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Installation Torque Tables for Noncritical Applications

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Abstract

The objective of this project is to define torque values for bolts and screws when loading is not a concern. Fasteners require a certain torque to fulfill its function and prevent failure. The NASA Glenn Research Center (GRC) did not have a set of fastener torque tables for noncritical applications without loads, usually referring to “hand-tight” or “wrench-tight torqueing”. The project is based on two formulas, torque and pullout load. Torque values are calculated giving way to preliminary data tables. Testing is done to various bolts and metal plates, torqueing them until the point of failure. Around 640 torque tables were developed for UNC, UNF, and M fasteners. Different lengths of thread engagement were analyzed for the five most common materials used at GRC.

Introduction

The following torque tables were developed with the purpose of having a proper mode of reference when tightening fasteners when loading is not a concern and critical measures are not necessary. Usually, the indications when tightening under these conditions are just “hand tight” or “wrench tight” or “snug”. However, these are not accurate designations since they have so many variants between person, location, etc. A defined reference chart for torqueing to a proper value is necessary to have consistency and prevent failures. The tables are presented first by parent material thickness, that is, the fastener’s thread engagement length, and then by fastener size. **The tables are not to be used for torqueing flight hardware or anywhere specific bolt tension (preload) is needed based on specific loads to be carried.**

Procedure

The basis of the tables are two formulas, pullout load and torque. The formula for the pullout load requires the shear strength of the parent material, either yield or ultimate. Determining shear yield strength of a material is not easy and the property is not found in common data sheets. As a result, the ultimate shear strength was used. Since the torque values are rather conservative, failure is not to be expected when using these charts. To calculate an accurate torque, an experimental value is needed called the torque coefficient or nut factor (K). For when experimental values for nut factors were not available, NASA has used values ranging from 0.15 to 0.2. After researching different sources, 0.2 seemed like a more sensible number for this situation. After obtaining preliminary torque values calculated from the formulas, a 65% of the pullout load was taken to obtain safer values for each fastener size and each parent material thickness. These torque values were then verified by testing samples of different bolt and parent material combinations and torqueing them until the threads strip out to certify that the assumptions make sense and that they are realistic values.

Definitions

- **Parent material**—The material the fastener is being threaded into.
- **Pullout load**—The amount of fastener tensile force required to strip the threads of the parent material.
- **Pitch diameter**—The diameter of an imaginary cylinder that cuts through the thread ridges and grooves at a position where the width of the ridges is equal to the width of the grooves.
- **Length of thread engagement**—The axial distance through which the fully formed threads of the bolt are in contact with the parent material.
- **Major diameter**—The largest material diameter that just touches the crest of an external thread.
- **Torque coefficient**—Torque coefficient between bolt and receptacle. It is a function of the materials' frictional characteristics, which are based on surface finish, coatings and so on. Comes from a combination of a geometric friction factor, a thread friction factor, and a bearing friction factor. A commonly used value is 0.2. The most reliable way to determine this value is by testing. However, since these tables are not for use for critical procedures, the common value was assumed.

Assumptions

- Full engagement of threads. Length of thread engagement is equal to thickness of plate and length of fastener.
- Bolt is fully threaded.
- Shear strength of Carbon Steel is equal to 0.6 of the tensile strength.
 - $F_s = 0.6F_t$
- Shear strength of both Aluminum and Stainless Steel is equal to 0.55 of the tensile strength.
 - $F_s = 0.55F_t$
- Fastener material is stronger than parent material.
- Fasteners made out of stainless steel with a yield strength of 180 ksi.
- Fasteners are screwed directly into parent material. No insert.
- 2A class fasteners.
- 65% of load is used to calculate assembly torque.
 - $SF = 1.538$
- Minimum of 3 threads for fastener.
- Machine screws.
- Torque coefficient (K) = 0.2

Shear Strengths

6061-T6 Aluminum = 27 ksi

304 Stainless Steel = 50 ksi

ASTM A36 Steel = 34.8 ksi

2024-T4/T351 Aluminum = 37.5 ksi

7075-T6/T651 Aluminum = 45.6 ksi

Formulas

Torque

$$T = KFd$$

where

T	torque
F	axial load
d	major bolt diameter
K	torque coefficient or “nut factor”

Pullout Load

$$P = \frac{\pi d_m F_s L}{3}$$

where

P	pullout load, lb
d_m	pitch diameter of threads, in.
F_s	material ultimate or yield shear stress, psi
L	length of thread engagement, in.

Comments

These torque tables are to be used when loading is not a concern on the fasteners.

The values used to define the maximum torques for each fastener size were taken from bolt preload tables from the Goddard Space Flight Center’s (GSFC) Mechanical Fastener Torque Guidelines.

The pullout load formula used to generate these tables accounts for a safety factor of 3. Therefore, the torque values in these tables are quite conservative.

The ultimate shear stress was used when calculating the pullout load.

The axial load required in the torque equation is taken as the calculated pullout load. These tables consider a fastener without any structural or vibrational loading. Therefore, the failure mode of concern is thread stripping.

Bolts have two common ways of failure when being tightened, snapping the head and stripping the threads. Fasteners are designed to break at the head first rather than stripping the threads because it is an easier way to see the breakage. Thread stripping often does not occur immediately. The minimum length suggested to avoid stripping the threads is 1.5 times the diameter of the fastener. After that point the failure torque value is constant for the fastener.

The assembly torque refers to 65% of the failure torque providing a safety factor of 1.538.

Testing Data

1st Test

8-32 Regular Steel Fasteners

Material	Length of Thread Engagement (in)	Experimental Torque Applied (in-lb)	Calculated Torque From Tables (in-lb)
304 Stainless Steel	7/16"	74.4	77.1
A36 Steel	3/8"	less than 60	53.7
6061-T6 Aluminum	1/2"	between 60-65	41.6

8-32 Stainless Steel Fasteners

Material	Length of Thread Engagement (in)	Experimental Torque Applied (in-lb)	Calculated Torque From Tables (in-lb)
304 Stainless Steel	7/16"	between 57-60	77.1
A36 Steel	3/8"	less than 50	53.7
6061-T6 Aluminum	1/2"	between 50-55	41.6

2nd Test

8-32 Regular Steel Fasteners

Material	Length of Thread Engagement (in)	Experimental Torque Applied (in-lb)	Calculated Torque From Tables (in-lb)
A36 Steel	1/4"	111.0	42.9
6061-T6 Aluminum	1/4"	98.0	33.3
6061-T6 Aluminum	1/4"	88.0	33.3

1/4-20 Regular Steel Fasteners

Material	Length of Thread Engagement (in)	Experimental Torque Applied (in-lb)	Calculated Torque From Tables (in-lb)
A36 Steel	1/4"	183.6	99.1
6061-T6 Aluminum	1/4"	146.4	76.9
6061-T6 Aluminum	1/4"	141.6	76.9

The first test was done using materials provided by Manufacturing. However, the second test was done using parts cut at home. The tap of the threaded holes was a little different. While the 1/4-20 bolts were drilled using the standard #7 size, the tap drill for the #8-32 bolts was #30, a smaller size than the standard #29 drill. A smaller tap means more shear area and the bolt can withstand a bigger load. These minor differences could give an explanation to the different values obtained in the second test.

The limited testing seems to indicate several things:

- 1) Actual failure point vs calculated is dependent on the specific fastener material which was not examined as part of the testing or table generation.
- 2) Actual failure point vs calculated is dependent on pilot hole size drilled before tapping. All calculations were done assuming standard thread area engagement per the pullout formulas used.
- 3) The larger the fastener, the more upside margin (before failure) there may be in the tables.

For all of the above reasons, a “range” of torques will not be specified here. More testing on a wider variety of fastener sizes and thread engagement plus more analysis on specific fastener material plus more analysis on drilled hole size effects would be needed to come up with any “ranges.” All testing done shows the “Assembly Torque” callouts are all below the failure points found.

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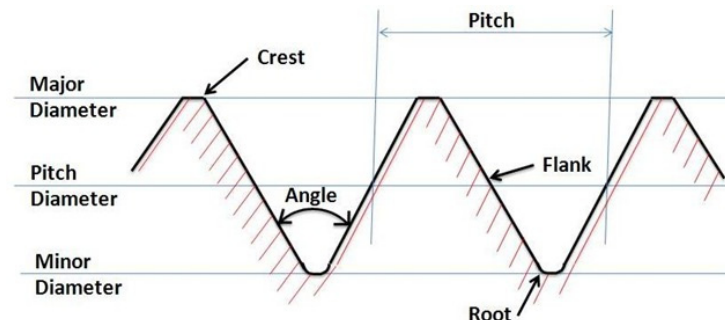
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Basic Thread Terms

English Units

(UNC & UNF)

Tables by Length of Thread Engagement

Aluminum 6061-T6

F_{su} = 27 ksi

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.0625 = 1/16$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
0-80 UNF	91.7	0.7	1.1
1-64 UNC	111.2	1.1	1.6
1-72 UNF	113.1	1.1	1.7
2-56 UNC	131.5	1.5	2.3
2-64 UNF	134.1	1.5	2.3
3-56 UNF	154.4	2.0	3.1

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.125 = 1/8$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
0-80 UNF	183.4	1.4	2.2
1-64 UNC	222.3	2.1	3.2
1-72 UNF	226.2	2.1	3.3
2-56 UNC	263.0	2.9	4.5
2-64 UNF	268.3	3.0	4.6
3-48 UNC	302.2	3.9	6.0
3-56 UNF	308.9	4.0	6.1
4-40 UNC	338.6	4.9	7.6
4-48 UNF	348.1	5.1	7.8
5-40 UNC	384.5	6.2	9.6
5-44 UNF	389.5	6.3	9.7
6-32 UNC	416.0	7.5	11.5
6-40 UNF	430.5	7.7	11.9
8-32 UNC	507.9	10.8	16.7
8-36 UNF	516.0	11.0	16.9
10-32 UNF	599.8	14.8	22.8
12-28 UNF	681.4	19.1	29.4
1/4-28 UNF	801.6	26.1	40.1

Aluminum 6061-T6 ($F_{su} = 27 \text{ ksi}$, $K = 0.20$)
Length of Thread Engagement (in) = $0.1875 = 3/16$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
0-80 UNF	275.1	2.1	3.3
1-64 UNC	333.5	3.2	4.9
1-72 UNF	339.3	3.2	5.0
2-56 UNC	394.4	4.4	6.8
2-64 UNF	402.4	4.5	6.9
3-48 UNC	453.3	5.8	9.0
3-56 UNF	463.3	6.0	9.2
4-40 UNC	507.9	7.4	11.4
4-48 UNF	522.2	7.6	11.7
5-40 UNC	576.8	9.4	14.4
5-44 UNF	584.2	9.5	14.6
6-32 UNC	624.0	11.2	17.2
6-40 UNF	645.7	11.6	17.8
8-32 UNC	761.8	16.2	25.0
8-36 UNF	774.0	16.5	25.4
10-24 UNC	863.6	21.3	32.8
10-32 UNF	899.7	22.2	34.2
12-24 UNC	1001.4	28.1	43.3
12-28 UNF	1022.1	28.7	44.2
1/4-20 UNC	1153.1	37.5	57.7
1/4-28 UNF	1202.4	39.1	60.1
5/16-18 UNC	1465.3	59.5	91.6
5/16-24 UNF	1513.0	61.5	94.6
3/8-24 UNF	1844.4	89.9	138.3
7/16-20 UNF	2147.1	122.1	187.9
1/2-20 UNF	2478.4	161.1	247.8
9/16-18 UNF	2790.7	204.1	314.0
5/8-18 UNF	3122.0	253.7	390.3

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.25 = 1/4$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
0-80 UNF	275.1	2.1	3.3
1-64 UNC	333.5	3.2	4.9
1-72 UNF	339.3	3.2	5.0
2-56 UNC	525.9	5.9	9.0
2-64 UNF	536.5	6.0	9.2
3-48 UNC	604.4	7.8	12.0
3-56 UNF	617.8	8.0	12.2
4-40 UNC	677.2	9.9	15.2
4-48 UNF	696.3	10.1	15.6
5-40 UNC	769.1	12.5	19.2
5-44 UNF	779.0	12.7	19.5
6-32 UNC	832.0	14.9	23.0
6-40 UNF	861.0	15.4	23.8
8-32 UNC	1015.8	21.7	33.3
8-36 UNF	1032.0	22.0	33.9
10-24 UNC	1151.5	28.4	43.8
10-32 UNF	1199.5	29.6	45.6
12-24 UNC	1335.3	37.5	57.7
12-28 UNF	1362.8	38.3	58.9
1/4-20 UNC	1537.4	50.0	76.9
1/4-28 UNF	1603.2	52.1	80.2
5/16-18 UNC	1953.8	79.4	122.1
5/16-24 UNF	2017.4	82.0	126.1
3/8-16 UNC	2363.7	115.2	177.3
3/8-24 UNF	2459.2	119.9	184.4
7/16-14 UNC	2764.5	157.2	241.9
7/16-20 UNF	2862.8	162.8	250.5
1/2-13 UNC	3180.9	206.8	318.1
1/2-20 UNF	3304.6	214.8	330.5
9/16-18 UNF	3720.9	272.1	418.6
5/8-18 UNF	4162.7	338.2	520.3
3/4-16 UNF	5014.5	488.9	752.2
7/8-14 UNF	5857.0	666.2	1025.0

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.3125 = 5/16$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
1-64 UNC	333.5	3.2	4.9
1-72 UNF	339.3	3.2	5.0
2-56 UNC	525.9	5.9	9.0
2-64 UNF	536.5	6.0	9.2
3-48 UNC	604.4	7.8	12.0
3-56 UNF	617.8	8.0	12.2
4-40 UNC	677.2	9.9	15.2
4-48 UNF	696.3	10.1	15.6
5-40 UNC	961.3	15.6	24.0
5-44 UNF	973.7	15.8	24.3
6-32 UNC	1040.0	18.7	28.7
6-40 UNF	1076.2	19.3	29.7
8-32 UNC	1269.7	27.1	41.6
8-36 UNF	1290.0	27.5	42.3
10-24 UNC	1439.3	35.6	54.7
10-32 UNF	1499.4	37.0	57.0
12-24 UNC	1669.1	46.9	72.1
12-28 UNF	1703.5	47.8	73.6
1/4-20 UNC	1921.8	62.5	96.1
1/4-28 UNF	2003.9	65.1	100.2
5/16-18 UNC	2442.2	99.2	152.6
5/16-24 UNF	2521.7	102.4	157.6
3/8-16 UNC	2954.7	144.0	221.6
3/8-24 UNF	3074.0	149.9	230.5
7/16-14 UNC	3455.7	196.5	302.4
7/16-20 UNF	3578.5	203.5	313.1
1/2-13 UNC	3976.1	258.4	397.6
1/2-20 UNF	4130.7	268.5	413.1
9/16-12 UNC	4492.1	328.5	505.4
9/16-18 UNF	4651.1	340.1	523.3
5/8-11 UNC	5001.0	406.3	625.1
5/8-18 UNF	5203.4	422.8	650.4
3/4-10 UNC	6052.5	590.1	907.9
3/4-16 UNF	6268.1	611.1	940.2
7/8-14 UNF	7321.3	832.8	1281.2
1-12 UNF	8357.7	1086.5	1671.5
1 1/8-12 UNF	9462.2	1383.8	2129.0
1 1/4-12 UNF	10566.6	1717.1	2641.7
1 3/8-12 UNF	11671.1	2086.2	3209.6
1 1/2-12 UNF	12775.6	2491.2	3832.7

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.375 = 3/8$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
1-64 UNC	333.5	3.2	4.9
1-72 UNF	339.3	3.2	5.0
2-56 UNC	525.9	5.9	9.0
2-64 UNF	536.5	6.0	9.2
3-48 UNC	604.4	7.8	12.0
3-56 UNF	617.8	8.0	12.2
4-40 UNC	677.2	9.9	15.2
4-48 UNF	696.3	10.1	15.6
5-40 UNC	961.3	15.6	24.0
5-44 UNF	973.7	15.8	24.3
6-32 UNC	1040.0	18.7	28.7
6-40 UNF	1076.2	19.3	29.7
8-32 UNC	1269.7	27.1	41.6
8-36 UNF	1290.0	27.5	42.3
10-24 UNC	1727.2	42.7	65.6
10-32 UNF	1799.3	44.4	68.4
12-24 UNC	2002.9	56.2	86.5
12-28 UNF	2044.2	57.4	88.3
1/4-20 UNC	2306.1	74.9	115.3
1/4-28 UNF	2404.7	78.2	120.2
5/16-18 UNC	2930.6	119.1	183.2
5/16-24 UNF	3026.1	122.9	189.1
3/8-16 UNC	3545.6	172.8	265.9
3/8-24 UNF	3688.7	179.8	276.7
7/16-14 UNC	4146.8	235.8	362.8
7/16-20 UNF	4294.2	244.2	375.7
1/2-13 UNC	4771.3	310.1	477.1
1/2-20 UNF	4956.8	322.2	495.7
9/16-12 UNC	5390.5	394.2	606.4
9/16-18 UNF	5581.4	408.1	627.9
5/8-11 UNC	6001.2	487.6	750.2
5/8-18 UNF	6244.0	507.3	780.5
3/4-10 UNC	7263.0	708.1	1089.4
3/4-16 UNF	7521.7	733.4	1128.3
7/8-9 UNC	8512.0	968.2	1489.6
7/8-14 UNF	8785.5	999.4	1537.5
1-12 UNF	10029.3	1303.8	2005.9
1 1/8-12 UNF	11354.6	1660.6	2554.8
1 1/4-12 UNF	12680.0	2060.5	3170.0
1 3/8-12 UNF	14005.3	2503.5	3851.5
1 1/2-12 UNF	15330.7	2989.5	4599.2

Aluminum 6061-T6 ($F_{su} = 27 \text{ ksi}$, $K = 0.20$)
Length of Thread Engagement (in) = $0.4375 = 7/16$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
2-56 UNC	525.9	5.9	9.0
2-64 UNF	536.5	6.0	9.2
3-48 UNC	604.4	7.8	12.0
3-56 UNF	617.8	8.0	12.2
4-40 UNC	677.2	9.9	15.2
4-48 UNF	696.3	10.1	15.6
5-40 UNC	961.3	15.6	24.0
5-44 UNF	973.7	15.8	24.3
6-32 UNC	1040.0	18.7	28.7
6-40 UNF	1076.2	19.3	29.7
8-32 UNC	1269.7	27.1	41.6
8-36 UNF	1290.0	27.5	42.3
10-24 UNC	1727.2	42.7	65.6
10-32 UNF	1799.3	44.4	68.4
12-24 UNC	2336.7	65.6	100.9
12-28 UNF	2384.9	67.0	103.0
1/4-20 UNC	2690.5	87.4	134.5
1/4-28 UNF	2805.5	91.2	140.3
5/16-18 UNC	3419.1	138.9	213.7
5/16-24 UNF	3530.4	143.4	220.7
3/8-16 UNC	4136.5	201.7	310.2
3/8-24 UNF	4303.5	209.8	322.8
7/16-14 UNC	4837.9	275.2	423.3
7/16-20 UNF	5009.9	284.9	438.4
1/2-13 UNC	5566.5	361.8	556.7
1/2-20 UNF	5783.0	375.9	578.3
9/16-12 UNC	6288.9	459.9	707.5
9/16-18 UNF	6511.6	476.2	732.6
5/8-11 UNC	7001.4	568.9	875.2
5/8-18 UNF	7284.7	591.9	910.6
3/4-10 UNC	8473.5	826.2	1271.0
3/4-16 UNF	8775.3	855.6	1316.3
7/8-9 UNC	9930.7	1129.6	1737.9
7/8-14 UNF	10249.8	1165.9	1793.7
1-8 UNC	11365.6	1477.5	2273.1
1-12 UNF	11700.8	1521.1	2340.2
1 1/8-7 UNC	12768.3	1867.4	2872.9
1 1/8-12 UNF	13247.1	1937.4	2980.6
1 1/4-7 UNC	14314.6	2326.1	3578.6
1 1/4-12 UNF	14793.3	2403.9	3698.3
1 3/8-6 UNC	15669.1	2800.9	4309.0
1 3/8-12 UNF	16339.6	2920.7	4493.4
1 1/2-12 UNF	17885.8	3487.7	5365.7

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.5 = 1/2$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
2-56 UNC	525.9	5.9	9.0
2-64 UNF	536.5	6.0	9.2
3-48 UNC	604.4	7.8	12.0
3-56 UNF	617.8	8.0	12.2
4-40 UNC	677.2	9.9	15.2
4-48 UNF	696.3	10.1	15.6
5-40 UNC	961.3	15.6	24.0
5-44 UNF	973.7	15.8	24.3
6-32 UNC	1040.0	18.7	28.7
6-40 UNF	1076.2	19.3	29.7
8-32 UNC	1269.7	27.1	41.6
8-36 UNF	1290.0	27.5	42.3
10-24 UNC	1727.2	42.7	65.6
10-32 UNF	1799.3	44.4	68.4
12-24 UNC	2670.5	75.0	115.4
12-28 UNF	2725.6	76.5	117.7
1/4-20 UNC	3074.8	99.9	153.7
1/4-28 UNF	3206.3	104.2	160.3
5/16-18 UNC	3907.5	158.7	244.2
5/16-24 UNF	4034.7	163.9	252.2
3/8-16 UNC	4727.5	230.5	354.6
3/8-24 UNF	4918.3	239.8	368.9
7/16-14 UNC	5529.0	314.5	483.8
7/16-20 UNF	5725.6	325.6	501.0
1/2-13 UNC	6361.7	413.5	636.2
1/2-20 UNF	6609.1	429.6	660.9
9/16-12 UNC	7187.3	525.6	808.6
9/16-18 UNF	7441.8	544.2	837.2
5/8-11 UNC	8001.6	650.1	1000.2
5/8-18 UNF	8325.4	676.4	1040.7
3/4-10 UNC	9684.0	944.2	1452.6
3/4-16 UNF	10028.9	977.8	1504.3
7/8-9 UNC	11349.3	1291.0	1986.1
7/8-14 UNF	11714.1	1332.5	2050.0
1-8 UNC	12989.2	1688.6	2597.8
1-12 UNF	13372.3	1738.4	2674.5
1 1/8-7 UNC	14592.4	2134.1	3283.3
1 1/8-12 UNF	15139.5	2214.2	3406.4
1 1/4-7 UNC	16359.5	2658.4	4089.9
1 1/4-12 UNF	16906.6	2747.3	4226.7
1 3/8-12 UNF	18673.8	3337.9	5135.3
1 1/2-12 UNF	20440.9	3986.0	6132.3

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.5625 = 9/16$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
3-48 UNC	604.4	7.8	12.0
3-56 UNF	617.8	8.0	12.2
4-40 UNC	677.2	9.9	15.2
4-48 UNF	696.3	10.1	15.6
5-40 UNC	961.3	15.6	24.0
5-44 UNF	973.7	15.8	24.3
6-32 UNC	1040.0	18.7	28.7
6-40 UNF	1076.2	19.3	29.7
8-32 UNC	1269.7	27.1	41.6
8-36 UNF	1290.0	27.5	42.3
10-24 UNC	1727.2	42.7	65.6
10-32 UNF	1799.3	44.4	68.4
12-24 UNC	3004.3	84.4	129.8
12-28 UNF	3066.4	86.1	132.5
1/4-20 UNC	3074.8	99.9	153.7
1/4-28 UNF	3206.3	104.2	160.3
5/16-18 UNC	3907.5	158.7	244.2
5/16-24 UNF	4034.7	163.9	252.2
3/8-16 UNC	4727.5	230.5	354.6
3/8-24 UNF	4918.3	239.8	368.9
7/16-14 UNC	5529.0	314.5	483.8
7/16-20 UNF	5725.6	325.6	501.0
1/2-13 UNC	6361.7	413.5	636.2
1/2-20 UNF	6609.1	429.6	660.9
9/16-12 UNC	8085.8	591.3	909.6
9/16-18 UNF	8372.0	612.2	941.9
5/8-11 UNC	9001.8	731.4	1125.2
5/8-18 UNF	9366.0	761.0	1170.8
3/4-10 UNC	10894.5	1062.2	1634.2
3/4-16 UNF	11282.5	1100.0	1692.4
7/8-9 UNC	12768.0	1452.4	2234.4
7/8-14 UNF	13178.3	1499.0	2306.2
1-8 UNC	14612.9	1899.7	2922.6
1-12 UNF	15043.9	1955.7	3008.8
1 1/8-7 UNC	16416.4	2400.9	3693.7
1 1/8-12 UNF	17031.9	2490.9	3832.2
1 1/4-7 UNC	18404.5	2990.7	4601.1
1 1/4-12 UNF	19020.0	3090.7	4755.0
1 3/8-6 UNC	20146.0	3601.1	5540.1
1 3/8-12 UNF	21008.0	3755.2	5777.2
1 1/2-6 UNC	22134.0	4316.1	6640.2
1 1/2-12 UNF	22996.0	4484.2	6898.8

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.625 = 5/8$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
3-48 UNC	604.4	7.8	12.0
3-56 UNF	617.8	8.0	12.2
4-40 UNC	677.2	9.9	15.2
4-48 UNF	696.3	10.1	15.6
5-40 UNC	961.3	15.6	24.0
5-44 UNF	973.7	15.8	24.3
6-32 UNC	1040.0	18.7	28.7
6-40 UNF	1076.2	19.3	29.7
8-32 UNC	1269.7	27.1	41.6
8-36 UNF	1290.0	27.5	42.3
10-24 UNC	1727.2	42.7	65.6
10-32 UNF	1799.3	44.4	68.4
12-24 UNC	3338.1	93.7	144.2
12-28 UNF	3407.1	95.7	147.2
1/4-20 UNC	3074.8	99.9	153.7
1/4-28 UNF	3206.3	104.2	160.3
5/16-18 UNC	3907.5	158.7	244.2
5/16-24 UNF	4034.7	163.9	252.2
3/8-16 UNC	4727.5	230.5	354.6
3/8-24 UNF	4918.3	239.8	368.9
7/16-14 UNC	5529.0	314.5	483.8
7/16-20 UNF	5725.6	325.6	501.0
1/2-13 UNC	6361.7	413.5	636.2
1/2-20 UNF	6609.1	429.6	660.9
9/16-12 UNC	8984.2	657.0	1010.7
9/16-18 UNF	9302.3	680.2	1046.5
5/8-11 UNC	10002.0	812.7	1250.3
5/8-18 UNF	10406.7	845.5	1300.8
3/4-10 UNC	12104.9	1180.2	1815.7
3/4-16 UNF	12536.1	1222.3	1880.4
7/8-9 UNC	14186.6	1613.7	2482.7
7/8-14 UNF	14642.6	1665.6	2562.4
1-8 UNC	16236.5	2110.7	3247.3
1-12 UNF	16715.4	2173.0	3343.1
1 1/8-7 UNC	18240.5	2667.7	4104.1
1 1/8-12 UNF	18924.4	2767.7	4258.0
1 1/4-7 UNC	20449.4	3323.0	5112.4
1 1/4-12 UNF	21133.3	3434.2	5283.3
1 3/8-6 UNC	22384.4	4001.2	6155.7
1 3/8-12 UNF	23342.2	4172.4	6419.1
1 1/2-6 UNC	24593.4	4795.7	7378.0
1 1/2-12 UNF	25551.2	4982.5	7665.3
1 3/4-5 UNC	28629.5	6513.2	10020.3

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Length of Thread Engagement (in) = $0.75 = 3/4$

[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
4-48 UNF	696.3	10.1	15.6
5-40 UNC	961.3	15.6	24.0
5-44 UNF	973.7	15.8	24.3
6-32 UNC	1040.0	18.7	28.7
6-40 UNF	1076.2	19.3	29.7
8-32 UNC	1269.7	27.1	41.6
8-36 UNF	1290.0	27.5	42.3
10-24 UNC	1727.2	42.7	65.6
10-32 UNF	1799.3	44.4	68.4
12-24 UNC	4005.8	112.5	173.0
12-28 UNF	4088.5	114.8	176.6
1/4-20 UNC	3074.8	99.9	153.7
1/4-28 UNF	3206.3	104.2	160.3
5/16-18 UNC	3907.5	158.7	244.2
5/16-24 UNF	4034.7	163.9	252.2
3/8-16 UNC	4727.5	230.5	354.6
3/8-24 UNF	4918.3	239.8	368.9
7/16-14 UNC	5529.0	314.5	483.8
7/16-20 UNF	5725.6	325.6	501.0
1/2-13 UNC	6361.7	413.5	636.2
1/2-20 UNF	6609.1	429.6	660.9
9/16-12 UNC	10781.0	788.4	1212.9
9/16-18 UNF	11162.7	816.3	1255.8
5/8-11 UNC	12002.5	975.2	1500.3
5/8-18 UNF	12488.1	1014.7	1561.0
3/4-10 UNC	14525.9	1416.3	2178.9
3/4-16 UNF	15043.4	1466.7	2256.5
7/8-9 UNC	17024.0	1936.5	2979.2
7/8-14 UNF	17571.1	1998.7	3074.9
1-8 UNC	19483.8	2532.9	3896.8
1-12 UNF	20058.5	2607.6	4011.7
1 1/8-7 UNC	21888.6	3201.2	4924.9
1 1/8-12 UNF	22709.2	3321.2	5109.6
1 1/4-7 UNC	24539.3	3987.6	6134.8
1 1/4-12 UNF	25360.0	4121.0	6340.0
1 3/8-6 UNC	26861.3	4801.5	7386.9
1 3/8-12 UNF	28010.7	5006.9	7702.9
1 1/2-6 UNC	29512.0	5754.8	8853.6
1 1/2-12 UNF	30661.4	5979.0	9198.4
1 3/4-5 UNC	34355.4	7815.9	12024.4
2-4 1/2 UNC	39351.5	10231.4	15740.6

Aluminum 6061-T6 ($F_{su} = 27 \text{ ksi}$, $K = 0.20$)
Length of Thread Engagement (in) = $0.875 = 7/8$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
6-40 UNF	1076.2	19.3	29.7
8-32 UNC	1269.7	27.1	41.6
8-36 UNF	1290.0	27.5	42.3
10-24 UNC	1727.2	42.7	65.6
10-32 UNF	1799.3	44.4	68.4
12-24 UNC	4673.4	131.2	201.9
12-28 UNF	4769.9	133.9	206.1
1/4-20 UNC	3074.8	99.9	153.7
1/4-28 UNF	3206.3	104.2	160.3
5/16-18 UNC	3907.5	158.7	244.2
5/16-24 UNF	4034.7	163.9	252.2
3/8-16 UNC	4727.5	230.5	354.6
3/8-24 UNF	4918.3	239.8	368.9
7/16-14 UNC	5529.0	314.5	483.8
7/16-20 UNF	5725.6	325.6	501.0
1/2-13 UNC	6361.7	413.5	636.2
1/2-20 UNF	6609.1	429.6	660.9
9/16-12 UNC	12577.8	919.8	1415.0
9/16-18 UNF	13023.2	952.3	1465.1
5/8-11 UNC	14002.9	1137.7	1750.4
5/8-18 UNF	14569.4	1183.8	1821.2
3/4-10 UNC	16946.9	1652.3	2542.0
3/4-16 UNF	17550.6	1711.2	2632.6
7/8-9 UNC	19861.3	2259.2	3475.7
7/8-14 UNF	20499.6	2331.8	3587.4
1-8 UNC	22731.2	2955.0	4546.2
1-12 UNF	23401.6	3042.2	4680.3
1 1/8-7 UNC	25536.7	3734.7	5745.8
1 1/8-12 UNF	26494.1	3874.8	5961.2
1 1/4-7 UNC	28629.2	4652.2	7157.3
1 1/4-12 UNF	29586.6	4807.8	7396.7
1 3/8-6 UNC	31338.2	5601.7	8618.0
1 3/8-12 UNF	32679.1	5841.4	8986.8
1 1/2-6 UNC	34430.7	6714.0	10329.2
1 1/2-12 UNF	35771.6	6975.5	10731.5
1 3/4-5 UNC	40081.3	9118.5	14028.5
2-4 1/2 UNC	45910.1	11936.6	18364.0

