

As a general rule, the stronger the material, the more susceptible it is to cracking when it is bent. Like glass, hard aluminum alloys are seriously weakened by scratches, nicks or sharp interior corners. These defects all cause stress concentrations which will result in failures at stresses well below the normal strength of the metal.

Rivets are the usual type of fasteners used in aircraft construction. In Table B, below, you will find shear and bearing strengths of the commonly used 2117 alloy aluminum rivets.

Pop rivets are finding increased use where it is difficult to get inside structure for bucking purposes. Rust-resistant, zinc-plated Monel Pop Rivets are the only type recommended for aircraft structural usage. Shear strengths are as follows:

Diameter	Strength in pounds	
	Shear	Tensile
7/32"	300	350
1/8"	440	565
5/16"	570	750
3/8"	940	1110

Steel aircraft bolts are about three times stronger than comparable-sized aluminum rivets and should be used where there is movement, disassembly or high tensile loading on the fastener. Table C gives bolt strength and Table D the ultimate allowable loads of 4130 steel tubing.

Next month we will describe how to build a set of HP-14 tail surfaces.

TABLE B—Allowable Single-shear Strength of Aluminum-alloy Rivets (Lb.)

Alloy	Diameter of rivet or pin, in.					
	3/32	1/8	5/32	3/16	1/4	5/16
2117-T4 ( $F_{su} = 30,000$ p.s.i.)	206	368	573	828	1472	2300
2024-T4 ( $F_{su} = 35,000$ p.s.i.)	241	429	670	966	1718	2684

Note: The values given are for universal head and press countersunk rivets. For machine countersunk rivets, it is recommended that these values be divided by 2.0.

Allowable Bearing\* Strength of 2024-T3 Alclad Aluminum-alloy Sheet (Lb.)  
( $F_{br} = 82,000$  p.s.i.)

Sheet thickness, in.	Diameter of rivet or pin, in.					
	3/32	1/8	5/32	3/16	1/4	5/16
0.018	138					
0.020	153					
0.025	192	256				
0.032	245	328	409			
0.036	276	369	461	553		
0.040	307	410	512	615		
0.045	345	461	576	691		
0.051	391	522	653	784	1045	
0.064	491	656	819	984	1312	1640
0.072	553	738	922	1107	1476	1845
0.081	622	830	1037	1245	1660	2075
0.091	699	932	1165	1399	1865	2331
0.102	783	1045	1306	1568	2091	2613
0.128	983	1312	1639	1968	2624	3280
5/32	1200	1601	2000	2401	3202	4002
3/16	1440	1921	2401	2882	3843	4804
1/4	1920	2562	3202	3843	5125	6406

\*For  $O/t$  values  $> 5.5$  the allowable bearing strengths should be substantiated by tests covering both yield and ultimate of the joint.

Note: The values given are for universal head and press countersunk rivets. For machine countersunk rivets it is recommended that these values be divided by 2.0.

UTU

ALL-PLASTIC STANDARD-CLASS SAILPLANE



UTU is built to withstand all weather conditions: Rain, sun and below-freezing temperatures. (Please see article in October SOARING.) Serial production has been started. Orders will be filled in the order they are received.

OY FIBERA AB

Fredrikinkatu 36B

Helsinki 10, Finland

TABLE D—4130 Steel Tubing, Allowable Ultimate Loads (From ANC-5)

Diam. in.	Wall Thickness in.	Tension lbs.	Bending in. lbs.	Torsion in. lbs.
3/8	.035	3740	385	370
	.049	5020	494	484
	.065	6940	705	679
1/2	.049	6940	955	920
	.058	8050	1080	1046
	.065	8490	1080	1061
5/8	.049	8870	1533	1473
	.058	10300	1773	1702
	.065	7860	1540	1522
3/4	.049	10800	2213	2150
	.058	12600	2618	2513
	.065	9240	2068	2038
1	.049	12700	2970	2913
	.058	14900	3542	3443
	.065	10600	2640	2594
1 1/8	.049	14600	3860	3805
	.058	17200	4610	4515
	.065	19100	5210	5062
1 1/4	.035	12000	3306	3240
	.049	16600	4810	4748
	.058	19400	5810	5709
1 1/2	.065	21700	6550	6418
	.035	13400	4015	3895
	.049	18500	5900	5821
1 3/8	.058	21700	7050	6945
	.065	24200	8040	7898
	.035	14700	4810	4618
1 1/2	.049	20400	7040	6922
	.058	24000	8450	8338
	.065	26800	9620	9508
1 1/2	.035	16100	5630	5343
	.049	22300	8250	8086
	.058	26300	10000	9850
	.065	29300	11380	11230

Compression strength of steel tubing is governed by column length. The following Tables will give this information: