CC57 tube that is inserted into the CC56 pitot block must be cut at a 45° angle. After deburring this, apply pro-seal on the end of CC57 and install into the CC56 pitot block as shown. Make sure the tapered side of CC57 pitot tube is facing up.
  - ❑16. Using a square, make sure the CC57 pitot tube is perpendicular to CC59 pitot plate.
  - ❑17. Cleco into place the FU77 bulkhead into the fuselage.
  - ❑18. Insert the pitot tube plate assembly into the aircraft through the 2" hole in the FU77 bulkhead until the CC59 pitot plate rests against the bulkhead. There should be a center line on FU77 and on the CC59 plate for alignment.
  - ❑19. Position this assembly with the hole in the CC56 pitot block in the up position and the extension of the CC57 pitot tube that is out of the nose is in the center sideways and between level with the water lines and 20° nose down. A carpenter's level is adequate for this procedure. With the pitot tube in this position, drill out the four holes in CC59 pitot plate to a # 12 (drill through a CC59 pitot plate and FU77 bulkhead).
  - ❑20. Remove pitot tube plate assembly and the FU77 bulkhead and install the nutplates in the FU77 bulkhead.
  - ❑21. Drill a 7/16" hole in FU77 at location shown (view AA) and install grommet.
  - ❑22. Drill a 5/16" hole through the side of the hat section FU1 11 as shown on page 165 and install the snap bushings.
  - ❑23. Rivet the FU77 bulkhead to nosegear box.
  - ❑24. Install the CC58 tubing through the snap bushings, grommet and pro-seal into the CC56 pitot block. Tubing may be bent by applying a very small amount of heat. NOTE: Between the grommet and the snap bushing, the tubing should be kept as close as possible to the wheelwell to make sure the over center spring arm of LG91 does not hit it when cycling the gear. Exercise care as to not collapse the walls of the tubing when bending.
  - ❑25. Install wheelwell by clecoing into place and insert the CC57 assembly to the hole in the nose. Install the bolts in the CC59 pitot plate.
  - ❑26. Recheck the position of pitot tube out of the nose (see step 8).
  - ❑27. Route the opposite end of the tubing CC58 high in the fuselage and connect to the tube fitting in the airspeed indicator labeled "pitot".

## INSPECTION HOLE FABRICATION AND INSTALLATION

- ❑1. Make a template 6" I.D. dia. from .025" material for the insp. holes in FU39 and FU40
- ❑2. Position the template per print on FU39 and FU40 then carefully scribe out the hole. The piece cut out of FU39 and FLJ40 will be the insp. hole cover. Cut out the lower insp. hole in bottom of fuselage.
- ❑3. Fabricate the two doublers per print and a insp. hole cover for the bottom insp. hole.
- ❑4. Locate and open the .75" holes in FU39 and FU40.
- ❑5. Lay out the rivet hole patterns on the fuselage skin for the doublers and open the holes with a # 40 drill.
- ❑6. Position the doublers and using the # 40 holes as a drill guide open the holes in the doublers.
- ❑7. Lay out the screw hole location on the insp. hole covers and open holes With a # 40 drill.
- ❑8. Position insp. hole cover on doubler and using the # 40 holes as a drill guide in the cover, open the holes with a # 40 drill in the doublers.
- ❑9. Deburr and dimple all holes in doubler and covers, install nutplates on doublers, pro-seal and permanently install doublers.
- ❑10. Cut out the 6" dia. hole per print in FU61.

## Parts & Materials Callout

DWG. REF. NO.	DESCRIPTION	QUANTITY	MATERIAL DESCRIPTION
□FU39	Filler Block	2	2" X 2" X .75" balsa wood
□FU36	Stop plate	2	.020 2024-T3 Al.
□FU93	Wing fillet	1	MBD5FU93
□FU92	Wing Fillet	1	MBD5FU92
□LG97	Plate	2	.020 2024-T3 Al.
□LG99	Angle	1	.020 2024-T3 Al.
□LG100	Angle	1	.020 2024-T3 Al.
□LG101	Angle	1	.020 2024-T3 Al.
□LG102	Angle	1	.020 2024-T3 Al.
□LG103	Angle	2	.020 2024-T3 Al.
□LGISB	Brace	2	.250 X .028 wall 2024-T3 tube
□FU137	Rib	1	MBD5W1
□FU138	Rib	1	MBD5W2
□FU141	Rib	1	.032 2024-T3 Al.
□FU142	Rib	1	.032 2024-T3 Al.
□FU143	Bulkhead	1	.025 2024-T3 Al.
□FU144	Bulkhead	1	.025 2024-T3 Al.
□LG173	Shim	2	.020 2024 T3 Al.
□LG174	Shim	2	.032 2024-T3 Al.
□LG175	Shim	2	.032 2024-T3 Al.
□LG176	Shim	2	.032 2024-T3 Al.
□LG202	Shim	2	.032 2024-T3 Al.

# WING ROOT FILLET

## Beginning Construction

- ❑1. Cut and bend tabs on FU137 rib as noted.
  - ❑2. install left hand wing on aircraft temporarily.
  - ❑3. Slide FU93 fillet over wing, locate and tape to fuselage.
  - ❑4. Hold light under fillet and scribe line on fillet allowing .03" to .06" between end of fillet and wing skin.
  - ❑5. Remove and trim FU93 fillet.
  - ❑6. Remove wing and locate FU137 rib inside FU93 fillet. NOTE: Prior to installation of FU137 Rib, set square on FU99 center section and verify web of FU137 to be perpendicular to FU99 center section.
  - ❑7. Install FU137 rib.
  - ❑8. Fabricate FU143 Bulkhead.
  - ❑9. Locate and install FU143 bulkhead inside FU93 fillet.
  - ❑10. Temporarily reinstall L/H wing.
  - ❑11. Verify proper location of FU93 fillet and with fillet held firmly in place, Scribe fuselage fillet trim line as noted per print.
  - ❑12. Remove wing and trim FU93 fillet. NOTE: If FU29 doubler interferes with FU93 fillet flange, lightly sand upper edge of FU29 doubler to eliminate interference.
  - ❑13. Reinstall fillet and wing. Drill fillet attach holes from center of FU93 fillet, drilling progressively outward while holding fillet in place.
  - ❑14. Trim preliminary main gear door cutout as indicated in drawings.
  - ❑15. Fabricate and install FU139 filler.
  - ❑16. Fabricate FU36 doubler and FU141 rib.
  - ❑17. Locate and drill the two 3/4" dia. holes in FU136 fillet.
  - ❑18. Install FU136 and FU141 as noted.
  - ❑19. Repeat steps 1 through 18 for R/H fillet installation.
- i** NOTE: Prior to final installation of fillet, control system, seat belt structure, wing rack, brakes lines and landing gear must be installed.