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Length of Thread Engagement (in) = 1.00

[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
8-32 UNC	1269.7	27.1	41.6
8-36 UNF	1290.0	27.5	42.3
10-24 UNC	1727.2	42.7	65.6
10-32 UNF	1799.3	44.4	68.4
12-24 UNC	5341.0	150.0	230.7
12-28 UNF	5451.3	153.1	235.5
1/4-20 UNC	3074.8	99.9	153.7
1/4-28 UNF	3206.3	104.2	160.3
5/16-18 UNC	3907.5	158.7	244.2
5/16-24 UNF	4034.7	163.9	252.2
3/8-16 UNC	4727.5	230.5	354.6
3/8-24 UNF	4918.3	239.8	368.9
7/16-14 UNC	5529.0	314.5	483.8
7/16-20 UNF	5725.6	325.6	501.0
1/2-13 UNC	6361.7	413.5	636.2
1/2-20 UNF	6609.1	429.6	660.9
9/16-12 UNC	14374.7	1051.1	1617.2
9/16-18 UNF	14883.6	1088.4	1674.4
5/8-11 UNC	16003.3	1300.3	2000.4
5/8-18 UNF	16650.8	1352.9	2081.3
3/4-10 UNC	19367.9	1888.4	2905.2
3/4-16 UNF	20057.8	1955.6	3008.7
7/8-9 UNC	22698.6	2582.0	3972.3
7/8-14 UNF	23428.1	2664.9	4099.9
1-8 UNC	25978.5	3377.2	5195.7
1-12 UNF	26744.7	3476.8	5348.9
1 1/8-7 UNC	29184.8	4268.3	6566.6
1 1/8-12 UNF	30279.0	4428.3	6812.8
1 1/4-7 UNC	32719.1	5316.8	8179.8
1 1/4-12 UNF	33813.3	5494.7	8453.3
1 3/8-6 UNC	35815.1	6401.9	9849.2
1 3/8-12 UNF	37347.6	6675.9	10270.6
1 1/2-6 UNC	39349.4	7673.1	11804.8
1 1/2-12 UNF	40881.9	7972.0	12264.6
1 3/4-5 UNC	45807.2	10421.1	16032.5
2-4 1/2 UNC	52468.7	13641.9	20987.5

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $1.125 = 1 \frac{1}{8}$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
8-36 UNF	1290.0	27.5	42.3
10-24 UNC	1727.2	42.7	65.6
10-32 UNF	1799.3	44.4	68.4
12-24 UNC	6008.6	168.7	259.6
12-28 UNF	6132.7	172.2	264.9
1/4-20 UNC	3074.8	99.9	153.7
1/4-28 UNF	3206.3	104.2	160.3
5/16-18 UNC	3907.5	158.7	244.2
5/16-24 UNF	4034.7	163.9	252.2
3/8-16 UNC	4727.5	230.5	354.6
3/8-24 UNF	4918.3	239.8	368.9
7/16-14 UNC	5529.0	314.5	483.8
7/16-20 UNF	5725.6	325.6	501.0
1/2-13 UNC	6361.7	413.5	636.2
1/2-20 UNF	6609.1	429.6	660.9
9/16-12 UNC	14374.7	1051.1	1617.2
9/16-18 UNF	14883.6	1088.4	1674.4
5/8-11 UNC	18003.7	1462.8	2250.5
5/8-18 UNF	18732.1	1522.0	2341.5
3/4-10 UNC	21788.9	2124.4	3268.3
3/4-16 UNF	22565.0	2200.1	3384.8
7/8-9 UNC	25536.0	2904.7	4468.8
7/8-14 UNF	26356.6	2998.1	4612.4
1-8 UNC	29225.8	3799.3	5845.2
1-12 UNF	30087.8	3911.4	6017.6
1 1/8-7 UNC	32832.9	4801.8	7387.4
1 1/8-12 UNF	34063.9	4981.8	7664.4
1 1/4-7 UNC	36808.9	5981.5	9202.2
1 1/4-12 UNF	38039.9	6181.5	9510.0
1 3/8-6 UNC	40292.0	7202.2	11080.3
1 3/8-12 UNF	42016.0	7510.4	11554.4
1 1/2-6 UNC	44268.1	8632.3	13280.4
1 1/2-12 UNF	45992.1	8968.5	13797.6
1 3/4-5 UNC	51533.2	11723.8	18036.6
2-4 1/2 UNC	59027.3	15347.1	23610.9

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $1.25 = 1 \frac{1}{4}$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
10-24 UNC	1727.2	42.7	65.6
10-32 UNF	1799.3	44.4	68.4
12-24 UNC	6676.3	187.5	288.4
12-28 UNF	6814.1	191.3	294.4
1/4-20 UNC	3074.8	99.9	153.7
1/4-28 UNF	3206.3	104.2	160.3
5/16-18 UNC	3907.5	158.7	244.2
5/16-24 UNF	4034.7	163.9	252.2
3/8-16 UNC	4727.5	230.5	354.6
3/8-24 UNF	4918.3	239.8	368.9
7/16-14 UNC	5529.0	314.5	483.8
7/16-20 UNF	5725.6	325.6	501.0
1/2-13 UNC	6361.7	413.5	636.2
1/2-20 UNF	6609.1	429.6	660.9
9/16-12 UNC	14374.7	1051.1	1617.2
9/16-18 UNF	14883.6	1088.4	1674.4
5/8-11 UNC	20004.1	1625.3	2500.5
5/8-18 UNF	20813.4	1691.1	2601.7
3/4-10 UNC	24209.9	2360.5	3631.5
3/4-16 UNF	25072.3	2444.5	3760.8
7/8-9 UNC	28373.3	3227.5	4965.3
7/8-14 UNF	29285.1	3331.2	5124.9
1-8 UNC	32473.1	4221.5	6494.6
1-12 UNF	33430.9	4346.0	6686.2
1 1/8-7 UNC	36481.0	5335.3	8208.2
1 1/8-12 UNF	37848.7	5535.4	8516.0
1 1/4-7 UNC	40898.8	6646.1	10224.7
1 1/4-12 UNF	42266.6	6868.3	10566.6
1 3/8-6 UNC	44768.9	8002.4	12311.4
1 3/8-12 UNF	46684.5	8344.8	12838.2
1 1/2-6 UNC	49186.7	9591.4	14756.0
1 1/2-12 UNF	51102.3	9965.0	15330.7
1 3/4-5 UNC	57259.1	13026.4	20040.7
2-4 1/2 UNC	65585.9	17052.3	26234.3

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $1.375 = 1 \frac{3}{8}$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
12-24 UNC	7343.9	206.2	317.3
12-28 UNF	7495.5	210.5	323.8
1/4-20 UNC	3074.8	99.9	153.7
1/4-28 UNF	3206.3	104.2	160.3
5/16-18 UNC	3907.5	158.7	244.2
5/16-24 UNF	4034.7	163.9	252.2
3/8-16 UNC	4727.5	230.5	354.6
3/8-24 UNF	4918.3	239.8	368.9
7/16-14 UNC	5529.0	314.5	483.8
7/16-20 UNF	5725.6	325.6	501.0
1/2-13 UNC	6361.7	413.5	636.2
1/2-20 UNF	6609.1	429.6	660.9
9/16-12 UNC	14374.7	1051.1	1617.2
9/16-18 UNF	14883.6	1088.4	1674.4
5/8-11 UNC	20004.1	1625.3	2500.5
5/8-18 UNF	20813.4	1691.1	2601.7
3/4-10 UNC	26630.9	2596.5	3994.6
3/4-16 UNF	27579.5	2689.0	4136.9
7/8-9 UNC	31210.6	3550.2	5461.9
7/8-14 UNF	32213.7	3664.3	5637.4
1-8 UNC	35720.4	4643.6	7144.1
1-12 UNF	36774.0	4780.6	7354.8
1 1/8-7 UNC	40129.1	5868.9	9029.0
1 1/8-12 UNF	41633.6	6088.9	9367.6
1 1/4-7 UNC	44988.7	7310.7	11247.2
1 1/4-12 UNF	46493.3	7555.2	11623.3
1 3/8-6 UNC	49245.8	8802.7	13542.6
1 3/8-12 UNF	51352.9	9179.3	14122.0
1 1/2-6 UNC	54105.4	10550.6	16231.6
1 1/2-12 UNF	56212.6	10961.4	16863.8
1 3/4-5 UNC	62985.0	14329.1	22044.7
2-4 1/2 UNC	72144.4	18757.6	28857.8

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 1.5 = 1 1/2
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
12-28 UNF	8176.9	229.6	353.2
1/4-20 UNC	3074.8	99.9	153.7
1/4-28 UNF	3206.3	104.2	160.3
5/16-18 UNC	3907.5	158.7	244.2
5/16-24 UNF	4034.7	163.9	252.2
3/8-16 UNC	4727.5	230.5	354.6
3/8-24 UNF	4918.3	239.8	368.9
7/16-14 UNC	5529.0	314.5	483.8
7/16-20 UNF	5725.6	325.6	501.0
1/2-13 UNC	6361.7	413.5	636.2
1/2-20 UNF	6609.1	429.6	660.9
9/16-12 UNC	14374.7	1051.1	1617.2
9/16-18 UNF	14883.6	1088.4	1674.4
5/8-11 UNC	20004.1	1625.3	2500.5
5/8-18 UNF	20813.4	1691.1	2601.7
3/4-10 UNC	26630.9	2596.5	3994.6
3/4-16 UNF	27579.5	2689.0	4136.9
7/8-9 UNC	34048.0	3873.0	5958.4
7/8-14 UNF	35142.2	3997.4	6149.9
1-8 UNC	38967.7	5065.8	7793.5
1-12 UNF	40117.0	5215.2	8023.4
1 1/8-7 UNC	43777.2	6402.4	9849.9
1 1/8-12 UNF	45418.5	6642.5	10219.2
1 1/4-7 UNC	49078.6	7975.3	12269.6
1 1/4-12 UNF	50719.9	8242.0	12680.0
1 3/8-6 UNC	53722.6	9602.9	14773.7
1 3/8-12 UNF	56021.4	10013.8	15405.9
1 1/2-6 UNC	59024.1	11509.7	17707.2
1 1/2-12 UNF	61322.8	11957.9	18396.8
1 3/4-5 UNC	68710.9	15631.7	24048.8
2-4 1/2 UNC	78703.0	20462.8	31481.2

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $1.75 = 1 \frac{3}{4}$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
1/4-28 UNF	3206.3	104.2	160.3
5/16-18 UNC	3907.5	158.7	244.2
5/16-24 UNF	4034.7	163.9	252.2
3/8-16 UNC	4727.5	230.5	354.6
3/8-24 UNF	4918.3	239.8	368.9
7/16-14 UNC	5529.0	314.5	483.8
7/16-20 UNF	5725.6	325.6	501.0
1/2-13 UNC	6361.7	413.5	636.2
1/2-20 UNF	6609.1	429.6	660.9
9/16-12 UNC	14374.7	1051.1	1617.2
9/16-18 UNF	14883.6	1088.4	1674.4
5/8-11 UNC	20004.1	1625.3	2500.5
5/8-18 UNF	20813.4	1691.1	2601.7
3/4-10 UNC	26630.9	2596.5	3994.6
3/4-16 UNF	27579.5	2689.0	4136.9
7/8-9 UNC	39722.6	4518.4	6951.5
7/8-14 UNF	40999.2	4663.7	7174.9
1-8 UNC	45462.3	5910.1	9092.5
1-12 UNF	46803.2	6084.4	9360.6
1 1/8-7 UNC	51073.3	7469.5	11491.5
1 1/8-12 UNF	52988.2	7749.5	11922.4
1 1/4-7 UNC	57258.4	9304.5	14314.6
1 1/4-12 UNF	59173.2	9615.7	14793.3
1 3/8-6 UNC	62676.4	11203.4	17236.0
1 3/8-12 UNF	65358.2	11682.8	17973.5
1 1/2-6 UNC	68861.4	13428.0	20658.4
1 1/2-12 UNF	71543.3	13950.9	21463.0
1 3/4-5 UNC	80162.7	18237.0	28056.9
2-4 1/2 UNC	91820.2	23873.3	36728.1

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 2.00
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
5/16-18 UNC	3907.5	158.7	244.2
5/16-24 UNF	4034.7	163.9	252.2
3/8-16 UNC	4727.5	230.5	354.6
3/8-24 UNF	4918.3	239.8	368.9
7/16-14 UNC	5529.0	314.5	483.8
7/16-20 UNF	5725.6	325.6	501.0
1/2-13 UNC	6361.7	413.5	636.2
1/2-20 UNF	6609.1	429.6	660.9
9/16-12 UNC	14374.7	1051.1	1617.2
9/16-18 UNF	14883.6	1088.4	1674.4
5/8-11 UNC	20004.1	1625.3	2500.5
5/8-18 UNF	20813.4	1691.1	2601.7
3/4-10 UNC	26630.9	2596.5	3994.6
3/4-16 UNF	27579.5	2689.0	4136.9
7/8-9 UNC	39722.6	4518.4	6951.5
7/8-14 UNF	40999.2	4663.7	7174.9
1-8 UNC	51956.9	6754.4	10391.4
1-12 UNF	53489.4	6953.6	10697.9
1 1/8-7 UNC	58369.5	8536.5	13133.1
1 1/8-12 UNF	60558.0	8856.6	13625.5
1 1/4-7 UNC	65438.1	10633.7	16359.5
1 1/4-12 UNF	67626.6	10989.3	16906.6
1 3/8-6 UNC	71630.2	12803.9	19698.3
1 3/8-12 UNF	74695.1	13351.8	20541.2
1 1/2-6 UNC	78698.8	15346.3	23609.6
1 1/2-12 UNF	81763.7	15943.9	24529.1
1 3/4-5 UNC	91614.5	20842.3	32065.1
2-4 1/2 UNC	104937.4	27283.7	41974.9

AISI 304 Stainless Steel

$$\mathbf{F_{su} = 50 \text{ ksi}}$$

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 0.0625 = 1/16
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
0-80 UNF	169.8	1.3	2.0
1-64 UNC	205.8	2.0	3.0
1-72 UNF	209.4	2.0	3.1
2-56 UNC	243.5	2.7	4.2
2-64 UNF	248.4	2.8	4.3
3-56 UNF	286.0	3.7	5.7

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 0.125 = 1/8
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
0-80 UNF	339.7	2.6	4.1
1-64 UNC	411.7	3.9	6.0
1-72 UNF	418.9	4.0	6.1
2-56 UNC	486.9	5.4	8.4
2-64 UNF	496.8	5.6	8.5
3-48 UNC	559.6	7.2	11.1
3-56 UNF	572.0	7.4	11.3
4-40 UNC	627.0	9.1	14.0
4-48 UNF	644.7	9.4	14.4
5-40 UNC	712.1	11.6	17.8
5-44 UNF	721.3	11.7	18.0
6-32 UNC	770.3	13.8	21.3
6-40 UNF	797.2	14.3	22.0
8-32 UNC	940.5	20.1	30.8
8-36 UNF	955.6	20.4	31.3
10-32 UNF	1110.7	27.4	42.2
12-28 UNF	1261.9	35.4	54.5
1/4-28 UNF	1484.4	48.2	74.2

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.1875 = 3/16$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
1-64 UNC	617.5	5.9	9.0
1-72 UNF	628.3	6.0	9.2
2-56 UNC	730.4	8.2	12.6
2-64 UNF	745.1	8.3	12.8
3-48 UNC	839.4	10.8	16.6
3-56 UNF	858.0	11.0	17.0
4-40 UNC	940.5	13.7	21.1
4-48 UNF	967.0	14.1	21.7
5-40 UNC	1068.1	17.4	26.7
5-44 UNF	1081.9	17.6	27.0
6-32 UNC	1155.5	20.7	31.9
6-40 UNF	1195.8	21.5	33.0
8-32 UNC	1410.8	30.1	46.3
8-36 UNF	1433.4	30.6	47.0
10-24 UNC	1599.3	39.5	60.8
10-32 UNF	1666.0	41.2	63.3
12-24 UNC	1854.5	52.1	80.1
12-28 UNF	1892.8	53.2	81.8
1/4-20 UNC	2135.3	69.4	106.8
1/4-28 UNF	2226.6	72.4	111.3
5/16-18 UNC	2713.6	110.2	169.6
5/16-24 UNF	2801.9	113.8	175.1
3/8-24 UNF	3415.5	166.5	256.2
7/16-20 UNF	3976.1	226.1	347.9
1/2-20 UNF	4589.7	298.3	459.0
9/16-18 UNF	5167.9	377.9	581.4
5/8-18 UNF	5781.5	469.7	722.7

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.25 = 1/4$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
2-56 UNC	973.9	10.9	16.8
2-64 UNF	993.5	11.1	17.1
3-48 UNC	1119.2	14.4	22.2
3-56 UNF	1144.1	14.7	22.7
4-40 UNC	1254.0	18.3	28.1
4-48 UNF	1289.4	18.8	28.9
5-40 UNC	1424.2	23.1	35.6
5-44 UNF	1442.5	23.4	36.1
6-32 UNC	1540.7	27.6	42.5
6-40 UNF	1594.4	28.6	44.0
8-32 UNC	1881.0	40.1	61.7
8-36 UNF	1911.1	40.7	62.7
10-24 UNC	2132.4	52.7	81.0
10-32 UNF	2221.4	54.9	84.4
12-24 UNC	2472.7	69.4	106.8
12-28 UNF	2523.7	70.9	109.0
1/4-20 UNC	2847.1	92.5	142.4
1/4-28 UNF	2968.8	96.5	148.4
5/16-18 UNC	3618.1	147.0	226.1
5/16-24 UNF	3735.9	151.8	233.5
3/8-16 UNC	4377.3	213.4	328.3
3/8-24 UNF	4554.0	222.0	341.6
7/16-14 UNC	5119.5	291.2	448.0
7/16-20 UNF	5301.4	301.5	463.9
1/2-13 UNC	5890.5	382.9	589.0
1/2-20 UNF	6119.6	397.8	612.0
9/16-18 UNF	6890.6	503.9	775.2
5/8-18 UNF	7708.7	626.3	963.6
3/4-16 UNF	9286.0	905.4	1392.9
7/8-14 UNF	10846.3	1233.8	1898.1

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.3125 = 5/16$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
3-48 UNC	1119.2	14.4	22.2
3-56 UNF	1144.1	14.7	22.7
4-40 UNC	1254.0	18.3	28.1
4-48 UNF	1289.4	18.8	28.9
5-40 UNC	1780.2	28.9	44.5
5-44 UNF	1803.1	29.3	45.1
6-32 UNC	1925.9	34.5	53.2
6-40 UNF	1992.9	35.8	55.0
8-32 UNC	2351.3	50.1	77.1
8-36 UNF	2388.9	50.9	78.4
10-24 UNC	2665.4	65.8	101.3
10-32 UNF	2776.7	68.6	105.5
12-24 UNC	3090.9	86.8	133.5
12-28 UNF	3154.7	88.6	136.3
1/4-20 UNC	3558.8	115.7	177.9
1/4-28 UNF	3711.0	120.6	185.6
5/16-18 UNC	4522.6	183.7	282.7
5/16-24 UNF	4669.8	189.7	291.9
3/8-16 UNC	5471.6	266.7	410.4
3/8-24 UNF	5692.5	277.5	426.9
7/16-14 UNC	6399.4	364.0	559.9
7/16-20 UNF	6626.8	376.9	579.8
1/2-13 UNC	7363.1	478.6	736.3
1/2-20 UNF	7649.5	497.2	764.9
9/16-12 UNC	8318.7	608.3	935.9
9/16-18 UNF	8613.2	629.8	969.0
5/8-11 UNC	9261.2	752.5	1157.6
5/8-18 UNF	9635.9	782.9	1204.5
3/4-10 UNC	11208.3	1092.8	1681.2
3/4-16 UNF	11607.5	1131.7	1741.1
7/8-14 UNF	13557.9	1542.2	2372.6
1-12 UNF	15477.3	2012.0	3095.5
1 1/8-12 UNF	17522.6	2562.7	3942.6
1 1/4-12 UNF	19567.9	3179.8	4892.0
1 3/8-12 UNF	21613.2	3863.4	5943.6
1 1/2-12 UNF	23658.5	4613.4	7097.5

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.375 = 3/8$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
4-40 UNC	1254.0	18.3	28.1
4-48 UNF	1289.4	18.8	28.9
5-40 UNC	1780.2	28.9	44.5
5-44 UNF	1803.1	29.3	45.1
6-32 UNC	1925.9	34.5	53.2
6-40 UNF	1992.9	35.8	55.0
8-32 UNC	2351.3	50.1	77.1
8-36 UNF	2388.9	50.9	78.4
10-24 UNC	3198.5	79.0	121.5
10-32 UNF	3332.1	82.3	126.6
12-24 UNC	3709.0	104.1	160.2
12-28 UNF	3785.6	106.3	163.5
1/4-20 UNC	4270.6	138.8	213.5
1/4-28 UNF	4453.2	144.7	222.7
5/16-18 UNC	5427.1	220.5	339.2
5/16-24 UNF	5603.8	227.7	350.2
3/8-16 UNC	6565.9	320.1	492.4
3/8-24 UNF	6831.0	333.0	512.3
7/16-14 UNC	7679.2	436.8	671.9
7/16-20 UNF	7952.2	452.3	695.8
1/2-13 UNC	8835.7	574.3	883.6
1/2-20 UNF	9179.3	596.7	917.9
9/16-12 UNC	9982.4	730.0	1123.0
9/16-18 UNF	10335.8	755.8	1162.8
5/8-11 UNC	11113.4	903.0	1389.2
5/8-18 UNF	11563.0	939.5	1445.4
3/4-10 UNC	13449.9	1311.4	2017.5
3/4-16 UNF	13929.0	1358.1	2089.4
7/8-9 UNC	15762.9	1793.0	2758.5
7/8-14 UNF	16269.5	1850.7	2847.2
1-12 UNF	18572.7	2414.5	3714.5
11/8-12 UNF	21027.1	3075.2	4731.1
11/4-12 UNF	23481.4	3815.7	5870.4
13/8-12 UNF	25935.8	4636.0	7132.3
11/2-12 UNF	28390.2	5536.1	8517.1

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.4375 = 7/16$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
5-40 UNC	1780.2	28.9	44.5
5-44 UNF	1803.1	29.3	45.1
6-32 UNC	1925.9	34.5	53.2
6-40 UNF	1992.9	35.8	55.0
8-32 UNC	2351.3	50.1	77.1
8-36 UNF	2388.9	50.9	78.4
10-24 UNC	3198.5	79.0	121.5
10-32 UNF	3332.1	82.3	126.6
12-24 UNC	4327.2	121.5	186.9
12-28 UNF	4416.6	124.0	190.8
1/4-20 UNC	4982.4	161.9	249.1
1/4-28 UNF	5195.4	168.9	259.8
5/16-18 UNC	6331.6	257.2	395.7
5/16-24 UNF	6537.8	265.6	408.6
3/8-16 UNC	7660.3	373.4	574.5
3/8-24 UNF	7969.5	388.5	597.7
7/16-14 UNC	8959.1	509.5	783.9
7/16-20 UNF	9277.5	527.7	811.8
1/2-13 UNC	10308.4	670.0	1030.8
1/2-20 UNF	10709.2	696.1	1070.9
9/16-12 UNC	11646.1	851.6	1310.2
9/16-18 UNF	12058.5	881.8	1356.6
5/8-11 UNC	12965.6	1053.5	1620.7
5/8-18 UNF	13490.2	1096.1	1686.3
3/4-10 UNC	15691.6	1529.9	2353.7
3/4-16 UNF	16250.5	1584.4	2437.6
7/8-9 UNC	18390.1	2091.9	3218.3
7/8-14 UNF	18981.1	2159.1	3321.7
1-8 UNC	21047.4	2736.2	4209.5
1-12 UNF	21668.2	2816.9	4333.6
1 1/8-7 UNC	23645.1	3458.1	5320.1
1 1/8-12 UNF	24531.6	3587.7	5519.6
1 1/4-7 UNC	26508.5	4307.6	6627.1
1 1/4-12 UNF	27395.0	4451.7	6848.8
1 3/8-6 UNC	29016.9	5186.8	7979.6
1 3/8-12 UNF	30258.4	5408.7	8321.1
1 1/2-12 UNF	33121.9	6458.8	9936.6

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.5 = 1/2$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
6-40 UNF	1992.9	35.8	55.0
8-32 UNC	2351.3	50.1	77.1
8-36 UNF	2388.9	50.9	78.4
10-24 UNC	3198.5	79.0	121.5
10-32 UNF	3332.1	82.3	126.6
12-24 UNC	4327.2	121.5	186.9
12-28 UNF	4416.6	124.0	190.8
1/4-20 UNC	5694.1	185.1	284.7
1/4-28 UNF	5937.6	193.0	296.9
5/16-18 UNC	7236.1	294.0	452.3
5/16-24 UNF	7471.8	303.5	467.0
3/8-16 UNC	8754.6	426.8	656.6
3/8-24 UNF	9108.0	444.0	683.1
7/16-14 UNC	10239.0	582.3	895.9
7/16-20 UNF	10602.9	603.0	927.8
1/2-13 UNC	11781.0	765.8	1178.1
1/2-20 UNF	12239.1	795.5	1223.9
9/16-12 UNC	13309.9	973.3	1497.4
9/16-18 UNF	13781.1	1007.7	1550.4
5/8-11 UNC	14817.8	1203.9	1852.2
5/8-18 UNF	15417.4	1252.7	1927.2
3/4-10 UNC	17933.3	1748.5	2690.0
3/4-16 UNF	18572.0	1810.8	2785.8
7/8-9 UNC	21017.3	2390.7	3678.0
7/8-14 UNF	21692.7	2467.5	3796.2
1-8 UNC	24054.1	3127.0	4810.8
1-12 UNF	24763.6	3219.3	4952.7
1 1/8-7 UNC	27022.9	3952.1	6080.2
1 1/8-12 UNF	28036.1	4100.3	6308.1
1 1/4-7 UNC	30295.4	4923.0	7573.9
1 1/4-12 UNF	31308.6	5087.6	7827.1
1 3/8-12 UNF	34581.1	6181.4	9509.8
1 1/2-12 UNF	37853.6	7381.4	11356.1

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.5625 = 9/16$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
8-32 UNC	2351.3	50.1	77.1
8-36 UNF	2388.9	50.9	78.4
10-24 UNC	3198.5	79.0	121.5
10-32 UNF	3332.1	82.3	126.6
12-24 UNC	4327.2	121.5	186.9
12-28 UNF	4416.6	124.0	190.8
1/4-20 UNC	5694.1	185.1	284.7
1/4-28 UNF	5937.6	193.0	296.9
5/16-18 UNC	8140.7	330.7	508.8
5/16-24 UNF	8405.7	341.5	525.4
3/8-16 UNC	9848.9	480.1	738.7
3/8-24 UNF	10246.5	499.5	768.5
7/16-14 UNC	11518.8	655.1	1007.9
7/16-20 UNF	11928.2	678.4	1043.7
1/2-13 UNC	13253.6	861.5	1325.4
1/2-20 UNF	13769.0	895.0	1376.9
9/16-12 UNC	14973.6	1094.9	1684.5
9/16-18 UNF	15503.8	1133.7	1744.2
5/8-11 UNC	16670.1	1354.4	2083.8
5/8-18 UNF	17344.5	1409.2	2168.1
3/4-10 UNC	20174.9	1967.1	3026.2
3/4-16 UNF	20893.6	2037.1	3134.0
7/8-9 UNC	23644.4	2689.6	4137.8
7/8-14 UNF	24404.3	2776.0	4270.7
1-8 UNC	27060.9	3517.9	5412.2
1-12 UNF	27859.1	3621.7	5571.8
1 1/8-7 UNC	30400.8	4446.1	6840.2
1 1/8-12 UNF	31540.6	4612.8	7096.6
1 1/4-7 UNC	34082.4	5538.4	8520.6
1 1/4-12 UNF	35222.2	5723.6	8805.5
1 3/8-6 UNC	37307.4	6668.7	10259.5
1 3/8-12 UNF	38903.7	6954.0	10698.5
1 1/2-6 UNC	40988.9	7992.8	12296.7
1 1/2-12 UNF	42585.3	8304.1	12775.6

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.625 = 5/8$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
8-36 UNF	2388.9	50.9	78.4
10-24 UNC	3198.5	79.0	121.5
10-32 UNF	3332.1	82.3	126.6
12-24 UNC	4327.2	121.5	186.9
12-28 UNF	4416.6	124.0	190.8
1/4-20 UNC	5694.1	185.1	284.7
1/4-28 UNF	5937.6	193.0	296.9
5/16-18 UNC	9045.2	367.5	565.3
5/16-24 UNF	9339.7	379.4	583.7
3/8-16 UNC	10943.2	533.5	820.7
3/8-24 UNF	11385.0	555.0	853.9
7/16-14 UNC	12798.7	727.9	1119.9
7/16-20 UNF	13253.6	753.8	1159.7
1/2-13 UNC	14726.2	957.2	1472.6
1/2-20 UNF	15298.9	994.4	1529.9
9/16-12 UNC	16637.4	1216.6	1871.7
9/16-18 UNF	17226.4	1259.7	1938.0
5/8-11 UNC	18522.3	1504.9	2315.3
5/8-18 UNF	19271.7	1565.8	2409.0
3/4-10 UNC	22416.6	2185.6	3362.5
3/4-16 UNF	23215.1	2263.5	3482.3
7/8-9 UNC	26271.6	2988.4	4597.5
7/8-14 UNF	27115.9	3084.4	4745.3
1-8 UNC	30067.7	3908.8	6013.5
1-12 UNF	30954.5	4024.1	6190.9
1 1/8-7 UNC	33778.7	4940.1	7600.2
1 1/8-12 UNF	35045.1	5125.3	7885.2
1 1/4-7 UNC	37869.3	6153.8	9467.3
1 1/4-12 UNF	39135.7	6359.6	9783.9
1 3/8-6 UNC	41452.7	7409.7	11399.5
1 3/8-12 UNF	43226.4	7726.7	11887.2
1 1/2-6 UNC	45543.3	8880.9	13663.0
1 1/2-12 UNF	47317.0	9226.8	14195.1
1 3/4-5 UNC	53017.6	12061.5	18556.2

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.75 = 3/4$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
12-24 UNC	4327.2	121.5	186.9
12-28 UNF	4416.6	124.0	190.8
1/4-20 UNC	5694.1	185.1	284.7
1/4-28 UNF	5937.6	193.0	296.9
5/16-18 UNC	9045.2	367.5	565.3
5/16-24 UNF	9339.7	379.4	583.7
3/8-16 UNC	13131.9	640.2	984.9
3/8-24 UNF	13662.0	666.0	1024.7
7/16-14 UNC	15358.5	873.5	1343.9
7/16-20 UNF	15904.3	904.6	1391.6
1/2-13 UNC	17671.5	1148.6	1767.1
1/2-20 UNF	18358.7	1193.3	1835.9
9/16-12 UNC	19964.8	1459.9	2246.0
9/16-18 UNF	20671.7	1511.6	2325.6
5/8-11 UNC	22226.8	1805.9	2778.3
5/8-18 UNF	23126.0	1879.0	2890.8
3/4-10 UNC	26899.9	2622.7	4035.0
3/4-16 UNF	27858.1	2716.2	4178.7
7/8-9 UNC	31525.9	3586.1	5517.0
7/8-14 UNF	32539.0	3701.3	5694.3
1-8 UNC	36081.2	4690.6	7216.2
1-12 UNF	37145.4	4828.9	7429.1
1 1/8-7 UNC	40534.4	5928.2	9120.2
1 1/8-12 UNF	42054.1	6150.4	9462.2
1 1/4-7 UNC	45443.1	7384.5	11360.8
1 1/4-12 UNF	46962.9	7631.5	11740.7
1 3/8-6 UNC	49743.2	8891.6	13679.4
1 3/8-12 UNF	51871.6	9272.1	14264.7
1 1/2-6 UNC	54651.9	10657.1	16395.6
1 1/2-12 UNF	56780.4	11072.2	17034.1
1 3/4-5 UNC	63621.2	14473.8	22267.4
2-4 1/2 UNC	72873.2	18947.0	29149.3

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.875 = 7/8$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
1/4-20 UNC	5694.1	185.1	284.7
1/4-28 UNF	5937.6	193.0	296.9
5/16-18 UNC	9045.2	367.5	565.3
5/16-24 UNF	9339.7	379.4	583.7
3/8-16 UNC	13131.9	640.2	984.9
3/8-24 UNF	13662.0	666.0	1024.7
7/16-14 UNC	17918.2	1019.1	1567.8
7/16-20 UNF	18555.0	1055.3	1623.6
1/2-13 UNC	20616.7	1340.1	2061.7
1/2-20 UNF	21418.5	1392.2	2141.8
9/16-12 UNC	23292.3	1703.2	2620.4
9/16-18 UNF	24117.0	1763.6	2713.2
5/8-11 UNC	25931.2	2106.9	3241.4
5/8-18 UNF	26980.4	2192.2	3372.5
3/4-10 UNC	31383.2	3059.9	4707.5
3/4-16 UNF	32501.1	3168.9	4875.2
7/8-9 UNC	36780.2	4183.7	6436.5
7/8-14 UNF	37962.2	4318.2	6643.4
1-8 UNC	42094.7	5472.3	8418.9
1-12 UNF	43336.3	5633.7	8667.3
1 1/8-7 UNC	47290.1	6916.2	10640.3
1 1/8-12 UNF	49063.2	7175.5	11039.2
1 1/4-7 UNC	53017.0	8615.3	13254.2
1 1/4-12 UNF	54790.0	8903.4	13697.5
1 3/8-6 UNC	58033.7	10373.5	15959.3
1 3/8-12 UNF	60516.9	10817.4	16642.1
1 1/2-6 UNC	63760.6	12433.3	19128.2
1 1/2-12 UNF	66243.8	12917.5	19873.1
1 3/4-5 UNC	74224.7	16886.1	25978.6
2-4 1/2 UNC	85018.7	22104.9	34007.5

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 1.00
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
1/4-28 UNF	5937.6	193.0	296.9
5/16-18 UNC	9045.2	367.5	565.3
5/16-24 UNF	9339.7	379.4	583.7
3/8-16 UNC	13131.9	640.2	984.9
3/8-24 UNF	13662.0	666.0	1024.7
7/16-14 UNC	17918.2	1019.1	1567.8
7/16-20 UNF	18555.0	1055.3	1623.6
1/2-13 UNC	23561.9	1531.5	2356.2
1/2-20 UNF	24478.2	1591.1	2447.8
9/16-12 UNC	26619.8	1946.6	2994.7
9/16-18 UNF	27562.2	2015.5	3100.8
5/8-11 UNC	29635.7	2407.9	3704.5
5/8-18 UNF	30834.7	2505.3	3854.3
3/4-10 UNC	35866.5	3497.0	5380.0
3/4-16 UNF	37144.1	3621.5	5571.6
7/8-9 UNC	42034.5	4781.4	7356.0
7/8-14 UNF	43385.4	4935.1	7592.4
1-8 UNC	48108.3	6254.1	9621.7
1-12 UNF	49527.2	6438.5	9905.4
1 1/8-7 UNC	54045.9	7904.2	12160.3
1 1/8-12 UNF	56072.2	8200.6	12616.2
1 1/4-7 UNC	60590.9	9846.0	15147.7
1 1/4-12 UNF	62617.2	10175.3	15654.3
1 3/8-6 UNC	66324.3	11855.5	18239.2
1 3/8-12 UNF	69162.2	12362.7	19019.6
1 1/2-6 UNC	72869.2	14209.5	21860.8
1 1/2-12 UNF	75707.1	14762.9	22712.1
1 3/4-5 UNC	84828.2	19298.4	29689.9
2-4 1/2 UNC	97164.2	25262.7	38865.7

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 1.125 = 1 1/8
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
5/16-18 UNC	9045.2	367.5	565.3
5/16-24 UNF	9339.7	379.4	583.7
3/8-16 UNC	13131.9	640.2	984.9
3/8-24 UNF	13662.0	666.0	1024.7
7/16-14 UNC	17918.2	1019.1	1567.8
7/16-20 UNF	18555.0	1055.3	1623.6
1/2-13 UNC	26507.2	1723.0	2650.7
1/2-20 UNF	27538.0	1790.0	2753.8
9/16-12 UNC	26619.8	1946.6	2994.7
9/16-18 UNF	27562.2	2015.5	3100.8
5/8-11 UNC	33340.2	2708.9	4167.5
5/8-18 UNF	34689.1	2818.5	4336.1
3/4-10 UNC	40349.8	3934.1	6052.5
3/4-16 UNF	41787.1	4074.2	6268.1
7/8-9 UNC	47288.8	5379.1	8275.5
7/8-14 UNF	48808.6	5552.0	8541.5
1-8 UNC	54121.8	7035.8	10824.4
1-12 UNF	55718.1	7243.4	11143.6
1 1/8-7 UNC	60801.6	8892.2	13680.4
1 1/8-12 UNF	63081.2	9225.6	14193.3
1 1/4-7 UNC	68164.7	11076.8	17041.2
1 1/4-12 UNF	70444.3	11447.2	17611.1
1 3/8-6 UNC	74614.8	13337.4	20519.1
1 3/8-12 UNF	77807.4	13908.1	21397.0
1 1/2-6 UNC	81977.9	15985.7	24593.4
1 1/2-12 UNF	85170.5	16608.3	25551.2
1 3/4-5 UNC	95431.8	21710.7	33401.1
2-4 1/2 UNC	109309.8	28420.5	43723.9

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 1.25 = 1/4
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
5/16-24 UNF	9339.7	379.4	583.7
3/8-16 UNC	13131.9	640.2	984.9
3/8-24 UNF	13662.0	666.0	1024.7
7/16-14 UNC	17918.2	1019.1	1567.8
7/16-20 UNF	18555.0	1055.3	1623.6
1/2-13 UNC	29452.4	1914.4	2945.2
1/2-20 UNF	30597.8	1988.9	3059.8
9/16-12 UNC	26619.8	1946.6	2994.7
9/16-18 UNF	27562.2	2015.5	3100.8
5/8-11 UNC	37044.6	3009.9	4630.6
5/8-18 UNF	38543.4	3131.7	4817.9
3/4-10 UNC	44833.1	4371.2	6725.0
3/4-16 UNF	46430.1	4526.9	6964.5
7/8-9 UNC	52543.1	5976.8	9195.0
7/8-14 UNF	54231.7	6168.9	9490.6
1-8 UNC	60135.3	7817.6	12027.1
1-12 UNF	61909.0	8048.2	12381.8
1 1/8-7 UNC	67557.3	9880.3	15200.4
1 1/8-12 UNF	70090.2	10250.7	15770.3
1 1/4-7 UNC	75738.6	12307.5	18934.6
1 1/4-12 UNF	78271.5	12719.1	19567.9
1 3/8-6 UNC	82905.3	14819.3	22799.0
1 3/8-12 UNF	86452.7	15453.4	23774.5
1 1/2-6 UNC	91086.6	17761.9	27326.0
1 1/2-12 UNF	94633.9	18453.6	28390.2
1 3/4-5 UNC	106035.3	24123.0	37112.4
2-4 1/2 UNC	121455.3	31578.4	48582.1

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 1.375 = 1 3/8
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
3/8-16 UNC	13131.9	640.2	984.9
3/8-24 UNF	13662.0	666.0	1024.7
7/16-14 UNC	17918.2	1019.1	1567.8
7/16-20 UNF	18555.0	1055.3	1623.6
1/2-13 UNC	32397.7	2105.8	3239.8
1/2-20 UNF	33657.6	2187.7	3365.8
9/16-12 UNC	26619.8	1946.6	2994.7
9/16-18 UNF	27562.2	2015.5	3100.8
5/8-11 UNC	37044.6	3009.9	4630.6
5/8-18 UNF	38543.4	3131.7	4817.9
3/4-10 UNC	49316.5	4808.4	7397.5
3/4-16 UNF	51073.1	4979.6	7661.0
7/8-9 UNC	57797.5	6574.5	10114.6
7/8-14 UNF	59654.9	6785.7	10439.6
1-8 UNC	66148.9	8599.4	13229.8
1-12 UNF	68099.9	8853.0	13620.0
1 1/8-7 UNC	74313.1	10868.3	16720.4
1 1/8-12 UNF	77099.3	11275.8	17347.3
1 1/4-7 UNC	83312.4	13538.3	20828.1
1 1/4-12 UNF	86098.6	13991.0	21524.7
1 3/8-6 UNC	91195.9	16301.3	25078.9
1 3/8-12 UNF	95098.0	16998.8	26151.9
1 1/2-6 UNC	100195.2	19538.1	30058.6
1 1/2-12 UNF	104097.3	20299.0	31229.2
1 3/4-5 UNC	116638.8	26535.3	40823.6
2-4 1/2 UNC	133600.8	34736.2	53440.3

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 1.5 = 1 1/2
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
3/8-24 UNF	13662.0	666.0	1024.7
7/16-14 UNC	17918.2	1019.1	1567.8
7/16-20 UNF	18555.0	1055.3	1623.6
1/2-13 UNC	35342.9	2297.3	3534.3
1/2-20 UNF	36717.4	2386.6	3671.7
9/16-12 UNC	26619.8	1946.6	2994.7
9/16-18 UNF	27562.2	2015.5	3100.8
5/8-11 UNC	37044.6	3009.9	4630.6
5/8-18 UNF	38543.4	3131.7	4817.9
3/4-10 UNC	49316.5	4808.4	7397.5
3/4-16 UNF	51073.1	4979.6	7661.0
7/8-9 UNC	63051.8	7172.1	11034.1
7/8-14 UNF	65078.1	7402.6	11388.7
1-8 UNC	72162.4	9381.1	14432.5
1-12 UNF	74290.8	9657.8	14858.2
1 1/8-7 UNC	81068.8	11856.3	18240.5
1 1/8-12 UNF	84108.3	12300.8	18924.4
1 1/4-7 UNC	90886.3	14769.0	22721.6
1 1/4-12 UNF	93925.8	15262.9	23481.4
1 3/8-6 UNC	99486.4	17783.2	27358.8
1 3/8-12 UNF	103743.2	18544.1	28529.4
1 1/2-6 UNC	109303.9	21314.3	32791.2
1 1/2-12 UNF	113560.7	22144.3	34068.2
1 3/4-5 UNC	127242.4	28947.6	44534.8
2-4 1/2 UNC	145746.3	37894.0	58298.5

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 1.75 = 1 3/4
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
7/16-20 UNF	18555.0	1055.3	1623.6
1/2-13 UNC	41233.4	2680.2	4123.3
1/2-20 UNF	42836.9	2784.4	4283.7
9/16-12 UNC	26619.8	1946.6	2994.7
9/16-18 UNF	27562.2	2015.5	3100.8
5/8-11 UNC	37044.6	3009.9	4630.6
5/8-18 UNF	38543.4	3131.7	4817.9
3/4-10 UNC	49316.5	4808.4	7397.5
3/4-16 UNF	51073.1	4979.6	7661.0
7/8-9 UNC	73560.4	8367.5	12873.1
7/8-14 UNF	75924.4	8636.4	13286.8
1-8 UNC	84189.4	10944.6	16837.9
1-12 UNF	86672.6	11267.4	17334.5
1 1/8-7 UNC	94580.3	13832.4	21280.6
1 1/8-12 UNF	98126.3	14351.0	22078.4
1 1/4-7 UNC	106034.0	17230.5	26508.5
1 1/4-12 UNF	109580.1	17806.8	27395.0
1 3/8-6 UNC	116067.4	20747.1	31918.5
1 3/8-12 UNF	121033.8	21634.8	33284.3
1 1/2-6 UNC	127521.2	24866.6	38256.4
1 1/2-12 UNF	132487.5	25835.1	39746.3
1 3/4-5 UNC	148449.4	33772.2	51957.3
2-4 1/2 UNC	170037.4	44209.7	68015.0

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 2.00
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
7/8-14 UNF	75924.4	8636.4	13286.8
1-12 UNF	99054.4	12877.1	19810.9
1 1/8-7 UNC	108091.7	15808.4	24320.6
1 1/8-12 UNF	112144.4	16401.1	25232.5
1 1/4-7 UNC	121181.7	19692.0	30295.4
1 1/4-12 UNF	125234.4	20350.6	31308.6
1 3/8-6 UNC	132648.5	23710.9	36478.3
1 3/8-12 UNF	138324.3	24725.5	38039.2
1 1/2-6 UNC	145738.5	28419.0	43721.5
1 1/2-12 UNF	151414.3	29525.8	45424.3
1 3/4-5 UNC	169656.5	38596.8	59379.8
2-4 1/2 UNC	194328.4	50525.4	77731.4

ASTM A36 Steel

$$\mathbf{F_{su} = 34.8 \text{ ksi}}$$

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 0.0625 = 1/16
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
0-80 UNF	118.2	0.9	1.4
1-64 UNC	143.3	1.4	2.1
1-72 UNF	145.8	1.4	2.1
2-56 UNC	169.5	1.9	2.9
2-64 UNF	172.9	1.9	3.0
3-56 UNF	199.1	2.6	3.9

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 0.125 = 1/8
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
0-80 UNF	236.4	1.8	2.8
1-64 UNC	286.5	2.7	4.2
1-72 UNF	291.5	2.8	4.3
2-56 UNC	338.9	3.8	5.8
2-64 UNF	345.7	3.9	5.9
3-48 UNC	389.5	5.0	7.7
3-56 UNF	398.1	5.1	7.9
4-40 UNC	436.4	6.4	9.8
4-48 UNF	448.7	6.5	10.1
5-40 UNC	495.6	8.1	12.4
5-44 UNF	502.0	8.2	12.5
6-32 UNC	536.2	9.6	14.8
6-40 UNF	554.8	10.0	15.3
8-32 UNC	654.6	14.0	21.5
8-36 UNF	665.1	14.2	21.8
10-32 UNF	773.0	19.1	29.4
12-28 UNF	878.3	24.7	37.9
1/4-28 UNF	1033.1	33.6	51.7

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.1875 = 3/16$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
1-64 UNC	429.8	4.1	6.3
1-72 UNF	437.3	4.2	6.4
2-56 UNC	508.4	5.7	8.7
2-64 UNF	518.6	5.8	8.9
3-48 UNC	584.2	7.5	11.6
3-56 UNF	597.2	7.7	11.8
4-40 UNC	654.6	9.5	14.7
4-48 UNF	673.0	9.8	15.1
5-40 UNC	743.4	12.1	18.6
5-44 UNF	753.0	12.2	18.8
6-32 UNC	804.2	14.4	22.2
6-40 UNF	832.3	14.9	23.0
8-32 UNC	981.9	20.9	32.2
8-36 UNF	997.6	21.3	32.7
10-24 UNC	1113.1	27.5	42.3
10-32 UNF	1159.6	28.6	44.1
12-24 UNC	1290.7	36.2	55.8
12-28 UNF	1317.4	37.0	56.9
1/4-20 UNC	1486.2	48.3	74.3
1/4-28 UNF	1549.7	50.4	77.5
5/16-18 UNC	1888.6	76.7	118.0
5/16-24 UNF	1950.1	79.2	121.9
3/8-24 UNF	2377.2	115.9	178.3
7/16-20 UNF	2767.4	157.4	242.1
1/2-20 UNF	3194.4	207.6	319.4
9/16-18 UNF	3596.9	263.0	404.6
5/8-18 UNF	4023.9	326.9	503.0

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.25 = 1/4$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
1-72 UNF	437.3	4.2	6.4
2-56 UNC	677.8	7.6	11.7
2-64 UNF	691.5	7.7	11.9
3-48 UNC	779.0	10.0	15.4
3-56 UNF	796.3	10.2	15.8
4-40 UNC	872.8	12.7	19.6
4-48 UNF	897.4	13.1	20.1
5-40 UNC	991.2	16.1	24.8
5-44 UNF	1004.0	16.3	25.1
6-32 UNC	1072.3	19.2	29.6
6-40 UNF	1109.7	19.9	30.6
8-32 UNC	1309.2	27.9	42.9
8-36 UNF	1330.2	28.4	43.6
10-24 UNC	1484.1	36.7	56.4
10-32 UNF	1546.1	38.2	58.8
12-24 UNC	1721.0	48.3	74.3
12-28 UNF	1756.5	49.3	75.9
1/4-20 UNC	1981.6	64.4	99.1
1/4-28 UNF	2066.3	67.2	103.3
5/16-18 UNC	2518.2	102.3	157.4
5/16-24 UNF	2600.2	105.6	162.5
3/8-16 UNC	3046.6	148.5	228.5
3/8-24 UNF	3169.6	154.5	237.7
7/16-14 UNC	3563.2	202.7	311.8
7/16-20 UNF	3689.8	209.9	322.9
1/2-13 UNC	4099.8	266.5	410.0
1/2-20 UNF	4259.2	276.8	425.9
9/16-18 UNF	4795.8	350.7	539.5
5/8-18 UNF	5365.2	435.9	670.7
3/4-16 UNF	6463.1	630.1	969.5
7/8-14 UNF	7549.1	858.7	1321.1

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.3125 = 5/16$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
2-64 UNF	691.5	7.7	11.9
3-48 UNC	779.0	10.0	15.4
3-56 UNF	796.3	10.2	15.8
4-40 UNC	872.8	12.7	19.6
4-48 UNF	897.4	13.1	20.1
5-40 UNC	1239.0	20.1	31.0
5-44 UNF	1255.0	20.4	31.4
6-32 UNC	1340.4	24.0	37.0
6-40 UNF	1387.1	24.9	38.3
8-32 UNC	1636.5	34.9	53.7
8-36 UNF	1662.7	35.4	54.5
10-24 UNC	1855.1	45.8	70.5
10-32 UNF	1932.6	47.7	73.4
12-24 UNC	2151.2	60.4	92.9
12-28 UNF	2195.7	61.7	94.9
1/4-20 UNC	2476.9	80.5	123.8
1/4-28 UNF	2582.9	83.9	129.1
5/16-18 UNC	3147.7	127.9	196.7
5/16-24 UNF	3250.2	132.0	203.1
3/8-16 UNC	3808.2	185.7	285.6
3/8-24 UNF	3962.0	193.1	297.1
7/16-14 UNC	4454.0	253.3	389.7
7/16-20 UNF	4612.3	262.3	403.6
1/2-13 UNC	5124.7	333.1	512.5
1/2-20 UNF	5324.0	346.1	532.4
9/16-12 UNC	5789.8	423.4	651.4
9/16-18 UNF	5994.8	438.4	674.4
5/8-11 UNC	6445.8	523.7	805.7
5/8-18 UNF	6706.6	544.9	838.3
3/4-10 UNC	7801.0	760.6	1170.1
3/4-16 UNF	8078.8	787.7	1211.8
7/8-14 UNF	9436.3	1073.4	1651.4
1-12 UNF	10772.2	1400.4	2154.4
1 1/8-12 UNF	12195.7	1783.6	2744.0
1 1/4-12 UNF	13619.2	2213.1	3404.8
1 3/8-12 UNF	15042.8	2688.9	4136.8
1 1/2-12 UNF	16466.3	3210.9	4939.9

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.375 = 3/8$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
3-56 UNF	796.3	10.2	15.8
4-40 UNC	872.8	12.7	19.6
4-48 UNF	897.4	13.1	20.1
5-40 UNC	1239.0	20.1	31.0
5-44 UNF	1255.0	20.4	31.4
6-32 UNC	1340.4	24.0	37.0
6-40 UNF	1387.1	24.9	38.3
8-32 UNC	1636.5	34.9	53.7
8-36 UNF	1662.7	35.4	54.5
10-24 UNC	2226.2	55.0	84.6
10-32 UNF	2319.1	57.3	88.1
12-24 UNC	2581.5	72.5	111.5
12-28 UNF	2634.8	74.0	113.8
1/4-20 UNC	2972.3	96.6	148.6
1/4-28 UNF	3099.4	100.7	155.0
5/16-18 UNC	3777.3	153.5	236.1
5/16-24 UNF	3900.3	158.4	243.8
3/8-16 UNC	4569.9	222.8	342.7
3/8-24 UNF	4754.4	231.8	356.6
7/16-14 UNC	5344.7	304.0	467.7
7/16-20 UNF	5534.7	314.8	484.3
1/2-13 UNC	6149.7	399.7	615.0
1/2-20 UNF	6388.8	415.3	638.9
9/16-12 UNC	6947.8	508.1	781.6
9/16-18 UNF	7193.7	526.0	809.3
5/8-11 UNC	7734.9	628.5	966.9
5/8-18 UNF	8047.9	653.9	1006.0
3/4-10 UNC	9361.2	912.7	1404.2
3/4-16 UNF	9694.6	945.2	1454.2
7/8-9 UNC	10971.0	1248.0	1919.9
7/8-14 UNF	11323.6	1288.1	1981.6
1-12 UNF	12926.6	1680.5	2585.3
1 1/8-12 UNF	14634.8	2140.3	3292.8
1 1/4-12 UNF	16343.1	2655.8	4085.8
1 3/8-12 UNF	18051.3	3226.7	4964.1
1 1/2-12 UNF	19759.6	3853.1	5927.9

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.4375 = 7/16$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
4-48 UNF	897.4	13.1	20.1
5-40 UNC	1239.0	20.1	31.0
5-44 UNF	1255.0	20.4	31.4
6-32 UNC	1340.4	24.0	37.0
6-40 UNF	1387.1	24.9	38.3
8-32 UNC	1636.5	34.9	53.7
8-36 UNF	1662.7	35.4	54.5
10-24 UNC	2226.2	55.0	84.6
10-32 UNF	2319.1	57.3	88.1
12-24 UNC	3011.7	84.6	130.1
12-28 UNF	3073.9	86.3	132.8
1/4-20 UNC	3467.7	112.7	173.4
1/4-28 UNF	3616.0	117.5	180.8
5/16-18 UNC	4406.8	179.0	275.4
5/16-24 UNF	4550.3	184.9	284.4
3/8-16 UNC	5331.5	259.9	399.9
3/8-24 UNF	5546.8	270.4	416.0
7/16-14 UNC	6235.5	354.6	545.6
7/16-20 UNF	6457.2	367.3	565.0
1/2-13 UNC	7174.6	466.3	717.5
1/2-20 UNF	7453.6	484.5	745.4
9/16-12 UNC	8105.7	592.7	911.9
9/16-18 UNF	8392.7	613.7	944.2
5/8-11 UNC	9024.1	733.2	1128.0
5/8-18 UNF	9389.2	762.9	1173.6
3/4-10 UNC	10921.4	1064.8	1638.2
3/4-16 UNF	11310.4	1102.8	1696.6
7/8-9 UNC	12799.5	1455.9	2239.9
7/8-14 UNF	13210.9	1502.7	2311.9
1-8 UNC	14649.0	1904.4	2929.8
1-12 UNF	15081.0	1960.5	3016.2
1 1/8-7 UNC	16457.0	2406.8	3702.8
1 1/8-12 UNF	17074.0	2497.1	3841.6
1 1/4-7 UNC	18449.9	2998.1	4612.5
1 1/4-12 UNF	19066.9	3098.4	4766.7
1 3/8-6 UNC	20195.7	3610.0	5553.8
1 3/8-12 UNF	21059.9	3764.5	5791.5
1 1/2-12 UNF	23052.8	4495.3	6915.8

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 0.5 = 1/2
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
5-44 UNF	1255.0	20.4	31.4
6-32 UNC	1340.4	24.0	37.0
6-40 UNF	1387.1	24.9	38.3
8-32 UNC	1636.5	34.9	53.7
8-36 UNF	1662.7	35.4	54.5
10-24 UNC	2226.2	55.0	84.6
10-32 UNF	2319.1	57.3	88.1
12-24 UNC	3011.7	84.6	130.1
12-28 UNF	3073.9	86.3	132.8
1/4-20 UNC	3963.1	128.8	198.2
1/4-28 UNF	4132.6	134.3	206.6
5/16-18 UNC	5036.4	204.6	314.8
5/16-24 UNF	5200.3	211.3	325.0
3/8-16 UNC	6093.2	297.0	457.0
3/8-24 UNF	6339.2	309.0	475.4
7/16-14 UNC	7126.3	405.3	623.6
7/16-20 UNF	7379.6	419.7	645.7
1/2-13 UNC	8199.6	533.0	820.0
1/2-20 UNF	8518.4	553.7	851.8
9/16-12 UNC	9263.7	677.4	1042.2
9/16-18 UNF	9591.7	701.4	1079.1
5/8-11 UNC	10313.2	837.9	1289.2
5/8-18 UNF	10730.5	871.9	1341.3
3/4-10 UNC	12481.5	1217.0	1872.2
3/4-16 UNF	12926.1	1260.3	1938.9
7/8-9 UNC	14628.0	1663.9	2559.9
7/8-14 UNF	15098.1	1717.4	2642.2
1-8 UNC	16741.7	2176.4	3348.3
1-12 UNF	17235.5	2240.6	3447.1
1 1/8-7 UNC	18808.0	2750.7	4231.8
1 1/8-12 UNF	19513.1	2853.8	4390.5
1 1/4-7 UNC	21085.6	3426.4	5271.4
1 1/4-12 UNF	21790.8	3541.0	5447.7
1 3/8-12 UNF	24068.4	4302.2	6618.8
1 1/2-12 UNF	26346.1	5137.5	7903.8

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.5625 = 9/16$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
8-32 UNC	1636.5	34.9	53.7
8-36 UNF	1662.7	35.4	54.5
10-24 UNC	2226.2	55.0	84.6
10-32 UNF	2319.1	57.3	88.1
12-24 UNC	3011.7	84.6	130.1
12-28 UNF	3073.9	86.3	132.8
1/4-20 UNC	3963.1	128.8	198.2
1/4-28 UNF	4132.6	134.3	206.6
5/16-18 UNC	5665.9	230.2	354.1
5/16-24 UNF	5850.4	237.7	365.6
3/8-16 UNC	6854.8	334.2	514.1
3/8-24 UNF	7131.6	347.7	534.9
7/16-14 UNC	8017.1	456.0	701.5
7/16-20 UNF	8302.1	472.2	726.4
1/2-13 UNC	9224.5	599.6	922.5
1/2-20 UNF	9583.2	622.9	958.3
9/16-12 UNC	10421.6	762.1	1172.4
9/16-18 UNF	10790.6	789.1	1213.9
5/8-11 UNC	11602.4	942.7	1450.3
5/8-18 UNF	12071.8	980.8	1509.0
3/4-10 UNC	14041.7	1369.1	2106.3
3/4-16 UNF	14541.9	1417.8	2181.3
7/8-9 UNC	16456.5	1871.9	2879.9
7/8-14 UNF	16985.4	1932.1	2972.4
1-8 UNC	18834.4	2448.5	3766.9
1-12 UNF	19389.9	2520.7	3878.0
1 1/8-7 UNC	21159.0	3094.5	4760.8
1 1/8-12 UNF	21952.3	3210.5	4939.3
1 1/4-7 UNC	23721.3	3854.7	5930.3
1 1/4-12 UNF	24514.6	3983.6	6128.7
1 3/8-6 UNC	25965.9	4641.4	7140.6
1 3/8-12 UNF	27077.0	4840.0	7446.2
1 1/2-6 UNC	28528.3	5563.0	8558.5
1 1/2-12 UNF	29639.3	5779.7	8891.8

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.625 = 5/8$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
8-32 UNC	1636.5	34.9	53.7
8-36 UNF	1662.7	35.4	54.5
10-24 UNC	2226.2	55.0	84.6
10-32 UNF	2319.1	57.3	88.1
12-24 UNC	3011.7	84.6	130.1
12-28 UNF	3073.9	86.3	132.8
1/4-20 UNC	3963.1	128.8	198.2
1/4-28 UNF	4132.6	134.3	206.6
5/16-18 UNC	6295.4	255.8	393.5
5/16-24 UNF	6500.4	264.1	406.3
3/8-16 UNC	7616.5	371.3	571.2
3/8-24 UNF	7924.0	386.3	594.3
7/16-14 UNC	8907.9	506.6	779.4
7/16-20 UNF	9224.5	524.6	807.1
1/2-13 UNC	10249.4	666.2	1024.9
1/2-20 UNF	10648.0	692.1	1064.8
9/16-12 UNC	11579.6	846.8	1302.7
9/16-18 UNF	11989.6	876.7	1348.8
5/8-11 UNC	12891.5	1047.4	1611.4
5/8-18 UNF	13413.1	1089.8	1676.6
3/4-10 UNC	15601.9	1521.2	2340.3
3/4-16 UNF	16157.7	1575.4	2423.7
7/8-9 UNC	18285.0	2079.9	3199.9
7/8-14 UNF	18872.6	2146.8	3302.7
1-8 UNC	20927.1	2720.5	4185.4
1-12 UNF	21544.3	2800.8	4308.9
1 1/8-7 UNC	23510.0	3438.3	5289.7
1 1/8-12 UNF	24391.4	3567.2	5488.1
1 1/4-7 UNC	26357.0	4283.0	6589.3
1 1/4-12 UNF	27238.5	4426.3	6809.6
1 3/8-6 UNC	28851.1	5157.1	7934.0
1 3/8-12 UNF	30085.5	5377.8	8273.5
1 1/2-6 UNC	31698.1	6181.1	9509.4
1 1/2-12 UNF	32932.6	6421.9	9879.8
1 3/4-5 UNC	36900.3	8394.8	12915.1

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.75 = 3/4$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
10-32 UNF	2319.1	57.3	88.1
12-24 UNC	3011.7	84.6	130.1
12-28 UNF	3073.9	86.3	132.8
1/4-20 UNC	3963.1	128.8	198.2
1/4-28 UNF	4132.6	134.3	206.6
5/16-18 UNC	6295.4	255.8	393.5
5/16-24 UNF	6500.4	264.1	406.3
3/8-16 UNC	9139.8	445.6	685.5
3/8-24 UNF	9508.8	463.6	713.2
7/16-14 UNC	10689.5	608.0	935.3
7/16-20 UNF	11069.4	629.6	968.6
1/2-13 UNC	12299.3	799.5	1229.9
1/2-20 UNF	12777.6	830.5	1277.8
9/16-12 UNC	13895.5	1016.1	1563.2
9/16-18 UNF	14387.5	1052.1	1618.6
5/8-11 UNC	15469.8	1256.9	1933.7
5/8-18 UNF	16095.7	1307.8	2012.0
3/4-10 UNC	18722.3	1825.4	2808.3
3/4-16 UNF	19389.2	1890.4	2908.4
7/8-9 UNC	21942.0	2495.9	3839.9
7/8-14 UNF	22647.2	2576.1	3963.3
1-8 UNC	25112.5	3264.6	5022.5
1-12 UNF	25853.2	3360.9	5170.6
1 1/8-7 UNC	28211.9	4126.0	6347.7
1 1/8-12 UNF	29269.7	4280.7	6585.7
1 1/4-7 UNC	31628.4	5139.6	7907.1
1 1/4-12 UNF	32686.2	5311.5	8171.5
1 3/8-6 UNC	34621.3	6188.6	9520.8
1 3/8-12 UNF	36102.6	6453.3	9928.2
1 1/2-6 UNC	38037.7	7417.4	11411.3
1 1/2-12 UNF	39519.1	7706.2	11855.7
1 3/4-5 UNC	44280.3	10073.8	15498.1
2-4 1/2 UNC	50719.7	13187.1	20287.9

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.875 = 7/8$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
12-28 UNF	3073.9	86.3	132.8
1/4-20 UNC	3963.1	128.8	198.2
1/4-28 UNF	4132.6	134.3	206.6
5/16-18 UNC	6295.4	255.8	393.5
5/16-24 UNF	6500.4	264.1	406.3
3/8-16 UNC	9139.8	445.6	685.5
3/8-24 UNF	9508.8	463.6	713.2
7/16-14 UNC	12471.1	709.3	1091.2
7/16-20 UNF	12914.3	734.5	1130.0
1/2-13 UNC	14349.2	932.7	1434.9
1/2-20 UNF	14907.2	969.0	1490.7
9/16-12 UNC	16211.4	1185.5	1823.8
9/16-18 UNF	16785.4	1227.4	1888.4
5/8-11 UNC	18048.1	1466.4	2256.0
5/8-18 UNF	18778.4	1525.7	2347.3
3/4-10 UNC	21842.7	2129.7	3276.4
3/4-16 UNF	22620.8	2205.5	3393.1
7/8-9 UNC	25599.0	2911.9	4479.8
7/8-14 UNF	26421.7	3005.5	4623.8
1-8 UNC	29297.9	3808.7	5859.6
1-12 UNF	30162.1	3921.1	6032.4
1 1/8-7 UNC	32913.9	4813.7	7405.6
1 1/8-12 UNF	34148.0	4994.1	7683.3
1 1/4-7 UNC	36899.8	5996.2	9225.0
1 1/4-12 UNF	38133.9	6196.8	9533.5
1 3/8-6 UNC	40391.5	7220.0	11107.7
1 3/8-12 UNF	42119.8	7528.9	11582.9
1 1/2-6 UNC	44377.4	8653.6	13313.2
1 1/2-12 UNF	46105.7	8990.6	13831.7
1 3/4-5 UNC	51660.4	11752.7	18081.1
2-4 1/2 UNC	59173.0	15385.0	23669.2

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 1.00
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
1/4-28 UNF	4132.6	134.3	206.6
5/16-18 UNC	6295.4	255.8	393.5
5/16-24 UNF	6500.4	264.1	406.3
3/8-16 UNC	9139.8	445.6	685.5
3/8-24 UNF	9508.8	463.6	713.2
7/16-14 UNC	12471.1	709.3	1091.2
7/16-20 UNF	12914.3	734.5	1130.0
1/2-13 UNC	16399.1	1065.9	1639.9
1/2-20 UNF	17036.9	1107.4	1703.7
9/16-12 UNC	18527.4	1354.8	2084.3
9/16-18 UNF	19183.3	1402.8	2158.1
5/8-11 UNC	20626.4	1675.9	2578.3
5/8-18 UNF	21461.0	1743.7	2682.6
3/4-10 UNC	24963.1	2433.9	3744.5
3/4-16 UNF	25852.3	2520.6	3877.8
7/8-9 UNC	29256.0	3327.9	5119.8
7/8-14 UNF	30196.2	3434.8	5284.3
1-8 UNC	33483.3	4352.8	6696.7
1-12 UNF	34470.9	4481.2	6894.2
1 1/8-7 UNC	37615.9	5501.3	8463.6
1 1/8-12 UNF	39026.2	5707.6	8780.9
1 1/4-7 UNC	42171.2	6852.8	10542.8
1 1/4-12 UNF	43581.6	7082.0	10895.4
1 3/8-6 UNC	46161.7	8251.4	12694.5
1 3/8-12 UNF	48136.9	8604.5	13237.6
1 1/2-6 UNC	50717.0	9889.8	15215.1
1 1/2-12 UNF	52692.2	10275.0	15807.7
1 3/4-5 UNC	59040.5	13431.7	20664.2
2-4 1/2 UNC	67626.3	17582.8	27050.5

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $1.125 = 1 \frac{1}{8}$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
5/16-18 UNC	6295.4	255.8	393.5
5/16-24 UNF	6500.4	264.1	406.3
3/8-16 UNC	9139.8	445.6	685.5
3/8-24 UNF	9508.8	463.6	713.2
7/16-14 UNC	12471.1	709.3	1091.2
7/16-20 UNF	12914.3	734.5	1130.0
1/2-13 UNC	16399.1	1065.9	1639.9
1/2-20 UNF	17036.9	1107.4	1703.7
9/16-12 UNC	18527.4	1354.8	2084.3
9/16-18 UNF	19183.3	1402.8	2158.1
5/8-11 UNC	23204.7	1885.4	2900.6
5/8-18 UNF	24143.6	1961.7	3017.9
3/4-10 UNC	28083.5	2738.1	4212.5
3/4-16 UNF	29083.8	2835.7	4362.6
7/8-9 UNC	32913.0	3743.9	5759.8
7/8-14 UNF	33970.8	3864.2	5944.9
1-8 UNC	37668.8	4896.9	7533.8
1-12 UNF	38779.8	5041.4	7756.0
1 1/8-7 UNC	42317.9	6189.0	9521.5
1 1/8-12 UNF	43904.5	6421.0	9878.5
1 1/4-7 UNC	47442.6	7709.4	11860.7
1 1/4-12 UNF	49029.3	7967.3	12257.3
1 3/8-6 UNC	51931.9	9282.8	14281.3
1 3/8-12 UNF	54154.0	9680.0	14892.3
1 1/2-6 UNC	57056.6	11126.0	17117.0
1 1/2-12 UNF	59278.7	11559.3	17783.6
1 3/4-5 UNC	66420.5	15110.7	23247.2
2-4 1/2 UNC	76079.6	19780.7	30431.8

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $1.25 = 1 \frac{1}{4}$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
5/16-18 UNC	6295.4	255.8	393.5
5/16-24 UNF	6500.4	264.1	406.3
3/8-16 UNC	9139.8	445.6	685.5
3/8-24 UNF	9508.8	463.6	713.2
7/16-14 UNC	12471.1	709.3	1091.2
7/16-20 UNF	12914.3	734.5	1130.0
1/2-13 UNC	16399.1	1065.9	1639.9
1/2-20 UNF	17036.9	1107.4	1703.7
9/16-12 UNC	18527.4	1354.8	2084.3
9/16-18 UNF	19183.3	1402.8	2158.1
5/8-11 UNC	25783.1	2094.9	3222.9
5/8-18 UNF	26826.2	2179.6	3353.3
3/4-10 UNC	31203.9	3042.4	4680.6
3/4-16 UNF	32315.4	3150.7	4847.3
7/8-9 UNC	36570.0	4159.8	6399.8
7/8-14 UNF	37745.3	4293.5	6605.4
1-8 UNC	41854.2	5441.0	8370.8
1-12 UNF	43088.7	5601.5	8617.7
1 1/8-7 UNC	47019.9	6876.7	10579.5
1 1/8-12 UNF	48782.8	7134.5	10976.1
1 1/4-7 UNC	52714.0	8566.0	13178.5
1 1/4-12 UNF	54476.9	8852.5	13619.2
1 3/8-6 UNC	57702.1	10314.3	15868.1
1 3/8-12 UNF	60171.1	10755.6	16547.0
1 1/2-6 UNC	63396.2	12362.3	19018.9
1 1/2-12 UNF	65865.2	12843.7	19759.6
1 3/4-5 UNC	73800.6	16789.6	25830.2
2-4 1/2 UNC	84532.9	21978.5	33813.2

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $1.375 = 1 \frac{3}{8}$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
5/16-24 UNF	6500.4	264.1	406.3
3/8-16 UNC	9139.8	445.6	685.5
3/8-24 UNF	9508.8	463.6	713.2
7/16-14 UNC	12471.1	709.3	1091.2
7/16-20 UNF	12914.3	734.5	1130.0
1/2-13 UNC	16399.1	1065.9	1639.9
1/2-20 UNF	17036.9	1107.4	1703.7
9/16-12 UNC	18527.4	1354.8	2084.3
9/16-18 UNF	19183.3	1402.8	2158.1
5/8-11 UNC	25783.1	2094.9	3222.9
5/8-18 UNF	26826.2	2179.6	3353.3
3/4-10 UNC	34324.3	3346.6	5148.6
3/4-16 UNF	35546.9	3465.8	5332.0
7/8-9 UNC	40227.0	4575.8	7039.7
7/8-14 UNF	41519.8	4722.9	7266.0
1-8 UNC	46039.6	5985.1	9207.9
1-12 UNF	47397.5	6161.7	9479.5
1 1/8-7 UNC	51721.9	7564.3	11637.4
1 1/8-12 UNF	53661.1	7847.9	12073.7
1 1/4-7 UNC	57985.4	9422.6	14496.4
1 1/4-12 UNF	59924.6	9737.8	14981.2
1 3/8-6 UNC	63472.3	11345.7	17454.9
1 3/8-12 UNF	66188.2	11831.1	18201.8
1 1/2-6 UNC	69735.9	13598.5	20920.8
1 1/2-12 UNF	72451.7	14128.1	21735.5
1 3/4-5 UNC	81180.6	18468.6	28413.2
2-4 1/2 UNC	92986.2	24176.4	37194.5

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 1.5 = 1 1/2
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
3/8-16 UNC	9139.8	445.6	685.5
3/8-24 UNF	9508.8	463.6	713.2
7/16-14 UNC	12471.1	709.3	1091.2
7/16-20 UNF	12914.3	734.5	1130.0
1/2-13 UNC	16399.1	1065.9	1639.9
1/2-20 UNF	17036.9	1107.4	1703.7
9/16-12 UNC	18527.4	1354.8	2084.3
9/16-18 UNF	19183.3	1402.8	2158.1
5/8-11 UNC	25783.1	2094.9	3222.9
5/8-18 UNF	26826.2	2179.6	3353.3
3/4-10 UNC	34324.3	3346.6	5148.6
3/4-16 UNF	35546.9	3465.8	5332.0
7/8-9 UNC	43884.0	4991.8	7679.7
7/8-14 UNF	45294.4	5152.2	7926.5
1-8 UNC	50225.0	6529.3	10045.0
1-12 UNF	51706.4	6721.8	10341.3
1 1/8-7 UNC	56423.9	8252.0	12695.4
1 1/8-12 UNF	58539.4	8561.4	13171.4
1 1/4-7 UNC	63256.8	10279.2	15814.2
1 1/4-12 UNF	65372.3	10623.0	16343.1
1 3/8-6 UNC	69242.5	12377.1	19041.7
1 3/8-12 UNF	72205.3	12906.7	19856.5
1 1/2-6 UNC	76075.5	14834.7	22822.6
1 1/2-12 UNF	79038.3	15412.5	23711.5
1 3/4-5 UNC	88560.7	20147.6	30996.2
2-4 1/2 UNC	101439.5	26374.3	40575.8

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $1.75 = 1 \frac{3}{4}$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
7/16-14 UNC	12471.1	709.3	1091.2
7/16-20 UNF	12914.3	734.5	1130.0
1/2-13 UNC	16399.1	1065.9	1639.9
1/2-20 UNF	17036.9	1107.4	1703.7
9/16-12 UNC	18527.4	1354.8	2084.3
9/16-18 UNF	19183.3	1402.8	2158.1
5/8-11 UNC	25783.1	2094.9	3222.9
5/8-18 UNF	26826.2	2179.6	3353.3
3/4-10 UNC	34324.3	3346.6	5148.6
3/4-16 UNF	35546.9	3465.8	5332.0
7/8-9 UNC	51198.0	5823.8	8959.7
7/8-14 UNF	52843.4	6010.9	9247.6
1-8 UNC	58595.9	7617.5	11719.2
1-12 UNF	60324.1	7842.1	12064.8
1 1/8-7 UNC	65827.9	9627.3	14811.3
1 1/8-12 UNF	68295.9	9988.3	15366.6
1 1/4-7 UNC	73799.7	11992.4	18449.9
1 1/4-12 UNF	76267.7	12393.5	19066.9
1 3/8-6 UNC	80782.9	14440.0	22215.3
1 3/8-12 UNF	84239.5	15057.8	23165.9
1 1/2-6 UNC	88754.7	17307.2	26626.4
1 1/2-12 UNF	92211.3	17981.2	27663.4
1 3/4-5 UNC	103320.8	23505.5	36162.3
2-4 1/2 UNC	118346.0	30770.0	47338.4

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 2.00
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
1/2-20 UNF	17036.9	1107.4	1703.7
9/16-12 UNC	18527.4	1354.8	2084.3
9/16-18 UNF	19183.3	1402.8	2158.1
5/8-11 UNC	25783.1	2094.9	3222.9
5/8-18 UNF	26826.2	2179.6	3353.3
3/4-10 UNC	34324.3	3346.6	5148.6
3/4-16 UNF	35546.9	3465.8	5332.0
7/8-9 UNC	51198.0	5823.8	8959.7
7/8-14 UNF	52843.4	6010.9	9247.6
1-8 UNC	66966.7	8705.7	13393.3
1-12 UNF	68941.9	8962.4	13788.4
1 1/8-7 UNC	75231.8	11002.7	16927.2
1 1/8-12 UNF	78052.5	11415.2	17561.8
1 1/4-7 UNC	84342.5	13705.7	21085.6
1 1/4-12 UNF	87163.1	14164.0	21790.8
1 3/8-6 UNC	92323.4	16502.8	25388.9
1 3/8-12 UNF	96273.7	17208.9	26475.3
1 1/2-6 UNC	101434.0	19779.6	30430.2
1 1/2-12 UNF	105384.3	20549.9	31615.3
1 3/4-5 UNC	118080.9	26863.4	41328.3
2-4 1/2 UNC	135252.6	35165.7	54101.0

Aluminum 2024-T4/T351

$$F_{su} = 37.5 \text{ ksi}$$

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 0.0625 = 1/16
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
0-80 UNF	127.4	1.0	1.5
1-64 UNC	154.4	1.5	2.3
1-72 UNF	157.1	1.5	2.3
2-56 UNC	182.6	2.0	3.1
2-64 UNF	186.3	2.1	3.2
3-56 UNF	214.5	2.8	4.2

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 0.125 = 1/8
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
0-80 UNF	254.8	2.0	3.1
1-64 UNC	308.8	2.9	4.5
1-72 UNF	314.2	3.0	4.6
2-56 UNC	365.2	4.1	6.3
2-64 UNF	372.6	4.2	6.4
3-48 UNC	419.7	5.4	8.3
3-56 UNF	429.0	5.5	8.5
4-40 UNC	470.3	6.8	10.5
4-48 UNF	483.5	7.0	10.8
5-40 UNC	534.1	8.7	13.4
5-44 UNF	540.9	8.8	13.5
6-32 UNC	577.8	10.4	15.9
6-40 UNF	597.9	10.7	16.5
8-32 UNC	705.4	15.0	23.1
8-36 UNF	716.7	15.3	23.5
10-32 UNF	833.0	20.6	31.7
12-28 UNF	946.4	26.6	40.9
1/4-28 UNF	1113.3	36.2	55.7

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.1875 = 3/16$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1-64 UNC	463.1	4.4	6.8
1-72 UNF	471.2	4.5	6.9
2-56 UNC	547.8	6.1	9.4
2-64 UNF	558.9	6.2	9.6
3-48 UNC	629.5	8.1	12.5
3-56 UNF	643.5	8.3	12.7
4-40 UNC	705.4	10.3	15.8
4-48 UNF	725.3	10.6	16.2
5-40 UNC	801.1	13.0	20.0
5-44 UNF	811.4	13.2	20.3
6-32 UNC	866.6	15.5	23.9
6-40 UNF	896.8	16.1	24.8
8-32 UNC	1058.1	22.6	34.7
8-36 UNF	1075.0	22.9	35.3
10-24 UNC	1199.5	29.6	45.6
10-32 UNF	1249.5	30.9	47.5
12-24 UNC	1390.9	39.1	60.1
12-28 UNF	1419.6	39.9	61.3
1/4-20 UNC	1601.5	52.0	80.1
1/4-28 UNF	1670.0	54.3	83.5
5/16-18 UNC	2035.2	82.7	127.2
5/16-24 UNF	2101.4	85.4	131.3
3/8-24 UNF	2561.6	124.9	192.1
7/16-20 UNF	2982.1	169.6	260.9
1/2-20 UNF	3442.3	223.7	344.2
9/16-18 UNF	3875.9	283.4	436.0
5/8-18 UNF	4336.1	352.3	542.0

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 0.25 = 1/4
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
2-56 UNC	730.4	8.2	12.6
2-64 UNF	745.1	8.3	12.8
3-48 UNC	839.4	10.8	16.6
3-56 UNF	858.0	11.0	17.0
4-40 UNC	940.5	13.7	21.1
4-48 UNF	967.0	14.1	21.7
5-40 UNC	1068.1	17.4	26.7
5-44 UNF	1081.9	17.6	27.0
6-32 UNC	1155.5	20.7	31.9
6-40 UNF	1195.8	21.5	33.0
8-32 UNC	1410.8	30.1	46.3
8-36 UNF	1433.4	30.6	47.0
10-24 UNC	1599.3	39.5	60.8
10-32 UNF	1666.0	41.2	63.3
12-24 UNC	1854.5	52.1	80.1
12-28 UNF	1892.8	53.2	81.8
1/4-20 UNC	2135.3	69.4	106.8
1/4-28 UNF	2226.6	72.4	111.3
5/16-18 UNC	2713.6	110.2	169.6
5/16-24 UNF	2801.9	113.8	175.1
3/8-16 UNC	3283.0	160.0	246.2
3/8-24 UNF	3415.5	166.5	256.2
7/16-14 UNC	3839.6	218.4	336.0
7/16-20 UNF	3976.1	226.1	347.9
1/2-13 UNC	4417.9	287.2	441.8
1/2-20 UNF	4589.7	298.3	459.0
9/16-18 UNF	5167.9	377.9	581.4
5/8-18 UNF	5781.5	469.7	722.7
3/4-16 UNF	6964.5	679.0	1044.7
7/8-14 UNF	8134.8	925.3	1423.6

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.3125 = 5/16$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3-48 UNC	839.4	10.8	16.6
3-56 UNF	858.0	11.0	17.0
4-40 UNC	940.5	13.7	21.1
4-48 UNF	967.0	14.1	21.7
5-40 UNC	1335.2	21.7	33.4
5-44 UNF	1352.4	22.0	33.8
6-32 UNC	1444.4	25.9	39.9
6-40 UNF	1494.7	26.8	41.3
8-32 UNC	1763.5	37.6	57.8
8-36 UNF	1791.7	38.2	58.8
10-24 UNC	1999.1	49.4	76.0
10-32 UNF	2082.5	51.4	79.1
12-24 UNC	2318.2	65.1	100.1
12-28 UNF	2366.0	66.4	102.2
1/4-20 UNC	2669.1	86.7	133.5
1/4-28 UNF	2783.3	90.5	139.2
5/16-18 UNC	3391.9	137.8	212.0
5/16-24 UNF	3502.4	142.3	218.9
3/8-16 UNC	4103.7	200.1	307.8
3/8-24 UNF	4269.4	208.1	320.2
7/16-14 UNC	4799.5	273.0	420.0
7/16-20 UNF	4970.1	282.7	434.9
1/2-13 UNC	5522.3	359.0	552.2
1/2-20 UNF	5737.1	372.9	573.7
9/16-12 UNC	6239.0	456.2	701.9
9/16-18 UNF	6459.9	472.4	726.7
5/8-11 UNC	6945.9	564.4	868.2
5/8-18 UNF	7226.9	587.2	903.4
3/4-10 UNC	8406.2	819.6	1260.9
3/4-16 UNF	8705.6	848.8	1305.8
7/8-14 UNF	10168.5	1156.7	1779.5
1-12 UNF	11607.9	1509.0	2321.6
11/8-12 UNF	13141.9	1922.0	2956.9
11/4-12 UNF	14675.9	2384.8	3669.0
13/8-12 UNF	16209.9	2897.5	4457.7
11/2-12 UNF	17743.9	3460.1	5323.2

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.375 = 3/8$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
4-40 UNC	940.5	13.7	21.1
4-48 UNF	967.0	14.1	21.7
5-40 UNC	1335.2	21.7	33.4
5-44 UNF	1352.4	22.0	33.8
6-32 UNC	1444.4	25.9	39.9
6-40 UNF	1494.7	26.8	41.3
8-32 UNC	1763.5	37.6	57.8
8-36 UNF	1791.7	38.2	58.8
10-24 UNC	2398.9	59.3	91.2
10-32 UNF	2499.0	61.7	95.0
12-24 UNC	2781.8	78.1	120.2
12-28 UNF	2839.2	79.7	122.7
1/4-20 UNC	3203.0	104.1	160.1
1/4-28 UNF	3339.9	108.5	167.0
5/16-18 UNC	4070.3	165.4	254.4
5/16-24 UNF	4202.9	170.7	262.7
3/8-16 UNC	4924.4	240.1	369.3
3/8-24 UNF	5123.3	249.8	384.2
7/16-14 UNC	5759.4	327.6	503.9
7/16-20 UNF	5964.1	339.2	521.9
1/2-13 UNC	6626.8	430.7	662.7
1/2-20 UNF	6884.5	447.5	688.5
9/16-12 UNC	7486.8	547.5	842.3
9/16-18 UNF	7751.9	566.9	872.1
5/8-11 UNC	8335.0	677.2	1041.9
5/8-18 UNF	8672.3	704.6	1084.0
3/4-10 UNC	10087.5	983.5	1513.1
3/4-16 UNF	10446.8	1018.6	1567.0
7/8-9 UNC	11822.2	1344.8	2068.9
7/8-14 UNF	12202.1	1388.0	2135.4
1-12 UNF	13929.5	1810.8	2785.9
1 1/8-12 UNF	15770.3	2306.4	3548.3
1 1/4-12 UNF	17611.1	2861.8	4402.8
1 3/8-12 UNF	19451.9	3477.0	5349.3
1 1/2-12 UNF	21292.6	4152.1	6387.8

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.4375 = 7/16$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5-40 UNC	1335.2	21.7	33.4
5-44 UNF	1352.4	22.0	33.8
6-32 UNC	1444.4	25.9	39.9
6-40 UNF	1494.7	26.8	41.3
8-32 UNC	1763.5	37.6	57.8
8-36 UNF	1791.7	38.2	58.8
10-24 UNC	2398.9	59.3	91.2
10-32 UNF	2499.0	61.7	95.0
12-24 UNC	3245.4	91.1	140.2
12-28 UNF	3312.4	93.0	143.1
1/4-20 UNC	3736.8	121.4	186.8
1/4-28 UNF	3896.6	126.6	194.8
5/16-18 UNC	4748.7	192.9	296.8
5/16-24 UNF	4903.3	199.2	306.5
3/8-16 UNC	5745.2	280.1	430.9
3/8-24 UNF	5977.1	291.4	448.3
7/16-14 UNC	6719.3	382.2	587.9
7/16-20 UNF	6958.1	395.7	608.8
1/2-13 UNC	7731.3	502.5	773.1
1/2-20 UNF	8031.9	522.1	803.2
9/16-12 UNC	8734.6	638.7	982.6
9/16-18 UNF	9043.9	661.3	1017.4
5/8-11 UNC	9724.2	790.1	1215.5
5/8-18 UNF	10117.6	822.1	1264.7
3/4-10 UNC	11768.7	1147.4	1765.3
3/4-16 UNF	12187.9	1188.3	1828.2
7/8-9 UNC	13792.6	1568.9	2413.7
7/8-14 UNF	14235.8	1619.3	2491.3
1-8 UNC	15785.5	2052.1	3157.1
1-12 UNF	16251.1	2112.6	3250.2
1 1/8-7 UNC	17733.8	2593.6	3990.1
1 1/8-12 UNF	18398.7	2690.8	4139.7
1 1/4-7 UNC	19881.4	3230.7	4970.3
1 1/4-12 UNF	20546.3	3338.8	5136.6
1 3/8-6 UNC	21762.6	3890.1	5984.7
1 3/8-12 UNF	22693.8	4056.5	6240.8
1 1/2-12 UNF	24841.4	4844.1	7452.4

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 0.5 = 1/2
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
6-40 UNF	1494.7	26.8	41.3
8-32 UNC	1763.5	37.6	57.8
8-36 UNF	1791.7	38.2	58.8
10-24 UNC	2398.9	59.3	91.2
10-32 UNF	2499.0	61.7	95.0
12-24 UNC	3245.4	91.1	140.2
12-28 UNF	3312.4	93.0	143.1
1/4-20 UNC	4270.6	138.8	213.5
1/4-28 UNF	4453.2	144.7	222.7
5/16-18 UNC	5427.1	220.5	339.2
5/16-24 UNF	5603.8	227.7	350.2
3/8-16 UNC	6565.9	320.1	492.4
3/8-24 UNF	6831.0	333.0	512.3
7/16-14 UNC	7679.2	436.8	671.9
7/16-20 UNF	7952.2	452.3	695.8
1/2-13 UNC	8835.7	574.3	883.6
1/2-20 UNF	9179.3	596.7	917.9
9/16-12 UNC	9982.4	730.0	1123.0
9/16-18 UNF	10335.8	755.8	1162.8
5/8-11 UNC	11113.4	903.0	1389.2
5/8-18 UNF	11563.0	939.5	1445.4
3/4-10 UNC	13449.9	1311.4	2017.5
3/4-16 UNF	13929.0	1358.1	2089.4
7/8-9 UNC	15762.9	1793.0	2758.5
7/8-14 UNF	16269.5	1850.7	2847.2
1-8 UNC	18040.6	2345.3	3608.1
1-12 UNF	18572.7	2414.5	3714.5
1 1/8-7 UNC	20267.2	2964.1	4560.1
1 1/8-12 UNF	21027.1	3075.2	4731.1
1 1/4-7 UNC	22721.6	3692.3	5680.4
1 1/4-12 UNF	23481.4	3815.7	5870.4
1 3/8-12 UNF	25935.8	4636.0	7132.3
1 1/2-12 UNF	28390.2	5536.1	8517.1

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.5625 = 9/16$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
8-32 UNC	1763.5	37.6	57.8
8-36 UNF	1791.7	38.2	58.8
10-24 UNC	2398.9	59.3	91.2
10-32 UNF	2499.0	61.7	95.0
12-24 UNC	3245.4	91.1	140.2
12-28 UNF	3312.4	93.0	143.1
1/4-20 UNC	4270.6	138.8	213.5
1/4-28 UNF	4453.2	144.7	222.7
5/16-18 UNC	6105.5	248.0	381.6
5/16-24 UNF	6304.3	256.1	394.0
3/8-16 UNC	7386.7	360.1	554.0
3/8-24 UNF	7684.9	374.6	576.4
7/16-14 UNC	8639.1	491.4	755.9
7/16-20 UNF	8946.2	508.8	782.8
1/2-13 UNC	9940.2	646.1	994.0
1/2-20 UNF	10326.8	671.2	1032.7
9/16-12 UNC	11230.2	821.2	1263.4
9/16-18 UNF	11627.8	850.3	1308.1
5/8-11 UNC	12502.6	1015.8	1562.8
5/8-18 UNF	13008.4	1056.9	1626.1
3/4-10 UNC	15131.2	1475.3	2269.7
3/4-16 UNF	15670.2	1527.8	2350.5
7/8-9 UNC	17733.3	2017.2	3103.3
7/8-14 UNF	18303.2	2082.0	3203.1
1-8 UNC	20295.7	2638.4	4059.1
1-12 UNF	20894.3	2716.3	4178.9
1 1/8-7 UNC	22800.6	3334.6	5130.1
1 1/8-12 UNF	23655.5	3459.6	5322.5
1 1/4-7 UNC	25561.8	4153.8	6390.4
1 1/4-12 UNF	26416.6	4292.7	6604.2
1 3/8-6 UNC	27980.5	5001.5	7694.7
1 3/8-12 UNF	29177.8	5215.5	8023.9
1 1/2-6 UNC	30741.7	5994.6	9222.5
1 1/2-12 UNF	31939.0	6228.1	9581.7

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.625 = 5/8$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
8-36 UNF	1791.7	38.2	58.8
10-24 UNC	2398.9	59.3	91.2
10-32 UNF	2499.0	61.7	95.0
12-24 UNC	3245.4	91.1	140.2
12-28 UNF	3312.4	93.0	143.1
1/4-20 UNC	4270.6	138.8	213.5
1/4-28 UNF	4453.2	144.7	222.7
5/16-18 UNC	6783.9	275.6	424.0
5/16-24 UNF	7004.8	284.6	437.8
3/8-16 UNC	8207.4	400.1	615.6
3/8-24 UNF	8538.8	416.3	640.4
7/16-14 UNC	9599.0	545.9	839.9
7/16-20 UNF	9940.2	565.3	869.8
1/2-13 UNC	11044.7	717.9	1104.5
1/2-20 UNF	11474.2	745.8	1147.4
9/16-12 UNC	12478.0	912.5	1403.8
9/16-18 UNF	12919.8	944.8	1453.5
5/8-11 UNC	13891.7	1128.7	1736.5
5/8-18 UNF	14453.8	1174.4	1806.7
3/4-10 UNC	16812.4	1639.2	2521.9
3/4-16 UNF	17411.3	1697.6	2611.7
7/8-9 UNC	19703.7	2241.3	3448.1
7/8-14 UNF	20336.9	2313.3	3559.0
1-8 UNC	22550.7	2931.6	4510.1
1-12 UNF	23215.9	3018.1	4643.2
1 1/8-7 UNC	25334.0	3705.1	5700.1
1 1/8-12 UNF	26283.8	3844.0	5913.9
1 1/4-7 UNC	28402.0	4615.3	7100.5
1 1/4-12 UNF	29351.8	4769.7	7338.0
1 3/8-6 UNC	31089.5	5557.2	8549.6
1 3/8-12 UNF	32419.8	5795.0	8915.4
1 1/2-6 UNC	34157.5	6660.7	10247.2
1 1/2-12 UNF	35487.7	6920.1	10646.3
1 3/4-5 UNC	39763.2	9046.1	13917.1

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.75 = 3/4$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
12-24 UNC	3245.4	91.1	140.2
12-28 UNF	3312.4	93.0	143.1
1/4-20 UNC	4270.6	138.8	213.5
1/4-28 UNF	4453.2	144.7	222.7
5/16-18 UNC	6783.9	275.6	424.0
5/16-24 UNF	7004.8	284.6	437.8
3/8-16 UNC	9848.9	480.1	738.7
3/8-24 UNF	10246.5	499.5	768.5
7/16-14 UNC	11518.8	655.1	1007.9
7/16-20 UNF	11928.2	678.4	1043.7
1/2-13 UNC	13253.6	861.5	1325.4
1/2-20 UNF	13769.0	895.0	1376.9
9/16-12 UNC	14973.6	1094.9	1684.5
9/16-18 UNF	15503.8	1133.7	1744.2
5/8-11 UNC	16670.1	1354.4	2083.8
5/8-18 UNF	17344.5	1409.2	2168.1
3/4-10 UNC	20174.9	1967.1	3026.2
3/4-16 UNF	20893.6	2037.1	3134.0
7/8-9 UNC	23644.4	2689.6	4137.8
7/8-14 UNF	24404.3	2776.0	4270.7
1-8 UNC	27060.9	3517.9	5412.2
1-12 UNF	27859.1	3621.7	5571.8
1 1/8-7 UNC	30400.8	4446.1	6840.2
1 1/8-12 UNF	31540.6	4612.8	7096.6
1 1/4-7 UNC	34082.4	5538.4	8520.6
1 1/4-12 UNF	35222.2	5723.6	8805.5
1 3/8-6 UNC	37307.4	6668.7	10259.5
1 3/8-12 UNF	38903.7	6954.0	10698.5
1 1/2-6 UNC	40988.9	7992.8	12296.7
1 1/2-12 UNF	42585.3	8304.1	12775.6
1 3/4-5 UNC	47715.9	10855.4	16700.6
2-4 1/2 UNC	54654.9	14210.3	21862.0

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.875 = 7/8$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/4-20 UNC	4270.6	138.8	213.5
1/4-28 UNF	4453.2	144.7	222.7
5/16-18 UNC	6783.9	275.6	424.0
5/16-24 UNF	7004.8	284.6	437.8
3/8-16 UNC	9848.9	480.1	738.7
3/8-24 UNF	10246.5	499.5	768.5
7/16-14 UNC	13438.7	764.3	1175.9
7/16-20 UNF	13916.3	791.5	1217.7
1/2-13 UNC	15462.5	1005.1	1546.3
1/2-20 UNF	16063.8	1044.2	1606.4
9/16-12 UNC	17469.2	1277.4	1965.3
9/16-18 UNF	18087.7	1322.7	2034.9
5/8-11 UNC	19448.4	1580.2	2431.1
5/8-18 UNF	20235.3	1644.1	2529.4
3/4-10 UNC	23537.4	2294.9	3530.6
3/4-16 UNF	24375.8	2376.6	3656.4
7/8-9 UNC	27585.1	3137.8	4827.4
7/8-14 UNF	28471.7	3238.7	4982.5
1-8 UNC	31571.0	4104.2	6314.2
1-12 UNF	32502.2	4225.3	6500.4
1 1/8-7 UNC	35467.6	5187.1	7980.2
1 1/8-12 UNF	36797.4	5381.6	8279.4
1 1/4-7 UNC	39762.7	6461.4	9940.7
1 1/4-12 UNF	41092.5	6677.5	10273.1
1 3/8-6 UNC	43525.3	7780.1	11969.5
1 3/8-12 UNF	45387.7	8113.0	12481.6
1 1/2-6 UNC	47820.4	9325.0	14346.1
1 1/2-12 UNF	49682.8	9688.1	14904.8
1 3/4-5 UNC	55668.5	12664.6	19484.0
2-4 1/2 UNC	63764.0	16578.6	25505.6

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 1.00
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/4-28 UNF	4453.2	144.7	222.7
5/16-18 UNC	6783.9	275.6	424.0
5/16-24 UNF	7004.8	284.6	437.8
3/8-16 UNC	9848.9	480.1	738.7
3/8-24 UNF	10246.5	499.5	768.5
7/16-14 UNC	13438.7	764.3	1175.9
7/16-20 UNF	13916.3	791.5	1217.7
1/2-13 UNC	17671.5	1148.6	1767.1
1/2-20 UNF	18358.7	1193.3	1835.9
9/16-12 UNC	19964.8	1459.9	2246.0
9/16-18 UNF	20671.7	1511.6	2325.6
5/8-11 UNC	22226.8	1805.9	2778.3
5/8-18 UNF	23126.0	1879.0	2890.8
3/4-10 UNC	26899.9	2622.7	4035.0
3/4-16 UNF	27858.1	2716.2	4178.7
7/8-9 UNC	31525.9	3586.1	5517.0
7/8-14 UNF	32539.0	3701.3	5694.3
1-8 UNC	36081.2	4690.6	7216.2
1-12 UNF	37145.4	4828.9	7429.1
1 1/8-7 UNC	40534.4	5928.2	9120.2
1 1/8-12 UNF	42054.1	6150.4	9462.2
1 1/4-7 UNC	45443.1	7384.5	11360.8
1 1/4-12 UNF	46962.9	7631.5	11740.7
1 3/8-6 UNC	49743.2	8891.6	13679.4
1 3/8-12 UNF	51871.6	9272.1	14264.7
1 1/2-6 UNC	54651.9	10657.1	16395.6
1 1/2-12 UNF	56780.4	11072.2	17034.1
1 3/4-5 UNC	63621.2	14473.8	22267.4
2-4 1/2 UNC	72873.2	18947.0	29149.3

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 1.125 = 1 1/8
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16-18 UNC	6783.9	275.6	424.0
5/16-24 UNF	7004.8	284.6	437.8
3/8-16 UNC	9848.9	480.1	738.7
3/8-24 UNF	10246.5	499.5	768.5
7/16-14 UNC	13438.7	764.3	1175.9
7/16-20 UNF	13916.3	791.5	1217.7
1/2-13 UNC	19880.4	1292.2	1988.0
1/2-20 UNF	20653.5	1342.5	2065.4
9/16-12 UNC	19964.8	1459.9	2246.0
9/16-18 UNF	20671.7	1511.6	2325.6
5/8-11 UNC	25005.1	2031.7	3125.6
5/8-18 UNF	26016.8	2113.9	3252.1
3/4-10 UNC	30262.4	2950.6	4539.4
3/4-16 UNF	31340.3	3055.7	4701.0
7/8-9 UNC	35466.6	4034.3	6206.7
7/8-14 UNF	36606.4	4164.0	6406.1
1-8 UNC	40591.3	5276.9	8118.3
1-12 UNF	41788.6	5432.5	8357.7
1 1/8-7 UNC	45601.2	6669.2	10260.3
1 1/8-12 UNF	47310.9	6919.2	10645.0
1 1/4-7 UNC	51123.5	8307.6	12780.9
1 1/4-12 UNF	52833.2	8585.4	13208.3
1 3/8-6 UNC	55961.1	10003.0	15389.3
1 3/8-12 UNF	58355.6	10431.1	16047.8
1 1/2-6 UNC	61483.4	11989.3	18445.0
1 1/2-12 UNF	63877.9	12456.2	19163.4
1 3/4-5 UNC	71573.8	16283.0	25050.8
2-4 1/2 UNC	81982.3	21315.4	32792.9

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 1.25 = 1 1/4
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16-24 UNF	7004.8	284.6	437.8
3/8-16 UNC	9848.9	480.1	738.7
3/8-24 UNF	10246.5	499.5	768.5
7/16-14 UNC	13438.7	764.3	1175.9
7/16-20 UNF	13916.3	791.5	1217.7
1/2-13 UNC	22089.3	1435.8	2208.9
1/2-20 UNF	22948.4	1491.6	2294.8
9/16-12 UNC	19964.8	1459.9	2246.0
9/16-18 UNF	20671.7	1511.6	2325.6
5/8-11 UNC	27783.5	2257.4	3472.9
5/8-18 UNF	28907.6	2348.7	3613.4
3/4-10 UNC	33624.9	3278.4	5043.7
3/4-16 UNF	34822.6	3395.2	5223.4
7/8-9 UNC	39407.4	4482.6	6896.3
7/8-14 UNF	40673.8	4626.6	7117.9
1-8 UNC	45101.5	5863.2	9020.3
1-12 UNF	46431.8	6036.1	9286.4
1 1/8-7 UNC	50668.0	7410.2	11400.3
1 1/8-12 UNF	52567.7	7688.0	11827.7
1 1/4-7 UNC	56803.9	9230.6	14201.0
1 1/4-12 UNF	58703.6	9539.3	14675.9
1 3/8-6 UNC	62179.0	11114.5	17099.2
1 3/8-12 UNF	64839.5	11590.1	17830.9
1 1/2-6 UNC	68314.9	13321.4	20494.5
1 1/2-12 UNF	70975.5	13840.2	21292.6
1 3/4-5 UNC	79526.5	18092.3	27834.3
2-4 1/2 UNC	91091.5	23683.8	36436.6

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 1.375 = 1 3/8
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/8-16 UNC	9848.9	480.1	738.7
3/8-24 UNF	10246.5	499.5	768.5
7/16-14 UNC	13438.7	764.3	1175.9
7/16-20 UNF	13916.3	791.5	1217.7
1/2-13 UNC	24298.3	1579.4	2429.8
1/2-20 UNF	25243.2	1640.8	2524.3
9/16-12 UNC	19964.8	1459.9	2246.0
9/16-18 UNF	20671.7	1511.6	2325.6
5/8-11 UNC	27783.5	2257.4	3472.9
5/8-18 UNF	28907.6	2348.7	3613.4
3/4-10 UNC	36987.3	3606.3	5548.1
3/4-16 UNF	38304.9	3734.7	5745.7
7/8-9 UNC	43348.1	4930.8	7585.9
7/8-14 UNF	44741.2	5089.3	7829.7
1-8 UNC	49611.6	6449.5	9922.3
1-12 UNF	51074.9	6639.7	10215.0
1 1/8-7 UNC	55734.8	8151.2	12540.3
1 1/8-12 UNF	57824.4	8456.8	13010.5
1 1/4-7 UNC	62484.3	10153.7	15621.1
1 1/4-12 UNF	64574.0	10493.3	16143.5
1 3/8-6 UNC	68396.9	12225.9	18809.1
1 3/8-12 UNF	71323.5	12749.1	19614.0
1 1/2-6 UNC	75146.4	14653.5	22543.9
1 1/2-12 UNF	78073.0	15224.2	23421.9
1 3/4-5 UNC	87479.1	19901.5	30617.7
2-41/2 UNC	100200.6	26052.2	40080.2

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 1.5 = 1 1/2
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/8-24 UNF	10246.5	499.5	768.5
7/16-14 UNC	13438.7	764.3	1175.9
7/16-20 UNF	13916.3	791.5	1217.7
1/2-13 UNC	26507.2	1723.0	2650.7
1/2-20 UNF	27538.0	1790.0	2753.8
9/16-12 UNC	19964.8	1459.9	2246.0
9/16-18 UNF	20671.7	1511.6	2325.6
5/8-11 UNC	27783.5	2257.4	3472.9
5/8-18 UNF	28907.6	2348.7	3613.4
3/4-10 UNC	36987.3	3606.3	5548.1
3/4-16 UNF	38304.9	3734.7	5745.7
7/8-9 UNC	47288.8	5379.1	8275.5
7/8-14 UNF	48808.6	5552.0	8541.5
1-8 UNC	54121.8	7035.8	10824.4
1-12 UNF	55718.1	7243.4	11143.6
1 1/8-7 UNC	60801.6	8892.2	13680.4
1 1/8-12 UNF	63081.2	9225.6	14193.3
1 1/4-7 UNC	68164.7	11076.8	17041.2
1 1/4-12 UNF	70444.3	11447.2	17611.1
1 3/8-6 UNC	74614.8	13337.4	20519.1
1 3/8-12 UNF	77807.4	13908.1	21397.0
1 1/2-6 UNC	81977.9	15985.7	24593.4
1 1/2-12 UNF	85170.5	16608.3	25551.2
1 3/4-5 UNC	95431.8	21710.7	33401.1
2-4 1/2 UNC	109309.8	28420.5	43723.9

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 1.75 = 1 3/4
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
7/16-20 UNF	13916.3	791.5	1217.7
1/2-13 UNC	30925.1	2010.1	3092.5
1/2-20 UNF	32127.7	2088.3	3212.8
9/16-12 UNC	19964.8	1459.9	2246.0
9/16-18 UNF	20671.7	1511.6	2325.6
5/8-11 UNC	27783.5	2257.4	3472.9
5/8-18 UNF	28907.6	2348.7	3613.4
3/4-10 UNC	36987.3	3606.3	5548.1
3/4-16 UNF	38304.9	3734.7	5745.7
7/8-9 UNC	55170.3	6275.6	9654.8
7/8-14 UNF	56943.3	6477.3	9965.1
1-8 UNC	63142.1	8208.5	12628.4
1-12 UNF	65004.5	8450.6	13000.9
1 1/8-7 UNC	70935.2	10374.3	15960.4
1 1/8-12 UNF	73594.8	10763.2	16558.8
1 1/4-7 UNC	79525.5	12922.9	19881.4
1 1/4-12 UNF	82185.0	13355.1	20546.3
1 3/8-6 UNC	87050.6	15560.3	23938.9
1 3/8-12 UNF	90775.3	16226.1	24963.2
1 1/2-6 UNC	95640.9	18650.0	28692.3
1 1/2-12 UNF	99365.6	19376.3	29809.7
1 3/4-5 UNC	111337.1	25329.2	38968.0
2-4 1/2 UNC	127528.0	33157.3	51011.2

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 2.00
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
9/16-18 UNF	20671.7	1511.6	2325.6
5/8-11 UNC	27783.5	2257.4	3472.9
5/8-18 UNF	28907.6	2348.7	3613.4
3/4-10 UNC	36987.3	3606.3	5548.1
3/4-16 UNF	38304.9	3734.7	5745.7
7/8-9 UNC	55170.3	6275.6	9654.8
7/8-14 UNF	56943.3	6477.3	9965.1
1-8 UNC	72162.4	9381.1	14432.5
1-12 UNF	74290.8	9657.8	14858.2
1 1/8-7 UNC	81068.8	11856.3	18240.5
1 1/8-12 UNF	84108.3	12300.8	18924.4
1 1/4-7 UNC	90886.3	14769.0	22721.6
1 1/4-12 UNF	93925.8	15262.9	23481.4
1 3/8-6 UNC	99486.4	17783.2	27358.8
1 3/8-12 UNF	103743.2	18544.1	28529.4
1 1/2-6 UNC	109303.9	21314.3	32791.2
1 1/2-12 UNF	113560.7	22144.3	34068.2
1 3/4-5 UNC	127242.4	28947.6	44534.8
2-4 1/2 UNC	145746.3	37894.0	58298.5

Aluminum 7075-T6/T651

$$F_{su} = 45.6 \text{ ksi}$$

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 0.0625 = 1/16
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
0-80 UNF	154.9	1.2	1.9
1-64 UNC	187.7	1.8	2.7
1-72 UNF	191.0	1.8	2.8
2-56 UNC	222.0	2.5	3.8
2-64 UNF	226.5	2.5	3.9
3-56 UNF	260.8	3.4	5.2

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 0.125 = 1/8
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
0-80 UNF	309.8	2.4	3.7
1-64 UNC	375.5	3.6	5.5
1-72 UNF	382.0	3.6	5.6
2-56 UNC	444.1	5.0	7.6
2-64 UNF	453.0	5.1	7.8
3-48 UNC	510.4	6.6	10.1
3-56 UNF	521.7	6.7	10.3
4-40 UNC	571.8	8.3	12.8
4-48 UNF	587.9	8.6	13.2
5-40 UNC	649.4	10.6	16.2
5-44 UNF	657.8	10.7	16.4
6-32 UNC	702.6	12.6	19.4
6-40 UNF	727.0	13.0	20.1
8-32 UNC	857.7	18.3	28.1
8-36 UNF	871.5	18.6	28.6
10-32 UNF	1012.9	25.0	38.5
12-28 UNF	1150.8	32.3	49.7
1/4-28 UNF	1353.8	44.0	67.7

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.1875 = 3/16$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
1-72 UNF	573.0	5.4	8.4
2-56 UNC	666.1	7.4	11.5
2-64 UNF	679.6	7.6	11.7
3-48 UNC	765.5	9.9	15.2
3-56 UNF	782.5	10.1	15.5
4-40 UNC	857.7	12.5	19.2
4-48 UNF	881.9	12.8	19.8
5-40 UNC	974.1	15.8	24.4
5-44 UNF	986.7	16.0	24.7
6-32 UNC	1053.8	18.9	29.1
6-40 UNF	1090.5	19.6	30.1
8-32 UNC	1286.6	27.4	42.2
8-36 UNF	1307.2	27.9	42.9
10-24 UNC	1458.5	36.0	55.4
10-32 UNF	1519.4	37.5	57.7
12-24 UNC	1691.3	47.5	73.1
12-28 UNF	1726.2	48.5	74.6
1/4-20 UNC	1947.4	63.3	97.4
1/4-28 UNF	2030.7	66.0	101.5
5/16-18 UNC	2474.8	100.5	154.7
5/16-24 UNF	2555.3	103.8	159.7
3/8-24 UNF	3114.9	151.9	233.6
7/16-20 UNF	3626.2	206.2	317.3
1/2-20 UNF	4185.8	272.1	418.6
9/16-18 UNF	4713.1	344.6	530.2
5/8-18 UNF	5272.7	428.4	659.1

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.25 = 1/4$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
3-48 UNC	1020.7	13.1	20.2
3-56 UNF	1043.4	13.4	20.7
4-40 UNC	1143.7	16.7	25.6
4-48 UNF	1175.9	17.1	26.3
5-40 UNC	1298.9	21.1	32.5
5-44 UNF	1315.6	21.4	32.9
6-32 UNC	1405.1	25.2	38.8
6-40 UNF	1454.1	26.1	40.1
8-32 UNC	1715.5	36.6	56.3
8-36 UNF	1743.0	37.2	57.2
10-24 UNC	1944.7	48.0	73.9
10-32 UNF	2025.9	50.0	77.0
12-24 UNC	2255.1	63.3	97.4
12-28 UNF	2301.7	64.6	99.4
1/4-20 UNC	2596.5	84.4	129.8
1/4-28 UNF	2707.6	88.0	135.4
5/16-18 UNC	3299.7	134.0	206.2
5/16-24 UNF	3407.1	138.4	212.9
3/8-16 UNC	3992.1	194.6	299.4
3/8-24 UNF	4153.2	202.5	311.5
7/16-14 UNC	4669.0	265.5	408.5
7/16-20 UNF	4834.9	275.0	423.1
1/2-13 UNC	5372.1	349.2	537.2
1/2-20 UNF	5581.0	362.8	558.1
9/16-18 UNF	6284.2	459.5	707.0
5/8-18 UNF	7030.3	571.2	878.8
3/4-16 UNF	8468.9	825.7	1270.3
7/8-14 UNF	9891.9	1125.2	1731.1

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.3125 = 5/16$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
4-40 UNC	1143.7	16.7	25.6
4-48 UNF	1175.9	17.1	26.3
5-40 UNC	1623.6	26.4	40.6
5-44 UNF	1644.5	26.7	41.1
6-32 UNC	1756.4	31.5	48.5
6-40 UNF	1817.6	32.6	50.2
8-32 UNC	2144.4	45.7	70.3
8-36 UNF	2178.7	46.4	71.5
10-24 UNC	2430.9	60.0	92.4
10-32 UNF	2532.4	62.5	96.2
12-24 UNC	2818.9	79.2	121.8
12-28 UNF	2877.1	80.8	124.3
1/4-20 UNC	3245.7	105.5	162.3
1/4-28 UNF	3384.4	110.0	169.2
5/16-18 UNC	4124.6	167.6	257.8
5/16-24 UNF	4258.9	173.0	266.2
3/8-16 UNC	4990.1	243.3	374.3
3/8-24 UNF	5191.6	253.1	389.4
7/16-14 UNC	5836.2	331.9	510.7
7/16-20 UNF	6043.6	343.7	528.8
1/2-13 UNC	6715.2	436.5	671.5
1/2-20 UNF	6976.3	453.5	697.6
9/16-12 UNC	7586.6	554.8	853.5
9/16-18 UNF	7855.2	574.4	883.7
5/8-11 UNC	8446.2	686.3	1055.8
5/8-18 UNF	8787.9	714.0	1098.5
3/4-10 UNC	10222.0	996.6	1533.3
3/4-16 UNF	10586.1	1032.1	1587.9
7/8-14 UNF	12364.8	1406.5	2163.8
1-12 UNF	14115.3	1835.0	2823.1
1 1/8-12 UNF	15980.6	2337.2	3595.6
1 1/4-12 UNF	17845.9	2900.0	4461.5
1 3/8-12 UNF	19711.2	3523.4	5420.6
1 1/2-12 UNF	21576.5	4207.4	6473.0

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.375 = 3/8$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
5-44 UNF	1644.5	26.7	41.1
6-32 UNC	1756.4	31.5	48.5
6-40 UNF	1817.6	32.6	50.2
8-32 UNC	2144.4	45.7	70.3
8-36 UNF	2178.7	46.4	71.5
10-24 UNC	2917.1	72.1	110.8
10-32 UNF	3038.8	75.1	115.5
12-24 UNC	3382.6	95.0	146.1
12-28 UNF	3452.5	96.9	149.1
1/4-20 UNC	3894.8	126.6	194.7
1/4-28 UNF	4061.3	132.0	203.1
5/16-18 UNC	4949.5	201.1	309.3
5/16-24 UNF	5110.7	207.6	319.4
3/8-16 UNC	5988.1	291.9	449.1
3/8-24 UNF	6229.9	303.7	467.2
7/16-14 UNC	7003.5	398.3	612.8
7/16-20 UNF	7252.4	412.5	634.6
1/2-13 UNC	8058.2	523.8	805.8
1/2-20 UNF	8371.6	544.2	837.2
9/16-12 UNC	9104.0	665.7	1024.2
9/16-18 UNF	9426.3	689.3	1060.5
5/8-11 UNC	10135.4	823.5	1266.9
5/8-18 UNF	10545.5	856.8	1318.2
3/4-10 UNC	12266.3	1196.0	1840.0
3/4-16 UNF	12703.3	1238.6	1905.5
7/8-9 UNC	14375.8	1635.2	2515.8
7/8-14 UNF	14837.8	1687.8	2596.6
1-12 UNF	16938.3	2202.0	3387.7
1 1/8-12 UNF	19176.7	2804.6	4314.8
1 1/4-12 UNF	21415.1	3479.9	5353.8
1 3/8-12 UNF	23653.5	4228.1	6504.7
1 1/2-12 UNF	25891.8	5048.9	7767.6

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.4375 = 7/16$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
8-32 UNC	2144.4	45.7	70.3
8-36 UNF	2178.7	46.4	71.5
10-24 UNC	2917.1	72.1	110.8
10-32 UNF	3038.8	75.1	115.5
12-24 UNC	3946.4	110.8	170.5
12-28 UNF	4027.9	113.1	174.0
1/4-20 UNC	4543.9	147.7	227.2
1/4-28 UNF	4738.2	154.0	236.9
5/16-18 UNC	5774.4	234.6	360.9
5/16-24 UNF	5962.5	242.2	372.7
3/8-16 UNC	6986.1	340.6	524.0
3/8-24 UNF	7268.2	354.3	545.1
7/16-14 UNC	8170.7	464.7	714.9
7/16-20 UNF	8461.1	481.2	740.3
1/2-13 UNC	9401.2	611.1	940.1
1/2-20 UNF	9766.8	634.8	976.7
9/16-12 UNC	10621.3	776.7	1194.9
9/16-18 UNF	10997.3	804.2	1237.2
5/8-11 UNC	11824.6	960.8	1478.1
5/8-18 UNF	12303.1	999.6	1537.9
3/4-10 UNC	14310.7	1395.3	2146.6
3/4-16 UNF	14820.5	1445.0	2223.1
7/8-9 UNC	16771.8	1907.8	2935.1
7/8-14 UNF	17310.8	1969.1	3029.4
1-8 UNC	19195.2	2495.4	3839.0
1-12 UNF	19761.4	2569.0	3952.3
1 1/8-7 UNC	21564.3	3153.8	4852.0
1 1/8-12 UNF	22372.8	3272.0	5033.9
1 1/4-7 UNC	24175.7	3928.6	6043.9
1 1/4-12 UNF	24984.3	4059.9	6246.1
1 3/8-6 UNC	26463.4	4730.3	7277.4
1 3/8-12 UNF	27595.7	4932.7	7588.8
1 1/2-12 UNF	30207.2	5890.4	9062.1

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 0.5 = 1/2
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
8-36 UNF	2178.7	46.4	71.5
10-24 UNC	2917.1	72.1	110.8
10-32 UNF	3038.8	75.1	115.5
12-24 UNC	3946.4	110.8	170.5
12-28 UNF	4027.9	113.1	174.0
1/4-20 UNC	5193.1	168.8	259.7
1/4-28 UNF	5415.1	176.0	270.8
5/16-18 UNC	6599.4	268.1	412.5
5/16-24 UNF	6814.2	276.8	425.9
3/8-16 UNC	7984.2	389.2	598.8
3/8-24 UNF	8306.5	404.9	623.0
7/16-14 UNC	9337.9	531.1	817.1
7/16-20 UNF	9669.8	550.0	846.1
1/2-13 UNC	10744.2	698.4	1074.4
1/2-20 UNF	11162.1	725.5	1116.2
9/16-12 UNC	12138.6	887.6	1365.6
9/16-18 UNF	12568.4	919.1	1413.9
5/8-11 UNC	13513.9	1098.0	1689.2
5/8-18 UNF	14060.6	1142.4	1757.6
3/4-10 UNC	16355.1	1594.6	2453.3
3/4-16 UNF	16937.7	1651.4	2540.7
7/8-9 UNC	19167.7	2180.3	3354.4
7/8-14 UNF	19783.7	2250.4	3462.2
1-8 UNC	21937.4	2851.9	4387.5
1-12 UNF	22584.4	2936.0	4516.9
1 1/8-7 UNC	24644.9	3604.3	5545.1
1 1/8-12 UNF	25568.9	3739.5	5753.0
1 1/4-7 UNC	27629.4	4489.8	6907.4
1 1/4-12 UNF	28553.4	4639.9	7138.4
1 3/8-12 UNF	31537.9	5637.4	8672.9
1 1/2-12 UNF	34522.5	6731.9	10356.7

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.5625 = 9/16$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
10-32 UNF	3038.8	75.1	115.5
12-24 UNC	3946.4	110.8	170.5
12-28 UNF	4027.9	113.1	174.0
1/4-20 UNC	5193.1	168.8	259.7
1/4-28 UNF	5415.1	176.0	270.8
5/16-18 UNC	7424.3	301.6	464.0
5/16-24 UNF	7666.0	311.4	479.1
3/8-16 UNC	8982.2	437.9	673.7
3/8-24 UNF	9344.8	455.6	700.9
7/16-14 UNC	10505.2	597.5	919.2
7/16-20 UNF	10878.5	618.7	951.9
1/2-13 UNC	12087.3	785.7	1208.7
1/2-20 UNF	12557.3	816.2	1255.7
9/16-12 UNC	13655.9	998.6	1536.3
9/16-18 UNF	14139.4	1033.9	1590.7
5/8-11 UNC	15203.1	1235.3	1900.4
5/8-18 UNF	15818.2	1285.2	1977.3
3/4-10 UNC	18399.5	1794.0	2759.9
3/4-16 UNF	19054.9	1857.9	2858.2
7/8-9 UNC	21563.7	2452.9	3773.6
7/8-14 UNF	22256.7	2531.7	3894.9
1-8 UNC	24679.5	3208.3	4935.9
1-12 UNF	25407.5	3303.0	5081.5
1 1/8-7 UNC	27725.5	4054.9	6238.2
1 1/8-12 UNF	28765.0	4206.9	6472.1
1 1/4-7 UNC	31083.1	5051.0	7770.8
1 1/4-12 UNF	32122.6	5219.9	8030.7
1 3/8-6 UNC	34024.3	6081.9	9356.7
1 3/8-12 UNF	35480.2	6342.1	9757.1
1 1/2-6 UNC	37381.9	7289.5	11214.6
1 1/2-12 UNF	38837.8	7573.4	11651.3

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.625 = 5/8$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
12-24 UNC	3946.4	110.8	170.5
12-28 UNF	4027.9	113.1	174.0
1/4-20 UNC	5193.1	168.8	259.7
1/4-28 UNF	5415.1	176.0	270.8
5/16-18 UNC	8249.2	335.1	515.6
5/16-24 UNF	8517.8	346.0	532.4
3/8-16 UNC	9980.2	486.5	748.5
3/8-24 UNF	10383.1	506.2	778.7
7/16-14 UNC	11672.4	663.9	1021.3
7/16-20 UNF	12087.3	687.5	1057.6
1/2-13 UNC	13430.3	873.0	1343.0
1/2-20 UNF	13952.6	906.9	1395.3
9/16-12 UNC	15173.3	1109.5	1707.0
9/16-18 UNF	15710.5	1148.8	1767.4
5/8-11 UNC	16892.3	1372.5	2111.5
5/8-18 UNF	17575.8	1428.0	2197.0
3/4-10 UNC	20443.9	1993.3	3066.6
3/4-16 UNF	21172.1	2064.3	3175.8
7/8-9 UNC	23959.7	2725.4	4192.9
7/8-14 UNF	24729.7	2813.0	4327.7
1-8 UNC	27421.7	3564.8	5484.3
1-12 UNF	28230.5	3670.0	5646.1
1 1/8-7 UNC	30806.1	4505.4	6931.4
1 1/8-12 UNF	31961.1	4674.3	7191.3
1 1/4-7 UNC	34536.8	5612.2	8634.2
1 1/4-12 UNF	35691.8	5799.9	8922.9
1 3/8-6 UNC	37804.8	6757.6	10396.3
1 3/8-12 UNF	39422.4	7046.8	10841.2
1 1/2-6 UNC	41535.5	8099.4	12460.6
1 1/2-12 UNF	43153.1	8414.8	12945.9
1 3/4-5 UNC	48352.1	11000.1	16923.2

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.75 = 3/4$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
1/4-20 UNC	5193.1	168.8	259.7
1/4-28 UNF	5415.1	176.0	270.8
5/16-18 UNC	8249.2	335.1	515.6
5/16-24 UNF	8517.8	346.0	532.4
3/8-16 UNC	9980.2	486.5	748.5
3/8-24 UNF	10383.1	506.2	778.7
7/16-14 UNC	14006.9	796.6	1225.6
7/16-20 UNF	14504.7	825.0	1269.2
1/2-13 UNC	16116.4	1047.6	1611.6
1/2-20 UNF	16743.1	1088.3	1674.3
9/16-12 UNC	18207.9	1331.5	2048.4
9/16-18 UNF	18852.6	1378.6	2120.9
5/8-11 UNC	20270.8	1647.0	2533.9
5/8-18 UNF	21091.0	1713.6	2636.4
3/4-10 UNC	24532.7	2391.9	3679.9
3/4-16 UNF	25406.6	2477.1	3811.0
7/8-9 UNC	28751.6	3270.5	5031.5
7/8-14 UNF	29675.6	3375.6	5193.2
1-8 UNC	32906.0	4277.8	6581.2
1-12 UNF	33876.6	4404.0	6775.3
1 1/8-7 UNC	36967.4	5406.5	8317.7
1 1/8-12 UNF	38353.4	5609.2	8629.5
1 1/4-7 UNC	41444.1	6734.7	10361.0
1 1/4-12 UNF	42830.1	6959.9	10707.5
1 3/8-6 UNC	45365.8	8109.1	12475.6
1 3/8-12 UNF	47306.9	8456.1	13009.4
1 1/2-6 UNC	49842.6	9719.3	14952.8
1 1/2-12 UNF	51783.7	10097.8	15535.1
1 3/4-5 UNC	58022.5	13200.1	20307.9
2-4 1/2 UNC	66460.3	17279.7	26584.1

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.875 = 7/8$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
5/16-18 UNC	8249.2	335.1	515.6
5/16-24 UNF	8517.8	346.0	532.4
3/8-16 UNC	9980.2	486.5	748.5
3/8-24 UNF	10383.1	506.2	778.7
7/16-14 UNC	14006.9	796.6	1225.6
7/16-20 UNF	14504.7	825.0	1269.2
1/2-13 UNC	18802.4	1222.2	1880.2
1/2-20 UNF	19533.6	1269.7	1953.4
9/16-12 UNC	21242.6	1553.4	2389.8
9/16-18 UNF	21994.7	1608.4	2474.4
5/8-11 UNC	23649.3	1921.5	2956.2
5/8-18 UNF	24606.1	1999.2	3075.8
3/4-10 UNC	28621.5	2790.6	4293.2
3/4-16 UNF	29641.0	2890.0	4446.1
7/8-9 UNC	33543.5	3815.6	5870.1
7/8-14 UNF	34621.5	3938.2	6058.8
1-8 UNC	38390.4	4990.8	7678.1
1-12 UNF	39522.7	5138.0	7904.5
1 1/8-7 UNC	43128.6	6307.6	9703.9
1 1/8-12 UNF	44745.6	6544.0	10067.8
1 1/4-7 UNC	48351.5	7857.1	12087.9
1 1/4-12 UNF	49968.5	8119.9	12492.1
1 3/8-6 UNC	52926.8	9460.7	14554.9
1 3/8-12 UNF	55191.4	9865.5	15177.6
1 1/2-6 UNC	58149.7	11339.2	17444.9
1 1/2-12 UNF	60414.3	11780.8	18124.3
1 3/4-5 UNC	67692.9	15400.1	23692.5
2-1 1/2 UNC	77537.1	20159.6	31014.8

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 1.00
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
5/16-24 UNF	8517.8	346.0	532.4
3/8-16 UNC	9980.2	486.5	748.5
3/8-24 UNF	10383.1	506.2	778.7
7/16-14 UNC	14006.9	796.6	1225.6
7/16-20 UNF	14504.7	825.0	1269.2
1/2-13 UNC	21488.5	1396.8	2148.8
1/2-20 UNF	22324.2	1451.1	2232.4
9/16-12 UNC	24277.2	1775.3	2731.2
9/16-18 UNF	25136.8	1838.1	2827.9
5/8-11 UNC	27027.7	2196.0	3378.5
5/8-18 UNF	28121.3	2284.9	3515.2
3/4-10 UNC	32710.3	3189.3	4906.5
3/4-16 UNF	33875.4	3302.9	5081.3
7/8-9 UNC	38335.5	4360.7	6708.7
7/8-14 UNF	39567.5	4500.8	6924.3
1-8 UNC	43874.7	5703.7	8774.9
1-12 UNF	45168.8	5871.9	9033.8
1 1/8-7 UNC	49289.8	7208.6	11090.2
1 1/8-12 UNF	51137.8	7478.9	11506.0
1 1/4-7 UNC	55258.9	8979.6	13814.7
1 1/4-12 UNF	57106.9	9279.9	14276.7
1 3/8-6 UNC	60487.7	10812.2	16634.1
1 3/8-12 UNF	63075.9	11274.8	17345.9
1 1/2-6 UNC	66456.7	12959.1	19937.0
1 1/2-12 UNF	69044.9	13463.8	20713.5
1 3/4-5 UNC	77363.4	17600.2	27077.2
2-4 1/2 UNC	88613.8	23039.6	35445.5

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $1.125 = 1 \frac{1}{8}$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
3/8-16 UNC	9980.2	486.5	748.5
3/8-24 UNF	10383.1	506.2	778.7
7/16-14 UNC	14006.9	796.6	1225.6
7/16-20 UNF	14504.7	825.0	1269.2
1/2-13 UNC	21488.5	1396.8	2148.8
1/2-20 UNF	22324.2	1451.1	2232.4
9/16-12 UNC	24277.2	1775.3	2731.2
9/16-18 UNF	25136.8	1838.1	2827.9
5/8-11 UNC	30406.2	2470.5	3800.8
5/8-18 UNF	31636.4	2570.5	3954.6
3/4-10 UNC	36799.0	3587.9	5519.9
3/4-16 UNF	38109.8	3715.7	5716.5
7/8-9 UNC	43127.4	4905.7	7547.3
7/8-14 UNF	44513.4	5063.4	7789.8
1-8 UNC	49359.1	6416.7	9871.8
1-12 UNF	50814.9	6605.9	10163.0
1 1/8-7 UNC	55451.1	8109.7	12476.5
1 1/8-12 UNF	57530.1	8413.8	12944.3
1 1/4-7 UNC	62166.2	10102.0	15541.6
1 1/4-12 UNF	64245.2	10439.8	16061.3
1 3/8-6 UNC	68048.7	12163.7	18713.4
1 3/8-12 UNF	70960.4	12684.2	19514.1
1 1/2-6 UNC	74763.8	14578.9	22429.2
1 1/2-12 UNF	77675.5	15146.7	23302.7
1 3/4-5 UNC	87033.8	19800.2	30461.8
2-1 1/2 UNC	99690.5	25919.5	39876.2

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 1.25 = 1 1/4
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
3/8-24 UNF	10383.1	506.2	778.7
7/16-14 UNC	14006.9	796.6	1225.6
7/16-20 UNF	14504.7	825.0	1269.2
1/2-13 UNC	21488.5	1396.8	2148.8
1/2-20 UNF	22324.2	1451.1	2232.4
9/16-12 UNC	24277.2	1775.3	2731.2
9/16-18 UNF	25136.8	1838.1	2827.9
5/8-11 UNC	33784.7	2745.0	4223.1
5/8-18 UNF	35151.6	2856.1	4393.9
3/4-10 UNC	40887.8	3986.6	6133.2
3/4-16 UNF	42344.3	4128.6	6351.6
7/8-9 UNC	47919.3	5450.8	8385.9
7/8-14 UNF	49459.3	5626.0	8655.4
1-8 UNC	54843.4	7129.6	10968.7
1-12 UNF	56461.0	7339.9	11292.2
1 1/8-7 UNC	61612.3	9010.8	13862.8
1 1/8-12 UNF	63922.3	9348.6	14382.5
1 1/4-7 UNC	69073.6	11224.5	17268.4
1 1/4-12 UNF	71383.6	11599.8	17845.9
1 3/8-6 UNC	75609.7	13515.2	20792.7
1 3/8-12 UNF	78844.9	14093.5	21682.3
1 1/2-6 UNC	83070.9	16198.8	24921.3
1 1/2-12 UNF	86306.1	16829.7	25891.8
1 3/4-5 UNC	96704.2	22000.2	33846.5
2-4 1/2 UNC	110767.2	28799.5	44306.9

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $1.375 = 1 \frac{3}{8}$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
7/16-14 UNC	14006.9	796.6	1225.6
7/16-20 UNF	14504.7	825.0	1269.2
1/2-13 UNC	21488.5	1396.8	2148.8
1/2-20 UNF	22324.2	1451.1	2232.4
9/16-12 UNC	24277.2	1775.3	2731.2
9/16-18 UNF	25136.8	1838.1	2827.9
5/8-11 UNC	33784.7	2745.0	4223.1
5/8-18 UNF	35151.6	2856.1	4393.9
3/4-10 UNC	44976.6	4385.2	6746.5
3/4-16 UNF	46578.7	4541.4	6986.8
7/8-9 UNC	52711.3	5995.9	9224.5
7/8-14 UNF	54405.3	6188.6	9520.9
1-8 UNC	60327.8	7842.6	12065.6
1-12 UNF	62107.1	8073.9	12421.4
1 1/8-7 UNC	67773.5	9911.9	15249.0
1 1/8-12 UNF	70314.5	10283.5	15820.8
1 1/4-7 UNC	75980.9	12346.9	18995.2
1 1/4-12 UNF	78521.9	12759.8	19630.5
1 3/8-6 UNC	83170.6	14866.7	22871.9
1 3/8-12 UNF	86729.4	15502.9	23850.6
1 1/2-6 UNC	91378.0	17818.7	27413.4
1 1/2-12 UNF	94936.8	18512.7	28481.0
1 3/4-5 UNC	106374.6	24200.2	37231.1
2-4 1/2 UNC	121843.9	31679.4	48737.6

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 1.5 = 1 1/2
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
7/16-20 UNF	14504.7	825.0	1269.2
1/2-13 UNC	21488.5	1396.8	2148.8
1/2-20 UNF	22324.2	1451.1	2232.4
9/16-12 UNC	24277.2	1775.3	2731.2
9/16-18 UNF	25136.8	1838.1	2827.9
5/8-11 UNC	33784.7	2745.0	4223.1
5/8-18 UNF	35151.6	2856.1	4393.9
3/4-10 UNC	44976.6	4385.2	6746.5
3/4-16 UNF	46578.7	4541.4	6986.8
7/8-9 UNC	57503.2	6541.0	10063.1
7/8-14 UNF	59351.2	6751.2	10386.5
1-8 UNC	65812.1	8555.6	13162.4
1-12 UNF	67753.2	8807.9	13550.6
1 1/8-7 UNC	73934.7	10813.0	16635.3
1 1/8-12 UNF	76706.8	11218.4	17259.0
1 1/4-7 UNC	82888.3	13469.3	20722.1
1 1/4-12 UNF	85660.3	13919.8	21415.1
1 3/8-6 UNC	90731.6	16218.3	24951.2
1 3/8-12 UNF	94613.8	16912.2	26018.8
1 1/2-6 UNC	99685.1	19438.6	29905.5
1 1/2-12 UNF	103567.4	20195.6	31070.2
1 3/4-5 UNC	116045.0	26400.2	40615.8
2-4 1/2 UNC	132920.7	34559.4	53168.3

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 1.75 = 1 3/4
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
1/2-20 UNF	22324.2	1451.1	2232.4
9/16-12 UNC	24277.2	1775.3	2731.2
9/16-18 UNF	25136.8	1838.1	2827.9
5/8-11 UNC	33784.7	2745.0	4223.1
5/8-18 UNF	35151.6	2856.1	4393.9
3/4-10 UNC	44976.6	4385.2	6746.5
3/4-16 UNF	46578.7	4541.4	6986.8
7/8-9 UNC	67087.1	7631.2	11740.2
7/8-14 UNF	69243.1	7876.4	12117.5
1-8 UNC	76780.8	9981.5	15356.2
1-12 UNF	79045.4	10275.9	15809.1
1 1/8-7 UNC	86257.2	12615.1	19407.9
1 1/8-12 UNF	89491.2	13088.1	20135.5
1 1/4-7 UNC	96703.0	15714.2	24175.7
1 1/4-12 UNF	99937.0	16239.8	24984.3
1 3/8-6 UNC	105853.5	18921.3	29109.7
1 3/8-12 UNF	110382.8	19730.9	30355.3
1 1/2-6 UNC	116299.3	22678.4	34889.8
1 1/2-12 UNF	120828.6	23561.6	36248.6
1 3/4-5 UNC	135385.9	30800.3	47385.1
2-4 1/2 UNC	155074.1	40319.3	62029.6

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Length of Thread Engagement (in) = 2.00

[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
9/16-18 UNF	25136.8	1838.1	2827.9
5/8-11 UNC	33784.7	2745.0	4223.1
5/8-18 UNF	35151.6	2856.1	4393.9
3/4-10 UNC	44976.6	4385.2	6746.5
3/4-16 UNF	46578.7	4541.4	6986.8
7/8-9 UNC	67087.1	7631.2	11740.2
7/8-14 UNF	69243.1	7876.4	12117.5
1-8 UNC	87749.5	11407.4	17549.9
1-12 UNF	90337.6	11743.9	18067.5
1 1/8-7 UNC	98579.7	14417.3	22180.4
1 1/8-12 UNF	102275.7	14957.8	23012.0
1 1/4-7 UNC	110517.7	17959.1	27629.4
1 1/4-12 UNF	114213.7	18559.7	28553.4
1 3/8-6 UNC	120975.4	21624.4	33268.2
1 3/8-12 UNF	126151.8	22549.6	34691.7
1 1/2-6 UNC	132913.5	25918.1	39874.0
1 1/2-12 UNF	138089.8	26927.5	41427.0
1 3/4-5 UNC	154726.7	35200.3	54154.3
2-4 1/2 UNC	177227.5	46079.2	70891.0

Tables by Fastener Size

Aluminum 6061-T6

$$F_{su} = 27 \text{ ksi}$$

Tables by Fastener Size

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = 0-80 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	91.7	0.7	1.1
1/8	183.4	1.4	2.2
3/16	275.1	2.1	3.3

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = 1-64 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	111.2	1.1	1.6
1/8	222.3	2.1	3.2
3/16	333.5	3.2	4.9
1/4	333.5	3.2	4.9

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = 1-72 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	113.1	1.1	1.7
1/8	226.2	2.1	3.3
3/16	339.3	3.2	5.0
1/4	339.3	3.2	5.0
5/16	339.3	3.2	5.0

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = 2-56 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	131.5	1.5	2.3
1/8	263.0	2.9	4.5
3/16	394.4	4.4	6.8
1/4	525.9	5.9	9.0
5/16	525.9	5.9	9.0
3/8	525.9	5.9	9.0

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = 2-64 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	134.1	1.5	2.3
1/8	268.3	3.0	4.6
3/16	402.4	4.5	6.9
1/4	536.5	6.0	9.2
5/16	536.5	6.0	9.2
3/8	536.5	6.0	9.2

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = 3-48 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	302.2	3.9	6.0
3/16	453.3	5.8	9.0
1/4	604.4	7.8	12.0
5/16	604.4	7.8	12.0
3/8	604.4	7.8	12.0
7/16	604.4	7.8	12.0

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = 3-56 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	154.4	2.0	3.1
1/8	308.9	4.0	6.1
3/16	463.3	6.0	9.2
1/4	617.8	8.0	12.2
5/16	617.8	8.0	12.2
3/8	617.8	8.0	12.2
7/16	617.8	8.0	12.2

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = 4-40 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	338.6	4.9	7.6
3/16	507.9	7.4	11.4
1/4	677.2	9.9	15.2
5/16	677.2	9.9	15.2
3/8	677.2	9.9	15.2
7/16	677.2	9.9	15.2
1/2	677.2	9.9	15.2

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = 4-48 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	348.1	5.1	7.8
3/16	522.2	7.6	11.7
1/4	696.3	10.1	15.6
5/16	696.3	10.1	15.6
3/8	696.3	10.1	15.6
7/16	696.3	10.1	15.6
1/2	696.3	10.1	15.6
9/16	696.3	10.1	15.6

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = 5-40 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	384.5	6.2	9.6
3/16	576.8	9.4	14.4
1/4	769.1	12.5	19.2
5/16	961.3	15.6	24.0
3/8	961.3	15.6	24.0
7/16	961.3	15.6	24.0
1/2	961.3	15.6	24.0
9/16	961.3	15.6	24.0

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = 5-44 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	389.5	6.3	9.7
3/16	584.2	9.5	14.6
1/4	779.0	12.7	19.5
5/16	973.7	15.8	24.3
3/8	973.7	15.8	24.3
7/16	973.7	15.8	24.3
1/2	973.7	15.8	24.3
9/16	973.7	15.8	24.3
5/8	973.7	15.8	24.3

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = 6-32 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	416.0	7.5	11.5
3/16	624.0	11.2	17.2
1/4	832.0	14.9	23.0
5/16	1040.0	18.7	28.7
3/8	1040.0	18.7	28.7
7/16	1040.0	18.7	28.7
1/2	1040.0	18.7	28.7
9/16	1040.0	18.7	28.7
5/8	1040.0	18.7	28.7

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = 6-40 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	430.5	7.7	11.9
3/16	645.7	11.6	17.8
1/4	861.0	15.4	23.8
5/16	1076.2	19.3	29.7
3/8	1076.2	19.3	29.7
7/16	1076.2	19.3	29.7
1/2	1076.2	19.3	29.7
9/16	1076.2	19.3	29.7
5/8	1076.2	19.3	29.7

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = 8-32 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	507.9	10.8	16.7
3/16	761.8	16.2	25.0
1/4	1015.8	21.7	33.3
5/16	1269.7	27.1	41.6
3/8	1269.7	27.1	41.6
7/16	1269.7	27.1	41.6
1/2	1269.7	27.1	41.6
9/16	1269.7	27.1	41.6
5/8	1269.7	27.1	41.6
3/4	1269.7	27.1	41.6

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = 8-36 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	516.0	11.0	16.9
3/16	774.0	16.5	25.4
1/4	1032.0	22.0	33.9
5/16	1290.0	27.5	42.3
3/8	1290.0	27.5	42.3
7/16	1290.0	27.5	42.3
1/2	1290.0	27.5	42.3
9/16	1290.0	27.5	42.3
5/8	1290.0	27.5	42.3
3/4	1290.0	27.5	42.3
7/8	1290.0	27.5	42.3

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = 10-24 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	863.6	21.3	32.8
1/4	1151.5	28.4	43.8
5/16	1439.3	35.6	54.7
3/8	1727.2	42.7	65.6
7/16	1727.2	42.7	65.6
1/2	1727.2	42.7	65.6
9/16	1727.2	42.7	65.6
5/8	1727.2	42.7	65.6
3/4	1727.2	42.7	65.6
7/8	1727.2	42.7	65.6

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = 10-32 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	599.8	14.8	22.8
3/16	899.7	22.2	34.2
1/4	1199.5	29.6	45.6
5/16	1499.4	37.0	57.0
3/8	1799.3	44.4	68.4
7/16	1799.3	44.4	68.4
1/2	1799.3	44.4	68.4
9/16	1799.3	44.4	68.4
5/8	1799.3	44.4	68.4
3/4	1799.3	44.4	68.4
7/8	1799.3	44.4	68.4
1	1799.3	44.4	68.4

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = 12-24 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	1001.4	28.1	43.3
1/4	1335.3	37.5	57.7
5/16	1669.1	46.9	72.1
3/8	2002.9	56.2	86.5
7/16	2336.7	65.6	100.9
1/2	2336.7	65.6	100.9
9/16	2336.7	65.6	100.9
5/8	2336.7	65.6	100.9
3/4	2336.7	65.6	100.9
7/8	2336.7	65.6	100.9
1	2336.7	65.6	100.9

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = 12-28 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	681.4	19.1	29.4
3/16	1022.1	28.7	44.2
1/4	1362.8	38.3	58.9
5/16	1703.5	47.8	73.6
3/8	2044.2	57.4	88.3
7/16	2384.9	67.0	103.0
1/2	2384.9	67.0	103.0
9/16	2384.9	67.0	103.0
5/8	2384.9	67.0	103.0
3/4	2384.9	67.0	103.0
7/8	2384.9	67.0	103.0
1	2384.9	67.0	103.0
1 1/8	2384.9	67.0	103.0

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = 1/4-20 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	1153.1	37.5	57.7
1/4	1537.4	50.0	76.9
5/16	1921.8	62.5	96.1
3/8	2306.1	74.9	115.3
7/16	2690.5	87.4	134.5
1/2	3074.8	99.9	153.7
9/16	3074.8	99.9	153.7
5/8	3074.8	99.9	153.7
3/4	3074.8	99.9	153.7
7/8	3074.8	99.9	153.7
1	3074.8	99.9	153.7
1 1/8	3074.8	99.9	153.7
1 1/4	3074.8	99.9	153.7

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = 1/4-28 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	801.6	26.1	40.1
3/16	1202.4	39.1	60.1
1/4	1603.2	52.1	80.2
5/16	2003.9	65.1	100.2
3/8	2404.7	78.2	120.2
7/16	2805.5	91.2	140.3
1/2	3206.3	104.2	160.3
9/16	3206.3	104.2	160.3
5/8	3206.3	104.2	160.3
3/4	3206.3	104.2	160.3
7/8	3206.3	104.2	160.3
1	3206.3	104.2	160.3
1 1/8	3206.3	104.2	160.3
1 1/4	3206.3	104.2	160.3
1 3/8	3206.3	104.2	160.3

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = 5/16-18 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	1465.3	59.5	91.6
1/4	1953.8	79.4	122.1
5/16	2442.2	99.2	152.6
3/8	2930.6	119.1	183.2
7/16	3419.1	138.9	213.7
1/2	3907.5	158.7	244.2
9/16	4396.0	178.6	274.7
5/8	4396.0	178.6	274.7
3/4	4396.0	178.6	274.7
7/8	4396.0	178.6	274.7
1	4396.0	178.6	274.7
1 1/8	4396.0	178.6	274.7
1 1/4	4396.0	178.6	274.7
1 3/8	4396.0	178.6	274.7
1 1/2	4396.0	178.6	274.7

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = 5/16-24 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	1513.0	61.5	94.6
1/4	2017.4	82.0	126.1
5/16	2521.7	102.4	157.6
3/8	3026.1	122.9	189.1
7/16	3530.4	143.4	220.7
1/2	4034.7	163.9	252.2
9/16	4539.1	184.4	283.7
5/8	4539.1	184.4	283.7
3/4	4539.1	184.4	283.7
7/8	4539.1	184.4	283.7
1	4539.1	184.4	283.7
1 1/8	4539.1	184.4	283.7
1 1/4	4539.1	184.4	283.7
1 3/8	4539.1	184.4	283.7
1 1/2	4539.1	184.4	283.7
1 3/4	4539.1	184.4	283.7

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = 3/8-16 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/4	2363.7	115.2	177.3
5/16	2954.7	144.0	221.6
3/8	3545.6	172.8	265.9
7/16	4136.5	201.7	310.2
1/2	4727.5	230.5	354.6
9/16	5318.4	259.3	398.9
5/8	5909.3	288.1	443.2
3/4	7091.2	345.7	531.8
7/8	7091.2	345.7	531.8
1	7091.2	345.7	531.8
1 1/8	7091.2	345.7	531.8
1 1/4	7091.2	345.7	531.8
1 3/8	7091.2	345.7	531.8
1 1/2	7091.2	345.7	531.8
1 3/4	7091.2	345.7	531.8
2	7091.2	345.7	531.8

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = 3/8-24 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	1844.4	89.9	138.3
1/4	2459.2	119.9	184.4
5/16	3074.0	149.9	230.5
3/8	3688.7	179.8	276.7
7/16	4303.5	209.8	322.8
1/2	4918.3	239.8	368.9
9/16	5533.1	269.7	415.0
5/8	6147.9	299.7	461.1
3/4	7377.5	359.7	553.3
7/8	7377.5	359.7	553.3
1	7377.5	359.7	553.3
1 1/8	7377.5	359.7	553.3
1 1/4	7377.5	359.7	553.3
1 3/8	7377.5	359.7	553.3
1 1/2	7377.5	359.7	553.3
1 3/4	7377.5	359.7	553.3
2	7377.5	359.7	553.3

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = 7/16-14 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	3455.7	196.5	302.4
3/8	4146.8	235.8	362.8
7/16	4837.9	275.2	423.3
1/2	5529.0	314.5	483.8
9/16	6220.2	353.8	544.3
5/8	6911.3	393.1	604.7
3/4	8293.6	471.7	725.7
7/8	9675.8	550.3	846.6
1	9675.8	550.3	846.6
1 1/8	9675.8	550.3	846.6
1 1/4	9675.8	550.3	846.6
1 3/8	9675.8	550.3	846.6
1 1/2	9675.8	550.3	846.6
1 3/4	9675.8	550.3	846.6
2	9675.8	550.3	846.6

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = 7/16-20 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	2147.1	122.1	187.9
1/4	2862.8	162.8	250.5
5/16	3578.5	203.5	313.1
3/8	4294.2	244.2	375.7
7/16	5009.9	284.9	438.4
1/2	5725.6	325.6	501.0
9/16	6441.2	366.3	563.6
5/8	7156.9	407.1	626.2
3/4	8588.3	488.5	751.5
7/8	10019.7	569.9	876.7
1	10019.7	569.9	876.7
1 1/8	10019.7	569.9	876.7
1 1/4	10019.7	569.9	876.7
1 3/8	10019.7	569.9	876.7
1 1/2	10019.7	569.9	876.7
1 3/4	10019.7	569.9	876.7
2	10019.7	569.9	876.7

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = 1/2-13 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/4	3180.9	206.8	318.1
5/16	3976.1	258.4	397.6
3/8	4771.3	310.1	477.1
7/16	5566.5	361.8	556.7
1/2	6361.7	413.5	636.2
9/16	7156.9	465.2	715.7
5/8	7952.2	516.9	795.2
3/4	9542.6	620.3	954.3
7/8	11133.0	723.6	1113.3
1	12723.5	827.0	1272.3
1 1/8	12723.5	827.0	1272.3
1 1/4	12723.5	827.0	1272.3
1 3/8	12723.5	827.0	1272.3
1 1/2	12723.5	827.0	1272.3
1 3/4	12723.5	827.0	1272.3
2	12723.5	827.0	1272.3

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = 1/2-20 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	2478.4	161.1	247.8
1/4	3304.6	214.8	330.5
5/16	4130.7	268.5	413.1
3/8	4956.8	322.2	495.7
7/16	5783.0	375.9	578.3
1/2	6609.1	429.6	660.9
9/16	7435.3	483.3	743.5
5/8	8261.4	537.0	826.1
3/4	9913.7	644.4	991.4
7/8	11566.0	751.8	1156.6
1	13218.3	859.2	1321.8
1 1/8	13218.3	859.2	1321.8
1 1/4	13218.3	859.2	1321.8
1 3/8	13218.3	859.2	1321.8
1 1/2	13218.3	859.2	1321.8
1 3/4	13218.3	859.2	1321.8
2	13218.3	859.2	1321.8

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = 9/16-12 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	4492.1	328.5	505.4
3/8	5390.5	394.2	606.4
7/16	6288.9	459.9	707.5
1/2	7187.3	525.6	808.6
9/16	8085.8	591.3	909.6
5/8	8984.2	657.0	1010.7
3/4	10781.0	788.4	1212.9
7/8	12577.8	919.8	1415.0
1	14374.7	1051.1	1617.2
1 1/8	14374.7	1051.1	1617.2
1 1/4	14374.7	1051.1	1617.2
1 3/8	14374.7	1051.1	1617.2
1 1/2	14374.7	1051.1	1617.2
1 3/4	14374.7	1051.1	1617.2
2	14374.7	1051.1	1617.2

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = 9/16-18 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	2790.7	204.1	314.0
1/4	3720.9	272.1	418.6
5/16	4651.1	340.1	523.3
3/8	5581.4	408.1	627.9
7/16	6511.6	476.2	732.6
1/2	7441.8	544.2	837.2
9/16	8372.0	612.2	941.9
5/8	9302.3	680.2	1046.5
3/4	11162.7	816.3	1255.8
7/8	13023.2	952.3	1465.1
1	14883.6	1088.4	1674.4
1 1/8	14883.6	1088.4	1674.4
1 1/4	14883.6	1088.4	1674.4
1 3/8	14883.6	1088.4	1674.4
1 1/2	14883.6	1088.4	1674.4
1 3/4	14883.6	1088.4	1674.4
2	14883.6	1088.4	1674.4

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = 5/8-11 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	5001.0	406.3	625.1
3/8	6001.2	487.6	750.2
7/16	7001.4	568.9	875.2
1/2	8001.6	650.1	1000.2
9/16	9001.8	731.4	1125.2
5/8	10002.0	812.7	1250.3
3/4	12002.5	975.2	1500.3
7/8	14002.9	1137.7	1750.4
1	16003.3	1300.3	2000.4
1 1/8	18003.7	1462.8	2250.5
1 1/4	18003.7	1462.8	2250.5
1 3/8	18003.7	1462.8	2250.5
1 1/2	18003.7	1462.8	2250.5
1 3/4	18003.7	1462.8	2250.5
2	18003.7	1462.8	2250.5

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = 5/8-18 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	3122.0	253.7	390.3
1/4	4162.7	338.2	520.3
5/16	5203.4	422.8	650.4
3/8	6244.0	507.3	780.5
7/16	7284.7	591.9	910.6
1/2	8325.4	676.4	1040.7
9/16	9366.0	761.0	1170.8
5/8	10406.7	845.5	1300.8
3/4	12488.1	1014.7	1561.0
7/8	14569.4	1183.8	1821.2
1	16650.8	1352.9	2081.3
1 1/8	18732.1	1522.0	2341.5
1 1/4	18732.1	1522.0	2341.5
1 3/8	18732.1	1522.0	2341.5
1 1/2	18732.1	1522.0	2341.5
1 3/4	18732.1	1522.0	2341.5
2	18732.1	1522.0	2341.5

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = 3/4-10 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	6052.5	590.1	907.9
3/8	7263.0	708.1	1089.4
7/16	8473.5	826.2	1271.0
1/2	9684.0	944.2	1452.6
9/16	10894.5	1062.2	1634.2
5/8	12104.9	1180.2	1815.7
3/4	14525.9	1416.3	2178.9
7/8	16946.9	1652.3	2542.0
1	19367.9	1888.4	2905.2
1 1/8	21788.9	2124.4	3268.3
1 1/4	24209.9	2360.5	3631.5
1 3/8	26630.9	2596.5	3994.6
1 1/2	26630.9	2596.5	3994.6
1 3/4	26630.9	2596.5	3994.6
2	26630.9	2596.5	3994.6

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = 3/4-16 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/4	5014.5	488.9	752.2
5/16	6268.1	611.1	940.2
3/8	7521.7	733.4	1128.3
7/16	8775.3	855.6	1316.3
1/2	10028.9	977.8	1504.3
9/16	11282.5	1100.0	1692.4
5/8	12536.1	1222.3	1880.4
3/4	15043.4	1466.7	2256.5
7/8	17550.6	1711.2	2632.6
1	20057.8	1955.6	3008.7
1 1/8	22565.0	2200.1	3384.8
1 1/4	25072.3	2444.5	3760.8
1 3/8	27579.5	2689.0	4136.9
1 1/2	27579.5	2689.0	4136.9
1 3/4	27579.5	2689.0	4136.9
2	27579.5	2689.0	4136.9

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = 7/8-9 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/8	8512.0	968.2	1489.6
7/16	9930.7	1129.6	1737.9
1/2	11349.3	1291.0	1986.1
9/16	12768.0	1452.4	2234.4
5/8	14186.6	1613.7	2482.7
3/4	17024.0	1936.5	2979.2
7/8	19861.3	2259.2	3475.7
1	22698.6	2582.0	3972.3
1 1/8	25536.0	2904.7	4468.8
1 1/4	28373.3	3227.5	4965.3
1 3/8	31210.6	3550.2	5461.9
1 1/2	34048.0	3873.0	5958.4
1 3/4	34048.0	3873.0	5958.4
2	34048.0	3873.0	5958.4

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = 7/8-14 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/4	5857.0	666.2	1025.0
5/16	7321.3	832.8	1281.2
3/8	8785.5	999.4	1537.5
7/16	10249.8	1165.9	1793.7
1/2	11714.1	1332.5	2050.0
9/16	13178.3	1499.0	2306.2
5/8	14642.6	1665.6	2562.4
3/4	17571.1	1998.7	3074.9
7/8	20499.6	2331.8	3587.4
1	23428.1	2664.9	4099.9
1 1/8	26356.6	2998.1	4612.4
1 1/4	29285.1	3331.2	5124.9
1 3/8	32213.7	3664.3	5637.4
1 1/2	35142.2	3997.4	6149.9
1 3/4	35142.2	3997.4	6149.9
2	35142.2	3997.4	6149.9

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = 1-8 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
7/16	11365.6	1477.5	2273.1
1/2	12989.2	1688.6	2597.8
9/16	14612.9	1899.7	2922.6
5/8	16236.5	2110.7	3247.3
3/4	19483.8	2532.9	3896.8
7/8	22731.2	2955.0	4546.2
1	25978.5	3377.2	5195.7
1 1/8	29225.8	3799.3	5845.2
1 1/4	32473.1	4221.5	6494.6
1 3/8	35720.4	4643.6	7144.1
1 1/2	38967.7	5065.8	7793.5
1 3/4	45462.3	5910.1	9092.5
2	51956.9	6754.4	10391.4

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = 1-12 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	8357.7	1086.5	1671.5
3/8	10029.3	1303.8	2005.9
7/16	11700.8	1521.1	2340.2
1/2	13372.3	1738.4	2674.5
9/16	15043.9	1955.7	3008.8
5/8	16715.4	2173.0	3343.1
3/4	20058.5	2607.6	4011.7
7/8	23401.6	3042.2	4680.3
1	26744.7	3476.8	5348.9
1 1/8	30087.8	3911.4	6017.6
1 1/4	33430.9	4346.0	6686.2
1 3/8	36774.0	4780.6	7354.8
1 1/2	40117.0	5215.2	8023.4
1 3/4	46803.2	6084.4	9360.6
2	53489.4	6953.6	10697.9

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = 1 1/8-7 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
7/16	12768.3	1867.4	2872.9
1/2	14592.4	2134.1	3283.3
9/16	16416.4	2400.9	3693.7
5/8	18240.5	2667.7	4104.1
3/4	21888.6	3201.2	4924.9
7/8	25536.7	3734.7	5745.8
1	29184.8	4268.3	6566.6
1 1/8	32832.9	4801.8	7387.4
1 1/4	36481.0	5335.3	8208.2
1 3/8	40129.1	5868.9	9029.0
1 1/2	43777.2	6402.4	9849.9
1 3/4	51073.3	7469.5	11491.5
2	58369.5	8536.5	13133.1

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = 1 1/8-12 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	9462.2	1383.8	2129.0
3/8	11354.6	1660.6	2554.8
7/16	13247.1	1937.4	2980.6
1/2	15139.5	2214.2	3406.4
9/16	17031.9	2490.9	3832.2
5/8	18924.4	2767.7	4258.0
3/4	22709.2	3321.2	5109.6
7/8	26494.1	3874.8	5961.2
1	30279.0	4428.3	6812.8
1 1/8	34063.9	4981.8	7664.4
1 1/4	37848.7	5535.4	8516.0
1 3/8	41633.6	6088.9	9367.6
1 1/2	45418.5	6642.5	10219.2
1 3/4	52988.2	7749.5	11922.4
2	60558.0	8856.6	13625.5

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = 1 1/4-7 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
7/16	14314.6	2326.1	3578.6
1/2	16359.5	2658.4	4089.9
9/16	18404.5	2990.7	4601.1
5/8	20449.4	3323.0	5112.4
3/4	24539.3	3987.6	6134.8
7/8	28629.2	4652.2	7157.3
1	32719.1	5316.8	8179.8
1 1/8	36808.9	5981.5	9202.2
1 1/4	40898.8	6646.1	10224.7
1 3/8	44988.7	7310.7	11247.2
1 1/2	49078.6	7975.3	12269.6
1 3/4	57258.4	9304.5	14314.6
2	65438.1	10633.7	16359.5

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = 1 1/4-12 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	10566.6	1717.1	2641.7
3/8	12680.0	2060.5	3170.0
7/16	14793.3	2403.9	3698.3
1/2	16906.6	2747.3	4226.7
9/16	19020.0	3090.7	4755.0
5/8	21133.3	3434.2	5283.3
3/4	25360.0	4121.0	6340.0
7/8	29586.6	4807.8	7396.7
1	33813.3	5494.7	8453.3
1 1/8	38039.9	6181.5	9510.0
1 1/4	42266.6	6868.3	10566.6
1 3/8	46493.3	7555.2	11623.3
1 1/2	50719.9	8242.0	12680.0
1 3/4	59173.2	9615.7	14793.3
2	67626.6	10989.3	16906.6

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = 1 3/8-6 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
9/16	20146.0	3601.1	5540.1
5/8	22384.4	4001.2	6155.7
3/4	26861.3	4801.5	7386.9
7/8	31338.2	5601.7	8618.0
1	35815.1	6401.9	9849.2
1 1/8	40292.0	7202.2	11080.3
1 1/4	44768.9	8002.4	12311.4
1 3/8	49245.8	8802.7	13542.6
1 1/2	53722.6	9602.9	14773.7
1 3/4	62676.4	11203.4	17236.0
2	71630.2	12803.9	19698.3

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = 1 3/8-12 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	11671.1	2086.2	3209.6
3/8	14005.3	2503.5	3851.5
7/16	16339.6	2920.7	4493.4
1/2	18673.8	3337.9	5135.3
9/16	21008.0	3755.2	5777.2
5/8	23342.2	4172.4	6419.1
3/4	28010.7	5006.9	7702.9
7/8	32679.1	5841.4	8986.8
1	37347.6	6675.9	10270.6
1 1/8	42016.0	7510.4	11554.4
1 1/4	46684.5	8344.8	12838.2
1 3/8	51352.9	9179.3	14122.0
1 1/2	56021.4	10013.8	15405.9
1 3/4	65358.2	11682.8	17973.5
2	74695.1	13351.8	20541.2

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = 1 1/2-6 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
9/16	22134.0	4316.1	6640.2
5/8	24593.4	4795.7	7378.0
3/4	29512.0	5754.8	8853.6
7/8	34430.7	6714.0	10329.2
1	39349.4	7673.1	11804.8
1 1/8	44268.1	8632.3	13280.4
1 1/4	49186.7	9591.4	14756.0
1 3/8	54105.4	10550.6	16231.6
1 1/2	59024.1	11509.7	17707.2
1 3/4	68861.4	13428.0	20658.4
2	78698.8	15346.3	23609.6

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = 1 1/2-12 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	12775.6	2491.2	3832.7
3/8	15330.7	2989.5	4599.2
7/16	17885.8	3487.7	5365.7
1/2	20440.9	3986.0	6132.3
9/16	22996.0	4484.2	6898.8
5/8	25551.2	4982.5	7665.3
3/4	30661.4	5979.0	9198.4
7/8	35771.6	6975.5	10731.5
1	40881.9	7972.0	12264.6
1 1/8	45992.1	8968.5	13797.6
1 1/4	51102.3	9965.0	15330.7
1 3/8	56212.6	10961.4	16863.8
1 1/2	61322.8	11957.9	18396.8
1 3/4	71543.3	13950.9	21463.0
2	81763.7	15943.9	24529.1

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = 1 3/4-5 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/8	28629.5	6513.2	10020.3
3/4	34355.4	7815.9	12024.4
7/8	40081.3	9118.5	14028.5
1	45807.2	10421.1	16032.5
1 1/8	51533.2	11723.8	18036.6
1 1/4	57259.1	13026.4	20040.7
1 3/8	62985.0	14329.1	22044.7
1 1/2	68710.9	15631.7	24048.8
1 3/4	80162.7	18237.0	28056.9
2	91614.5	20842.3	32065.1

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = 2-4 1/2 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/4	39351.5	10231.4	15740.6
7/8	45910.1	11936.6	18364.0
1	52468.7	13641.9	20987.5
1 1/8	59027.3	15347.1	23610.9
1 1/4	65585.9	17052.3	26234.3
1 3/8	72144.4	18757.6	28857.8
1 1/2	78703.0	20462.8	31481.2
1 3/4	91820.2	23873.3	36728.1
2	104937.4	27283.7	41974.9

AISI 304 Stainless Steel

$$F_{su} = 50 \text{ ksi}$$

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)

Fastener Size = 0-80 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	169.8	1.3	2.0

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)

Fastener Size = 1-64 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	205.8	2.0	3.0
1/8	411.7	3.9	6.0

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)

Fastener Size = 1-72 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	209.4	2.0	3.1
1/8	418.9	4.0	6.1

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)

Fastener Size = 2-56 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	243.5	2.7	4.2
1/8	486.9	5.4	8.4
3/16	730.4	8.2	12.6

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)

Fastener Size = 2-64 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	248.4	2.8	4.3
1/8	496.8	5.6	8.5
3/16	745.1	8.3	12.8

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)

Fastener Size = 3-48 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	559.6	7.2	11.1
3/16	839.4	10.8	16.6
1/4	1119.2	14.4	22.2

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)

Fastener Size = 3-56 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	286.0	3.7	5.7
1/8	572.0	7.4	11.3
3/16	858.0	11.0	17.0
1/4	1144.1	14.7	22.7

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)

Fastener Size = 4-40 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	627.0	9.1	14.0
3/16	940.5	13.7	21.1
1/4	1254.0	18.3	28.1

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)

Fastener Size = 4-48 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	644.7	9.4	14.4
3/16	967.0	14.1	21.7
1/4	1289.4	18.8	28.9

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)

Fastener Size = 5-40 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	712.1	11.6	17.8
3/16	1068.1	17.4	26.7
1/4	1424.2	23.1	35.6
5/16	1780.2	28.9	44.5

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)

Fastener Size = 5-44 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	721.3	11.7	18.0
3/16	1081.9	17.6	27.0
1/4	1442.5	23.4	36.1
5/16	1803.1	29.3	45.1

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)

Fastener Size = 6-32 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	770.3	13.8	21.3
3/16	1155.5	20.7	31.9
1/4	1540.7	27.6	42.5
5/16	1925.9	34.5	53.2

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)

Fastener Size = 6-40 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	797.2	14.3	22.0
3/16	1195.8	21.5	33.0
1/4	1594.4	28.6	44.0
5/16	1992.9	35.8	55.0
3/8	1992.9	35.8	55.0

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)

Fastener Size = 8-32 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	940.5	20.1	30.8
3/16	1410.8	30.1	46.3
1/4	1881.0	40.1	61.7
5/16	2351.3	50.1	77.1
3/8	2351.3	50.1	77.1
7/16	2351.3	50.1	77.1

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)

Fastener Size = 8-36 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	955.6	20.4	31.3
3/16	1433.4	30.6	47.0
1/4	1911.1	40.7	62.7
5/16	2388.9	50.9	78.4
3/8	2388.9	50.9	78.4
7/16	2388.9	50.9	78.4

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)

Fastener Size = 10-24 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	1599.3	39.5	60.8
1/4	2132.4	52.7	81.0
5/16	2665.4	65.8	101.3
3/8	3198.5	79.0	121.5
7/16	3198.5	79.0	121.5
1/2	3198.5	79.0	121.5

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)

Fastener Size = 10-32 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	1110.7	27.4	42.2
3/16	1666.0	41.2	63.3
1/4	2221.4	54.9	84.4
5/16	2776.7	68.6	105.5
3/8	3332.1	82.3	126.6
7/16	3332.1	82.3	126.6
1/2	3332.1	82.3	126.6

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)

Fastener Size = 12-24 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	1854.5	52.1	80.1
1/4	2472.7	69.4	106.8
5/16	3090.9	86.8	133.5
3/8	3709.0	104.1	160.2
7/16	4327.2	121.5	186.9
1/2	4327.2	121.5	186.9
9/16	4327.2	121.5	186.9

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)**Fastener Size = 12-28 UNF****[NOT TO BE USED FOR FLIGHT HARDWARE]**

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	1261.9	35.4	54.5
3/16	1892.8	53.2	81.8
1/4	2523.7	70.9	109.0
5/16	3154.7	88.6	136.3
3/8	3785.6	106.3	163.5
7/16	4416.6	124.0	190.8
1/2	4416.6	124.0	190.8
9/16	4416.6	124.0	190.8
5/8	4416.6	124.0	190.8

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)**Fastener Size = 1/4-20 UNC****[NOT TO BE USED FOR FLIGHT HARDWARE]**

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	2135.3	69.4	106.8
1/4	2847.1	92.5	142.4
5/16	3558.8	115.7	177.9
3/8	4270.6	138.8	213.5
7/16	4982.4	161.9	249.1
1/2	5694.1	185.1	284.7
9/16	5694.1	185.1	284.7
5/8	5694.1	185.1	284.7

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)**Fastener Size = 1/4-28 UNF****[NOT TO BE USED FOR FLIGHT HARDWARE]**

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	1484.4	48.2	74.2
3/16	2226.6	72.4	111.3
1/4	2968.8	96.5	148.4
5/16	3711.0	120.6	185.6
3/8	4453.2	144.7	222.7
7/16	5195.4	168.9	259.8
1/2	5937.6	193.0	296.9
9/16	5937.6	193.0	296.9
5/8	5937.6	193.0	296.9
3/4	5937.6	193.0	296.9

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)**Fastener Size = 5/16-18 UNC****[NOT TO BE USED FOR FLIGHT HARDWARE]**

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	2713.6	110.2	169.6
1/4	3618.1	147.0	226.1
5/16	4522.6	183.7	282.7
3/8	5427.1	220.5	339.2
7/16	6331.6	257.2	395.7
1/2	7236.1	294.0	452.3
9/16	8140.7	330.7	508.8
5/8	8140.7	330.7	508.8
3/4	8140.7	330.7	508.8
7/8	8140.7	330.7	508.8

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)**Fastener Size = 5/16-24 UNF****[NOT TO BE USED FOR FLIGHT HARDWARE]**

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	2801.9	113.8	175.1
1/4	3735.9	151.8	233.5
5/16	4669.8	189.7	291.9
3/8	5603.8	227.7	350.2
7/16	6537.8	265.6	408.6
1/2	7471.8	303.5	467.0
9/16	8405.7	341.5	525.4
5/8	8405.7	341.5	525.4
3/4	8405.7	341.5	525.4
7/8	8405.7	341.5	525.4

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)**Fastener Size = 3/8-16 UNC****[NOT TO BE USED FOR FLIGHT HARDWARE]**

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/4	4377.3	213.4	328.3
5/16	5471.6	266.7	410.4
3/8	6565.9	320.1	492.4
7/16	7660.3	373.4	574.5
1/2	8754.6	426.8	656.6
9/16	9848.9	480.1	738.7
5/8	10943.2	533.5	820.7
3/4	13131.9	640.2	984.9
7/8	13131.9	640.2	984.9
1	13131.9	640.2	984.9

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)

Fastener Size = 3/8-24 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	3415.5	166.5	256.2
1/4	4554.0	222.0	341.6
5/16	5692.5	277.5	426.9
3/8	6831.0	333.0	512.3
7/16	7969.5	388.5	597.7
1/2	9108.0	444.0	683.1
9/16	10246.5	499.5	768.5
5/8	11385.0	555.0	853.9
3/4	13662.0	666.0	1024.7
7/8	13662.0	666.0	1024.7
1	13662.0	666.0	1024.7
1 1/8	13662.0	666.0	1024.7

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)

Fastener Size = 7/16-14 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	6399.4	364.0	559.9
3/8	7679.2	436.8	671.9
7/16	8959.1	509.5	783.9
1/2	10239.0	582.3	895.9
9/16	11518.8	655.1	1007.9
5/8	12798.7	727.9	1119.9
3/4	15358.5	873.5	1343.9
7/8	17918.2	1019.1	1567.8
1	17918.2	1019.1	1567.8
1 1/8	17918.2	1019.1	1567.8
1 1/4	17918.2	1019.1	1567.8

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)**Fastener Size = 7/16-20 UNF****[NOT TO BE USED FOR FLIGHT HARDWARE]**

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	3976.1	226.1	347.9
1/4	5301.4	301.5	463.9
5/16	6626.8	376.9	579.8
3/8	7952.2	452.3	695.8
7/16	9277.5	527.7	811.8
1/2	10602.9	603.0	927.8
9/16	11928.2	678.4	1043.7
5/8	13253.6	753.8	1159.7
3/4	15904.3	904.6	1391.6
7/8	18555.0	1055.3	1623.6
1	18555.0	1055.3	1623.6
1 1/8	18555.0	1055.3	1623.6
1 1/4	18555.0	1055.3	1623.6
1 3/8	18555.0	1055.3	1623.6

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)**Fastener Size = 1/2-13 UNC****[NOT TO BE USED FOR FLIGHT HARDWARE]**

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/4	5890.5	382.9	589.0
5/16	7363.1	478.6	736.3
3/8	8835.7	574.3	883.6
7/16	10308.4	670.0	1030.8
1/2	11781.0	765.8	1178.1
9/16	13253.6	861.5	1325.4
5/8	14726.2	957.2	1472.6
3/4	17671.5	1148.6	1767.1
7/8	20616.7	1340.1	2061.7
1	23561.9	1531.5	2356.2
1 1/8	23561.9	1531.5	2356.2
1 1/4	23561.9	1531.5	2356.2
1 3/8	23561.9	1531.5	2356.2
1 1/2	23561.9	1531.5	2356.2

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)**Fastener Size = 1/2-20 UNF****[NOT TO BE USED FOR FLIGHT HARDWARE]**

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	4589.7	298.3	459.0
1/4	6119.6	397.8	612.0
5/16	7649.5	497.2	764.9
3/8	9179.3	596.7	917.9
7/16	10709.2	696.1	1070.9
1/2	12239.1	795.5	1223.9
9/16	13769.0	895.0	1376.9
5/8	15298.9	994.4	1529.9
3/4	18358.7	1193.3	1835.9
7/8	21418.5	1392.2	2141.8
1	24478.2	1591.1	2447.8
1 1/8	24478.2	1591.1	2447.8
1 1/4	24478.2	1591.1	2447.8
1 3/8	24478.2	1591.1	2447.8
1 1/2	24478.2	1591.1	2447.8

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)**Fastener Size = 9/16-12 UNC****[NOT TO BE USED FOR FLIGHT HARDWARE]**

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	8318.7	608.3	935.9
3/8	9982.4	730.0	1123.0
7/16	11646.1	851.6	1310.2
1/2	13309.9	973.3	1497.4
9/16	14973.6	1094.9	1684.5
5/8	16637.4	1216.6	1871.7
3/4	19964.8	1459.9	2246.0
7/8	23292.3	1703.2	2620.4
1	26619.8	1946.6	2994.7
1 1/8	26619.8	1946.6	2994.7
1 1/4	26619.8	1946.6	2994.7
1 3/8	26619.8	1946.6	2994.7
1 1/2	26619.8	1946.6	2994.7

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)**Fastener Size = 9/16-18 UNF****[NOT TO BE USED FOR FLIGHT HARDWARE]**

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	5167.9	377.9	581.4
1/4	6890.6	503.9	775.2
5/16	8613.2	629.8	969.0
3/8	10335.8	755.8	1162.8
7/16	12058.5	881.8	1356.6
1/2	13781.1	1007.7	1550.4
9/16	15503.8	1133.7	1744.2
5/8	17226.4	1259.7	1938.0
3/4	20671.7	1511.6	2325.6
7/8	24117.0	1763.6	2713.2
1	27562.2	2015.5	3100.8
1 1/8	27562.2	2015.5	3100.8
1 1/4	27562.2	2015.5	3100.8
1 3/8	27562.2	2015.5	3100.8
1 1/2	27562.2	2015.5	3100.8
1 3/4	27562.2	2015.5	3100.8

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)**Fastener Size = 5/8-11 UNC****[NOT TO BE USED FOR FLIGHT HARDWARE]**

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	9261.2	752.5	1157.6
3/8	11113.4	833.5	1282.3
7/16	12965.6	972.4	1496.0
1/2	14817.8	1111.3	1709.8
9/16	16670.1	1250.3	1923.5
5/8	18522.3	1389.2	2137.2
3/4	22226.8	1667.0	2564.6
7/8	25931.2	1944.8	2992.1
1	29635.7	2222.7	3419.5
1 1/8	33340.2	2500.5	3846.9
1 1/4	33340.2	2500.5	3846.9
1 3/8	33340.2	2500.5	3846.9
1 1/2	33340.2	2500.5	3846.9
1 3/4	33340.2	2500.5	3846.9
2	33340.2	2500.5	3846.9

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)

Fastener Size = 5/8-18 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	5781.5	469.7	722.7
1/4	7708.7	626.3	963.6
5/16	9635.9	782.9	1204.5
3/8	11563.0	939.5	1445.4
7/16	13490.2	1096.1	1686.3
1/2	15417.4	1252.7	1927.2
9/16	17344.5	1409.2	2168.1
5/8	19271.7	1565.8	2409.0
3/4	23126.0	1879.0	2890.8
7/8	26980.4	2192.2	3372.5
1	30834.7	2505.3	3854.3
1 1/8	34689.1	2818.5	4336.1
1 1/4	34689.1	2818.5	4336.1
1 3/8	34689.1	2818.5	4336.1
1 1/2	34689.1	2818.5	4336.1
1 3/4	34689.1	2818.5	4336.1
2	34689.1	2818.5	4336.1

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)

Fastener Size = 3/4-10 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	11208.3	1092.8	1681.2
3/8	13449.9	1311.4	2017.5
7/16	15691.6	1529.9	2353.7
1/2	17933.3	1748.5	2690.0
9/16	20174.9	1967.1	3026.2
5/8	22416.6	2185.6	3362.5
3/4	26899.9	2622.7	4035.0
7/8	31383.2	3059.9	4707.5
1	35866.5	3497.0	5380.0
1 1/8	40349.8	3934.1	6052.5
1 1/4	44833.1	4371.2	6725.0
1 3/8	49316.5	4808.4	7397.5
1 1/2	49316.5	4808.4	7397.5
1 3/4	49316.5	4808.4	7397.5
2	49316.5	4808.4	7397.5

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)**Fastener Size = 3/4-16 UNF****[NOT TO BE USED FOR FLIGHT HARDWARE]**

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/4	9286.0	905.4	1392.9
5/16	11607.5	1131.7	1741.1
3/8	13929.0	1358.1	2089.4
7/16	16250.5	1584.4	2437.6
1/2	18572.0	1810.8	2785.8
9/16	20893.6	2037.1	3134.0
5/8	23215.1	2263.5	3482.3
3/4	27858.1	2716.2	4178.7
7/8	32501.1	3168.9	4875.2
1	37144.1	3621.5	5571.6
1 1/8	41787.1	4074.2	6268.1
1 1/4	46430.1	4526.9	6964.5
1 3/8	51073.1	4979.6	7661.0
1 1/2	51073.1	4979.6	7661.0
1 3/4	51073.1	4979.6	7661.0
2	51073.1	4979.6	7661.0

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)**Fastener Size = 7/8-9 UNC****[NOT TO BE USED FOR FLIGHT HARDWARE]**

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/8	15762.9	1793.0	2758.5
7/16	18390.1	2091.9	3218.3
1/2	21017.3	2390.7	3678.0
9/16	23644.4	2689.6	4137.8
5/8	26271.6	2988.4	4597.5
3/4	31525.9	3586.1	5517.0
7/8	36780.2	4183.7	6436.5
1	42034.5	4781.4	7356.0
1 1/8	47288.8	5379.1	8275.5
1 1/4	52543.1	5976.8	9195.0
1 3/8	57797.5	6574.5	10114.6
1 1/2	63051.8	7172.1	11034.1
1 3/4	63051.8	7172.1	11034.1
2	63051.8	7172.1	11034.1

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)

Fastener Size = 7/8-14 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/4	10846.3	1233.8	1898.1
5/16	13557.9	1542.2	2372.6
3/8	16269.5	1850.7	2847.2
7/16	18981.1	2159.1	3321.7
1/2	21692.7	2467.5	3796.2
9/16	24404.3	2776.0	4270.7
5/8	27115.9	3084.4	4745.3
3/4	32539.0	3701.3	5694.3
7/8	37962.2	4318.2	6643.4
1	43385.4	4935.1	7592.4
1 1/8	48808.6	5552.0	8541.5
1 1/4	54231.7	6168.9	9490.6
1 3/8	59654.9	6785.7	10439.6
1 1/2	65078.1	7402.6	11388.7
1 3/4	65078.1	7402.6	11388.7
2	65078.1	7402.6	11388.7

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)

Fastener Size = 1-8 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
7/16	21047.4	2736.2	4209.5
1/2	24054.1	3127.0	4810.8
9/16	27060.9	3517.9	5412.2
5/8	30067.7	3908.8	6013.5
3/4	36081.2	4690.6	7216.2
7/8	42094.7	5472.3	8418.9
1	48108.3	6254.1	9621.7
1 1/8	54121.8	7035.8	10824.4
1 1/4	60135.3	7817.6	12027.1
1 3/8	66148.9	8599.4	13229.8
1 1/2	72162.4	9381.1	14432.5
1 3/4	84189.4	10944.6	16837.9
2	96216.5	12508.1	19243.3

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)**Fastener Size = 1-12 UNF****[NOT TO BE USED FOR FLIGHT HARDWARE]**

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	15477.3	2012.0	3095.5
3/8	18572.7	2414.5	3714.5
7/16	21668.2	2816.9	4333.6
1/2	24763.6	3219.3	4952.7
9/16	27859.1	3621.7	5571.8
5/8	30954.5	4024.1	6190.9
3/4	37145.4	4828.9	7429.1
7/8	43336.3	5633.7	8667.3
1	49527.2	6438.5	9905.4
1 1/8	55718.1	7243.4	11143.6
1 1/4	61909.0	8048.2	12381.8
1 3/8	68099.9	8853.0	13620.0
1 1/2	74290.8	9657.8	14858.2
1 3/4	86672.6	11267.4	17334.5
2	99054.4	12877.1	19810.9

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)**Fastener Size = 1 1/8-7 UNC****[NOT TO BE USED FOR FLIGHT HARDWARE]**

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
7/16	23645.1	3458.1	5320.1
1/2	27022.9	3952.1	6080.2
9/16	30400.8	4446.1	6840.2
5/8	33778.7	4940.1	7600.2
3/4	40534.4	5928.2	9120.2
7/8	47290.1	6916.2	10640.3
1	54045.9	7904.2	12160.3
1 1/8	60801.6	8892.2	13680.4
1 1/4	67557.3	9880.3	15200.4
1 3/8	74313.1	10868.3	16720.4
1 1/2	81068.8	11856.3	18240.5
1 3/4	94580.3	13832.4	21280.6
2	108091.7	15808.4	24320.6

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)**Fastener Size = 1 1/8-12 UNF****[NOT TO BE USED FOR FLIGHT HARDWARE]**

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	17522.6	2562.7	3942.6
3/8	21027.1	3075.2	4731.1
7/16	24531.6	3587.7	5519.6
1/2	28036.1	4100.3	6308.1
9/16	31540.6	4612.8	7096.6
5/8	35045.1	5125.3	7885.2
3/4	42054.1	6150.4	9462.2
7/8	49063.2	7175.5	11039.2
1	56072.2	8200.6	12616.2
1 1/8	63081.2	9225.6	14193.3
1 1/4	70090.2	10250.7	15770.3
1 3/8	77099.3	11275.8	17347.3
1 1/2	84108.3	12300.8	18924.4
1 3/4	98126.3	14351.0	22078.4
2	112144.4	16401.1	25232.5

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)**Fastener Size = 1 1/4-7 UNC****[NOT TO BE USED FOR FLIGHT HARDWARE]**

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
7/16	26508.5	4307.6	6627.1
1/2	30295.4	4923.0	7573.9
9/16	34082.4	5538.4	8520.6
5/8	37869.3	6153.8	9467.3
3/4	45443.1	7384.5	11360.8
7/8	53017.0	8615.3	13254.2
1	60590.9	9846.0	15147.7
1 1/8	68164.7	11076.8	17041.2
1 1/4	75738.6	12307.5	18934.6
1 3/8	83312.4	13538.3	20828.1
1 1/2	90886.3	14769.0	22721.6
1 3/4	106034.0	17230.5	26508.5
2	121181.7	19692.0	30295.4

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)**Fastener Size = 1 1/4-12 UNF****[NOT TO BE USED FOR FLIGHT HARDWARE]**

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	19567.9	3179.8	4892.0
3/8	23481.4	3815.7	5870.4
7/16	27395.0	4451.7	6848.8
1/2	31308.6	5087.6	7827.1
9/16	35222.2	5723.6	8805.5
5/8	39135.7	6359.6	9783.9
3/4	46962.9	7631.5	11740.7
7/8	54790.0	8903.4	13697.5
1	62617.2	10175.3	15654.3
1 1/8	70444.3	11447.2	17611.1
1 1/4	78271.5	12719.1	19567.9
1 3/8	86098.6	13991.0	21524.7
1 1/2	93925.8	15262.9	23481.4
1 3/4	109580.1	17806.8	27395.0
2	125234.4	20350.6	31308.6

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)**Fastener Size = 1 3/8-6 UNC****[NOT TO BE USED FOR FLIGHT HARDWARE]**

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
9/16	37307.4	6668.7	10259.5
5/8	41452.7	7409.7	11399.5
3/4	49743.2	8891.6	13679.4
7/8	58033.7	10373.5	15959.3
1	66324.3	11855.5	18239.2
1 1/8	74614.8	13337.4	20519.1
1 1/4	82905.3	14819.3	22799.0
1 3/8	91195.9	16301.3	25078.9
1 1/2	99486.4	17783.2	27358.8
1 3/4	116067.4	20747.1	31918.5
2	132648.5	23710.9	36478.3

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)**Fastener Size = 1 3/8-12 UNF****[NOT TO BE USED FOR FLIGHT HARDWARE]**

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	21613.2	3863.4	5943.6
3/8	25935.8	4636.0	7132.3
7/16	30258.4	5408.7	8321.1
1/2	34581.1	6181.4	9509.8
9/16	38903.7	6954.0	10698.5
5/8	43226.4	7726.7	11887.2
3/4	51871.6	9272.1	14264.7
7/8	60516.9	10817.4	16642.1
1	69162.2	12362.7	19019.6
1 1/8	77807.4	13908.1	21397.0
1 1/4	86452.7	15453.4	23774.5
1 3/8	95098.0	16998.8	26151.9
1 1/2	103743.2	18544.1	28529.4
1 3/4	121033.8	21634.8	33284.3
2	138324.3	24725.5	38039.2

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)**Fastener Size = 1 1/2-6 UNC****[NOT TO BE USED FOR FLIGHT HARDWARE]**

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
9/16	40988.9	7992.8	12296.7
5/8	45543.3	8880.9	13663.0
3/4	54651.9	10657.1	16395.6
7/8	63760.6	12433.3	19128.2
1	72869.2	14209.5	21860.8
1 1/8	81977.9	15985.7	24593.4
1 1/4	91086.6	17761.9	27326.0
1 3/8	100195.2	19538.1	30058.6
1 1/2	109303.9	21314.3	32791.2
1 3/4	127521.2	24866.6	38256.4
2	145738.5	28419.0	43721.5

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)**Fastener Size = 1 1/2-12 UNF****[NOT TO BE USED FOR FLIGHT HARDWARE]**

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	23658.5	4613.4	7097.5
3/8	28390.2	5536.1	8517.1
7/16	33121.9	6458.8	9936.6
1/2	37853.6	7381.4	11356.1
9/16	42585.3	8304.1	12775.6
5/8	47317.0	9226.8	14195.1
3/4	56780.4	11072.2	17034.1
7/8	66243.8	12917.5	19873.1
1	75707.1	14762.9	22712.1
1 1/8	85170.5	16608.3	25551.2
1 1/4	94633.9	18453.6	28390.2
1 3/8	104097.3	20299.0	31229.2
1 1/2	113560.7	22144.3	34068.2
1 3/4	132487.5	25835.1	39746.3
2	151414.3	29525.8	45424.3

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)**Fastener Size = 1 3/4-5 UNC****[NOT TO BE USED FOR FLIGHT HARDWARE]**

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/8	53017.6	12061.5	18556.2
3/4	63621.2	14473.8	22267.4
7/8	74224.7	16886.1	25978.6
1	84828.2	19298.4	29689.9
1 1/8	95431.8	21710.7	33401.1
1 1/4	106035.3	24123.0	37112.4
1 3/8	116638.8	26535.3	40823.6
1 1/2	127242.4	28947.6	44534.8
1 3/4	148449.4	33772.2	51957.3
2	169656.5	38596.8	59379.8

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)**Fastener Size = 2-4 1/2 UNC****[NOT TO BE USED FOR FLIGHT HARDWARE]**

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/4	72873.2	18947.0	29149.3
7/8	85018.7	22104.9	34007.5
1	97164.2	25262.7	38865.7
1 1/8	109309.8	28420.5	43723.9
1 1/4	121455.3	31578.4	48582.1
1 3/8	133600.8	34736.2	53440.3
1 1/2	145746.3	37894.0	58298.5
1 3/4	170037.4	44209.7	68015.0
2	194328.4	50525.4	77731.4

ASTM A36 Steel

$$F_{su} = 34.8 \text{ ksi}$$

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = 0-80 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	118.2	0.9	1.4
1/8	236.4	1.8	2.8

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = 1-64 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	143.3	1.4	2.1
1/8	286.5	2.7	4.2
3/16	429.8	4.1	6.3

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = 1-72 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	145.8	1.4	2.1
1/8	291.5	2.8	4.3
3/16	437.3	4.2	6.4
1/4	437.3	4.2	6.4

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = 2-56 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	169.5	1.9	2.9
1/8	338.9	3.5	5.4
3/16	508.4	5.2	8.1
1/4	677.8	7.0	10.8
5/16	677.8	7.0	10.8

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = 2-64 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	172.9	1.9	3.0
1/8	345.7	3.6	5.5
3/16	518.6	5.4	8.2
1/4	691.5	7.1	11.0
5/16	691.5	7.1	11.0

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = 3-48 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	389.5	5.0	7.7
3/16	584.2	6.9	10.7
1/4	779.0	9.3	14.2
5/16	779.0	9.3	14.2
3/8	779.0	9.3	14.2

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = 3-56 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	199.1	2.6	3.9
1/8	398.1	5.1	7.9
3/16	597.2	7.7	11.8
1/4	796.3	10.2	15.8
5/16	796.3	10.2	15.8
3/8	796.3	10.2	15.8

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = 4-40 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	436.4	6.4	9.8
3/16	654.6	9.5	14.7
1/4	872.8	12.7	19.6
5/16	872.8	12.7	19.6
3/8	872.8	12.7	19.6

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = 4-48 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	448.7	6.5	10.1
3/16	673.0	9.8	15.1
1/4	897.4	13.1	20.1
5/16	897.4	13.1	20.1
3/8	897.4	13.1	20.1
7/16	897.4	13.1	20.1

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = 5-40 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	495.6	8.1	12.4
3/16	743.4	12.1	18.6
1/4	991.2	16.1	24.8
5/16	1239.0	20.1	31.0
3/8	1239.0	20.1	31.0
7/16	1239.0	20.1	31.0

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = 5-44 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	502.0	8.2	12.5
3/16	753.0	12.2	18.8
1/4	1004.0	16.3	25.1
5/16	1255.0	20.4	31.4
3/8	1255.0	20.4	31.4
7/16	1255.0	20.4	31.4
1/2	1255.0	20.4	31.4

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = 6-32 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	536.2	9.6	14.8
3/16	804.2	14.4	22.2
1/4	1072.3	19.2	29.6
5/16	1340.4	24.0	37.0
3/8	1340.4	24.0	37.0
7/16	1340.4	24.0	37.0
1/2	1340.4	24.0	37.0

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = 6-40 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	554.8	10.0	15.3
3/16	832.3	14.9	23.0
1/4	1109.7	19.9	30.6
5/16	1387.1	24.9	38.3
3/8	1387.1	24.9	38.3
7/16	1387.1	24.9	38.3
1/2	1387.1	24.9	38.3

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = 8-32 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	654.6	14.0	21.5
3/16	981.9	20.9	32.2
1/4	1309.2	27.9	42.9
5/16	1636.5	34.9	53.7
3/8	1636.5	34.9	53.7
7/16	1636.5	34.9	53.7
1/2	1636.5	34.9	53.7
9/16	1636.5	34.9	53.7
5/8	1636.5	34.9	53.7

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = 8-36 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	665.1	14.2	21.8
3/16	997.6	21.3	32.7
1/4	1330.2	28.4	43.6
5/16	1662.7	35.4	54.5
3/8	1662.7	35.4	54.5
7/16	1662.7	35.4	54.5
1/2	1662.7	35.4	54.5
9/16	1662.7	35.4	54.5
5/8	1662.7	35.4	54.5

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = 10-24 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	1113.1	27.5	42.3
1/4	1484.1	36.7	56.4
5/16	1855.1	45.8	70.5
3/8	2226.2	55.0	84.6
7/16	2226.2	55.0	84.6
1/2	2226.2	55.0	84.6
9/16	2226.2	55.0	84.6
5/8	2226.2	55.0	84.6

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = 10-32 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	773.0	19.1	29.4
3/16	1159.6	28.6	44.1
1/4	1546.1	38.2	58.8
5/16	1932.6	47.7	73.4
3/8	2319.1	57.3	88.1
7/16	2319.1	57.3	88.1
1/2	2319.1	57.3	88.1
9/16	2319.1	57.3	88.1
5/8	2319.1	57.3	88.1
3/4	2319.1	57.3	88.1

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = 12-24 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	1290.7	36.2	55.8
1/4	1721.0	48.3	74.3
5/16	2151.2	60.4	92.9
3/8	2581.5	72.5	111.5
7/16	3011.7	84.6	130.1
1/2	3011.7	84.6	130.1
9/16	3011.7	84.6	130.1
5/8	3011.7	84.6	130.1
3/4	3011.7	84.6	130.1

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = 12-28 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	878.3	24.7	37.9
3/16	1317.4	37.0	56.9
1/4	1756.5	49.3	75.9
5/16	2195.7	61.7	94.9
3/8	2634.8	74.0	113.8
7/16	3073.9	86.3	132.8
1/2	3073.9	86.3	132.8
9/16	3073.9	86.3	132.8
5/8	3073.9	86.3	132.8
3/4	3073.9	86.3	132.8
7/8	3073.9	86.3	132.8

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = 1/4-20 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	1486.2	48.3	74.3
1/4	1981.6	64.4	99.1
5/16	2476.9	80.5	123.8
3/8	2972.3	96.6	148.6
7/16	3467.7	112.7	173.4
1/2	3963.1	128.8	198.2
9/16	3963.1	128.8	198.2
5/8	3963.1	128.8	198.2
3/4	3963.1	128.8	198.2
7/8	3963.1	128.8	198.2

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = 1/4-28 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	1033.1	33.6	51.7
3/16	1549.7	50.4	77.5
1/4	2066.3	67.2	103.3
5/16	2582.9	83.9	129.1
3/8	3099.4	100.7	155.0
7/16	3616.0	117.5	180.8
1/2	4132.6	134.3	206.6
9/16	4132.6	134.3	206.6
5/8	4132.6	134.3	206.6
3/4	4132.6	134.3	206.6
7/8	4132.6	134.3	206.6
1	4132.6	134.3	206.6

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Fastener Size = 5/16-18 UNC
[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	1888.6	76.7	118.0
1/4	2518.2	102.3	157.4
5/16	3147.7	127.9	196.7
3/8	3777.3	153.5	236.1
7/16	4406.8	179.0	275.4
1/2	5036.4	204.6	314.8
9/16	5665.9	230.2	354.1
5/8	5665.9	230.2	354.1
3/4	5665.9	230.2	354.1
7/8	5665.9	230.2	354.1
1	5665.9	230.2	354.1
1 1/8	5665.9	230.2	354.1
1 1/4	5665.9	230.2	354.1

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Fastener Size = 5/16-24 UNF
[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	1950.1	79.2	121.9
1/4	2600.2	105.6	162.5
5/16	3250.2	132.0	203.1
3/8	3900.3	158.4	243.8
7/16	4550.3	184.9	284.4
1/2	5200.3	211.3	325.0
9/16	5850.4	237.7	365.6
5/8	5850.4	237.7	365.6
3/4	5850.4	237.7	365.6
7/8	5850.4	237.7	365.6
1	5850.4	237.7	365.6
1 1/8	5850.4	237.7	365.6
1 1/4	5850.4	237.7	365.6
1 3/8	5850.4	237.7	365.6

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Fastener Size = 3/8-16 UNC
[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/4	3046.6	148.5	228.5
5/16	3808.2	185.7	285.6
3/8	4569.9	222.8	342.7
7/16	5331.5	259.9	399.9
1/2	6093.2	297.0	457.0
9/16	6854.8	334.2	514.1
5/8	7616.5	371.3	571.2
3/4	9139.8	445.6	685.5
7/8	9139.8	445.6	685.5
1	9139.8	445.6	685.5
1 1/8	9139.8	445.6	685.5
1 1/4	9139.8	445.6	685.5
1 3/8	9139.8	445.6	685.5
1 1/2	9139.8	445.6	685.5

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Fastener Size = 3/8-24 UNF
[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	2377.2	115.9	178.3
1/4	3169.6	154.5	237.7
5/16	3962.0	193.1	297.1
3/8	4754.4	231.8	356.6
7/16	5546.8	270.4	416.0
1/2	6339.2	309.0	475.4
9/16	7131.6	347.7	534.9
5/8	7924.0	386.3	594.3
3/4	9508.8	463.6	713.2
7/8	9508.8	463.6	713.2
1	9508.8	463.6	713.2
1 1/8	9508.8	463.6	713.2
1 1/4	9508.8	463.6	713.2
1 3/8	9508.8	463.6	713.2
1 1/2	9508.8	463.6	713.2

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Fastener Size = 7/16-14 UNC
[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	4454.0	253.3	389.7
3/8	5344.7	304.0	467.7
7/16	6235.5	354.6	545.6
1/2	7126.3	405.3	623.6
9/16	8017.1	456.0	701.5
5/8	8907.9	506.6	779.4
3/4	10689.5	608.0	935.3
7/8	12471.1	709.3	1091.2
1	12471.1	709.3	1091.2
1 1/8	12471.1	709.3	1091.2
1 1/4	12471.1	709.3	1091.2
1 3/8	12471.1	709.3	1091.2
1 1/2	12471.1	709.3	1091.2
1 3/4	12471.1	709.3	1091.2

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Fastener Size = 7/16-20 UNF
[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	2767.4	157.4	242.1
1/4	3689.8	209.9	322.9
5/16	4612.3	262.3	403.6
3/8	5534.7	314.8	484.3
7/16	6457.2	367.3	565.0
1/2	7379.6	419.7	645.7
9/16	8302.1	472.2	726.4
5/8	9224.5	524.6	807.1
3/4	11069.4	629.6	968.6
7/8	12914.3	734.5	1130.0
1	12914.3	734.5	1130.0
1 1/8	12914.3	734.5	1130.0
1 1/4	12914.3	734.5	1130.0
1 3/8	12914.3	734.5	1130.0
1 1/2	12914.3	734.5	1130.0
1 3/4	12914.3	734.5	1130.0
2	12914.3	734.5	1130.0

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = 1/2-13 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/4	4099.8	266.5	410.0
5/16	5124.7	333.1	512.5
3/8	6149.7	399.7	615.0
7/16	7174.6	466.3	717.5
1/2	8199.6	533.0	820.0
9/16	9224.5	599.6	922.5
5/8	10249.4	666.2	1024.9
3/4	12299.3	799.5	1229.9
7/8	14349.2	932.7	1434.9
1	16399.1	1065.9	1639.9
1 1/8	16399.1	1065.9	1639.9
1 1/4	16399.1	1065.9	1639.9
1 3/8	16399.1	1065.9	1639.9
1 1/2	16399.1	1065.9	1639.9
1 3/4	16399.1	1065.9	1639.9
2	16399.1	1065.9	1639.9

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = 1/2-20 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	3194.4	207.6	319.4
1/4	4259.2	276.8	425.9
5/16	5324.0	346.1	532.4
3/8	6388.8	415.3	638.9
7/16	7453.6	484.5	745.4
1/2	8518.4	553.7	851.8
9/16	9583.2	622.9	958.3
5/8	10648.0	692.1	1064.8
3/4	12777.6	830.5	1277.8
7/8	14907.2	969.0	1490.7
1	17036.9	1107.4	1703.7
1 1/8	17036.9	1107.4	1703.7
1 1/4	17036.9	1107.4	1703.7
1 3/8	17036.9	1107.4	1703.7
1 1/2	17036.9	1107.4	1703.7
1 3/4	17036.9	1107.4	1703.7
2	17036.9	1107.4	1703.7

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = 9/16-12 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	5789.8	423.4	651.4
3/8	6947.8	508.1	781.6
7/16	8105.7	592.7	911.9
1/2	9263.7	677.4	1042.2
9/16	10421.6	762.1	1172.4
5/8	11579.6	846.8	1302.7
3/4	13895.5	1016.1	1563.2
7/8	16211.4	1185.5	1823.8
1	18527.4	1354.8	2084.3
1 1/8	18527.4	1354.8	2084.3
1 1/4	18527.4	1354.8	2084.3
1 3/8	18527.4	1354.8	2084.3
1 1/2	18527.4	1354.8	2084.3
1 3/4	18527.4	1354.8	2084.3
2	18527.4	1354.8	2084.3

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = 9/16-18 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	3596.9	263.0	404.6
1/4	4795.8	350.7	539.5
5/16	5994.8	438.4	674.4
3/8	7193.7	526.0	809.3
7/16	8392.7	613.7	944.2
1/2	9591.7	701.4	1079.1
9/16	10790.6	789.1	1213.9
5/8	11989.6	876.7	1348.8
3/4	14387.5	1052.1	1618.6
7/8	16785.4	1227.4	1888.4
1	19183.3	1402.8	2158.1
1 1/8	19183.3	1402.8	2158.1
1 1/4	19183.3	1402.8	2158.1
1 3/8	19183.3	1402.8	2158.1
1 1/2	19183.3	1402.8	2158.1
1 3/4	19183.3	1402.8	2158.1
2	19183.3	1402.8	2158.1

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Fastener Size = 5/8-11 UNC
[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	6445.8	523.7	805.7
3/8	7734.9	628.5	966.9
7/16	9024.1	733.2	1128.0
1/2	10313.2	837.9	1289.2
9/16	11602.4	942.7	1450.3
5/8	12891.5	1047.4	1611.4
3/4	15469.8	1256.9	1933.7
7/8	18048.1	1466.4	2256.0
1	20626.4	1675.9	2578.3
1 1/8	23204.7	1885.4	2900.6
1 1/4	23204.7	1885.4	2900.6
1 3/8	23204.7	1885.4	2900.6
1 1/2	23204.7	1885.4	2900.6
1 3/4	23204.7	1885.4	2900.6
2	23204.7	1885.4	2900.6

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Fastener Size = 5/8-18 UNF
[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	4023.9	326.9	503.0
1/4	5365.2	435.9	670.7
5/16	6706.6	544.9	838.3
3/8	8047.9	653.9	1006.0
7/16	9389.2	762.9	1173.6
1/2	10730.5	871.9	1341.3
9/16	12071.8	980.8	1509.0
5/8	13413.1	1089.8	1676.6
3/4	16095.7	1307.8	2012.0
7/8	18778.4	1525.7	2347.3
1	21461.0	1743.7	2682.6
1 1/8	24143.6	1961.7	3017.9
1 1/4	24143.6	1961.7	3017.9
1 3/8	24143.6	1961.7	3017.9
1 1/2	24143.6	1961.7	3017.9
1 3/4	24143.6	1961.7	3017.9
2	24143.6	1961.7	3017.9

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Fastener Size = 3/4-10 UNC
[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	7801.0	760.6	1170.1
3/8	9361.2	912.7	1404.2
7/16	10921.4	1064.8	1638.2
1/2	12481.5	1217.0	1872.2
9/16	14041.7	1369.1	2106.3
5/8	15601.9	1521.2	2340.3
3/4	18722.3	1825.4	2808.3
7/8	21842.7	2129.7	3276.4
1	24963.1	2433.9	3744.5
1 1/8	28083.5	2738.1	4212.5
1 1/4	31203.9	3042.4	4680.6
1 3/8	34324.3	3346.6	5148.6
1 1/2	34324.3	3346.6	5148.6
1 3/4	34324.3	3346.6	5148.6
2	34324.3	3346.6	5148.6

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Fastener Size = 3/4-16 UNF
[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/4	6463.1	630.1	969.5
5/16	8078.8	787.7	1211.8
3/8	9694.6	945.2	1454.2
7/16	11310.4	1102.8	1696.6
1/2	12926.1	1260.3	1938.9
9/16	14541.9	1417.8	2181.3
5/8	16157.7	1575.4	2423.7
3/4	19389.2	1890.4	2908.4
7/8	22620.8	2205.5	3393.1
1	25852.3	2520.6	3877.8
1 1/8	29083.8	2835.7	4362.6
1 1/4	32315.4	3150.7	4847.3
1 3/8	35546.9	3465.8	5332.0
1 1/2	35546.9	3465.8	5332.0
1 3/4	35546.9	3465.8	5332.0
2	35546.9	3465.8	5332.0

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Fastener Size = 7/8-9 UNC
[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/8	10971.0	1248.0	1919.9
7/16	12799.5	1455.9	2239.9
1/2	14628.0	1663.9	2559.9
9/16	16456.5	1871.9	2879.9
5/8	18285.0	2079.9	3199.9
3/4	21942.0	2495.9	3839.9
7/8	25599.0	2911.9	4479.8
1	29256.0	3327.9	5119.8
1 1/8	32913.0	3743.9	5759.8
1 1/4	36570.0	4159.8	6399.8
1 3/8	40227.0	4575.8	7039.7
1 1/2	43884.0	4991.8	7679.7
1 3/4	43884.0	4991.8	7679.7
2	43884.0	4991.8	7679.7

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Fastener Size = 7/8-14 UNF
[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/4	7549.1	858.7	1321.1
5/16	9436.3	1073.4	1651.4
3/8	11323.6	1288.1	1981.6
7/16	13210.9	1502.7	2311.9
1/2	15098.1	1717.4	2642.2
9/16	16985.4	1932.1	2972.4
5/8	18872.6	2146.8	3302.7
3/4	22647.2	2576.1	3963.3
7/8	26421.7	3005.5	4623.8
1	30196.2	3434.8	5284.3
1 1/8	33970.8	3864.2	5944.9
1 1/4	37745.3	4293.5	6605.4
1 3/8	41519.8	4722.9	7266.0
1 1/2	45294.4	5152.2	7926.5
1 3/4	45294.4	5152.2	7926.5
2	45294.4	5152.2	7926.5

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Fastener Size = 1-8 UNC
[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
7/16	14649.0	1904.4	2929.8
1/2	16741.7	2176.4	3348.3
9/16	18834.4	2448.5	3766.9
5/8	20927.1	2720.5	4185.4
3/4	25112.5	3264.6	5022.5
7/8	29297.9	3808.7	5859.6
1	33483.3	4352.8	6696.7
1 1/8	37668.8	4896.9	7533.8
1 1/4	41854.2	5441.0	8370.8
1 3/8	46039.6	5985.1	9207.9
1 1/2	50225.0	6529.3	10045.0
1 3/4	58595.9	7617.5	11719.2
2	66966.7	8705.7	13393.3

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Fastener Size = 1-12 UNF
[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	10772.2	1400.4	2154.4
3/8	12926.6	1680.5	2585.3
7/16	15081.0	1960.5	3016.2
1/2	17235.5	2240.6	3447.1
9/16	19389.9	2520.7	3878.0
5/8	21544.3	2800.8	4308.9
3/4	25853.2	3360.9	5170.6
7/8	30162.1	3921.1	6032.4
1	34470.9	4481.2	6894.2
1 1/8	38779.8	5041.4	7756.0
1 1/4	43088.7	5601.5	8617.7
1 3/8	47397.5	6161.7	9479.5
1 1/2	51706.4	6721.8	10341.3
1 3/4	60324.1	7842.1	12064.8
2	68941.9	8962.4	13788.4

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Fastener Size = 1 1/8-7 UNC
[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
7/16	16457.0	2406.8	3702.8
1/2	18808.0	2750.7	4231.8
9/16	21159.0	3094.5	4760.8
5/8	23510.0	3438.3	5289.7
3/4	28211.9	4126.0	6347.7
7/8	32913.9	4813.7	7405.6
1	37615.9	5501.3	8463.6
1 1/8	42317.9	6189.0	9521.5
1 1/4	47019.9	6876.7	10579.5
1 3/8	51721.9	7564.3	11637.4
1 1/2	56423.9	8252.0	12695.4
1 3/4	65827.9	9627.3	14811.3
2	75231.8	11002.7	16927.2

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Fastener Size = 1 1/8-12 UNF
[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	12195.7	1783.6	2744.0
3/8	14634.8	2140.3	3292.8
7/16	17074.0	2497.1	3841.6
1/2	19513.1	2853.8	4390.5
9/16	21952.3	3210.5	4939.3
5/8	24391.4	3567.2	5488.1
3/4	29269.7	4280.7	6585.7
7/8	34148.0	4994.1	7683.3
1	39026.2	5707.6	8780.9
1 1/8	43904.5	6421.0	9878.5
1 1/4	48782.8	7134.5	10976.1
1 3/8	53661.1	7847.9	12073.7
1 1/2	58539.4	8561.4	13171.4
1 3/4	68295.9	9988.3	15366.6
2	78052.5	11415.2	17561.8

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Fastener Size = 1 1/4-7 UNC
[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
7/16	18449.9	2998.1	4612.5
1/2	21085.6	3426.4	5271.4
9/16	23721.3	3854.7	5930.3
5/8	26357.0	4283.0	6589.3
3/4	31628.4	5139.6	7907.1
7/8	36899.8	5996.2	9225.0
1	42171.2	6852.8	10542.8
1 1/8	47442.6	7709.4	11860.7
1 1/4	52714.0	8566.0	13178.5
1 3/8	57985.4	9422.6	14496.4
1 1/2	63256.8	10279.2	15814.2
1 3/4	73799.7	11992.4	18449.9
2	84342.5	13705.7	21085.6

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Fastener Size = 1 1/4-12 UNF
[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	13619.2	2213.1	3404.8
3/8	16343.1	2655.8	4085.8
7/16	19066.9	3098.4	4766.7
1/2	21790.8	3541.0	5447.7
9/16	24514.6	3983.6	6128.7
5/8	27238.5	4426.3	6809.6
3/4	32686.2	5311.5	8171.5
7/8	38133.9	6196.8	9533.5
1	43581.6	7082.0	10895.4
1 1/8	49029.3	7967.3	12257.3
1 1/4	54476.9	8852.5	13619.2
1 3/8	59924.6	9737.8	14981.2
1 1/2	65372.3	10623.0	16343.1
1 3/4	76267.7	12393.5	19066.9
2	87163.1	14164.0	21790.8

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = 1 3/8-6 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
9/16	25965.9	4641.4	7140.6
5/8	28851.1	5157.1	7934.0
3/4	34621.3	6188.6	9520.8
7/8	40391.5	7220.0	11107.7
1	46161.7	8251.4	12694.5
1 1/8	51931.9	9282.8	14281.3
1 1/4	57702.1	10314.3	15868.1
1 3/8	63472.3	11345.7	17454.9
1 1/2	69242.5	12377.1	19041.7
1 3/4	80782.9	14440.0	22215.3
2	92323.4	16502.8	25388.9

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = 1 3/8-12 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	15042.8	2688.9	4136.8
3/8	18051.3	3226.7	4964.1
7/16	21059.9	3764.5	5791.5
1/2	24068.4	4302.2	6618.8
9/16	27077.0	4840.0	7446.2
5/8	30085.5	5377.8	8273.5
3/4	36102.6	6453.3	9928.2
7/8	42119.8	7528.9	11582.9
1	48136.9	8604.5	13237.6
1 1/8	54154.0	9680.0	14892.3
1 1/4	60171.1	10755.6	16547.0
1 3/8	66188.2	11831.1	18201.8
1 1/2	72205.3	12906.7	19856.5
1 3/4	84239.5	15057.8	23165.9
2	96273.7	17208.9	26475.3

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = 1 1/2-6 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
9/16	28528.3	5563.0	8558.5
5/8	31698.1	6181.1	9509.4
3/4	38037.7	7417.4	11411.3
7/8	44377.4	8653.6	13313.2
1	50717.0	9889.8	15215.1
1 1/8	57056.6	11126.0	17117.0
1 1/4	63396.2	12362.3	19018.9
1 3/8	69735.9	13598.5	20920.8
1 1/2	76075.5	14834.7	22822.6
1 3/4	88754.7	17307.2	26626.4
2	101434.0	19779.6	30430.2

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = 1 1/2-12 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	16466.3	3210.9	4939.9
3/8	19759.6	3853.1	5927.9
7/16	23052.8	4495.3	6915.8
1/2	26346.1	5137.5	7903.8
9/16	29639.3	5779.7	8891.8
5/8	32932.6	6421.9	9879.8
3/4	39519.1	7706.2	11855.7
7/8	46105.7	8990.6	13831.7
1	52692.2	10275.0	15807.7
1 1/8	59278.7	11559.3	17783.6
1 1/4	65865.2	12843.7	19759.6
1 3/8	72451.7	14128.1	21735.5
1 1/2	79038.3	15412.5	23711.5
1 3/4	92211.3	17981.2	27663.4
2	105384.3	20549.9	31615.3

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = 1 3/4-5 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/8	36900.3	8394.8	12915.1
3/4	44280.3	10073.8	15498.1
7/8	51660.4	11752.7	18081.1
1	59040.5	13431.7	20664.2
1 1/8	66420.5	15110.7	23247.2
1 1/4	73800.6	16789.6	25830.2
1 3/8	81180.6	18468.6	28413.2
1 1/2	88560.7	20147.6	30996.2
1 3/4	103320.8	23505.5	36162.3
2	118080.9	26863.4	41328.3

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = 2-4 1/2 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/4	50719.7	13187.1	20287.9
7/8	59173.0	15385.0	23669.2
1	67626.3	17582.8	27050.5
1 1/8	76079.6	19780.7	30431.8
1 1/4	84532.9	21978.5	33813.2
1 3/8	92986.2	24176.4	37194.5
1 1/2	101439.5	26374.3	40575.8
1 3/4	118346.0	30770.0	47338.4
2	135252.6	35165.7	54101.0

Aluminum 2024-T4/T351

$$F_{su} = 37.5 \text{ ksi}$$

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = 0-80 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	127.4	1.0	1.5
1/8	254.8	2.0	3.1

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = 1-64 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	154.4	1.5	2.3
1/8	308.8	2.9	4.5
3/16	463.1	4.4	6.8

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = 1-72 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	157.1	1.5	2.3
1/8	314.2	3.0	4.6
3/16	471.2	4.5	6.9

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = 2-56 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	182.6	2.0	3.1
1/8	365.2	4.1	6.3
3/16	547.8	6.1	9.4
1/4	730.4	8.2	12.6

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = 2-64 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	186.3	2.1	3.2
1/8	372.6	4.2	6.4
3/16	558.9	6.2	9.6
1/4	745.1	8.3	12.8

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)
Fastener Size = 3-48 UNC
[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	419.7	5.4	8.3
3/16	629.5	8.1	12.5
1/4	839.4	10.8	16.6
5/16	839.4	10.8	16.6

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)
Fastener Size = 3-56 UNF
[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	214.5	2.8	4.2
1/8	429.0	5.5	8.5
3/16	643.5	8.3	12.7
1/4	858.0	11.0	17.0
5/16	858.0	11.0	17.0

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)
Fastener Size = 4-40 UNC
[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	470.3	6.8	10.5
3/16	705.4	10.3	15.8
1/4	940.5	13.7	21.1
5/16	940.5	13.7	21.1
3/8	940.5	13.7	21.1

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)
Fastener Size = 4-48 UNF
[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	483.5	7.0	10.8
3/16	725.3	10.6	16.2
1/4	967.0	14.1	21.7
5/16	967.0	14.1	21.7
3/8	967.0	14.1	21.7

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)
Fastener Size = 5-40 UNC
[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	534.1	8.7	13.4
3/16	801.1	13.0	20.0
1/4	1068.1	17.4	26.7
5/16	1335.2	21.7	33.4
3/8	1335.2	21.7	33.4
7/16	1335.2	21.7	33.4

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)
Fastener Size = 5-44 UNF
[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	540.9	8.8	13.5
3/16	811.4	13.2	20.3
1/4	1081.9	17.6	27.0
5/16	1352.4	22.0	33.8
3/8	1352.4	22.0	33.8
7/16	1352.4	22.0	33.8

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)
Fastener Size = 6-32 UNC
[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	577.8	10.4	15.9
3/16	866.6	15.5	23.9
1/4	1155.5	20.7	31.9
5/16	1444.4	25.9	39.9
3/8	1444.4	25.9	39.9
7/16	1444.4	25.9	39.9

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)
Fastener Size = 6-40 UNF
[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	597.9	10.7	16.5
3/16	896.8	16.1	24.8
1/4	1195.8	21.5	33.0
5/16	1494.7	26.8	41.3
3/8	1494.7	26.8	41.3
7/16	1494.7	26.8	41.3
1/2	1494.7	26.8	41.3

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)
Fastener Size = 8-32 UNC
[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	705.4	15.0	23.1
3/16	1058.1	22.6	34.7
1/4	1410.8	30.1	46.3
5/16	1763.5	37.6	57.8
3/8	1763.5	37.6	57.8
7/16	1763.5	37.6	57.8
1/2	1763.5	37.6	57.8
9/16	1763.5	37.6	57.8

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)
Fastener Size = 8-36 UNF
[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	716.7	15.3	23.5
3/16	1075.0	22.9	35.3
1/4	1433.4	30.6	47.0
5/16	1791.7	38.2	58.8
3/8	1791.7	38.2	58.8
7/16	1791.7	38.2	58.8
1/2	1791.7	38.2	58.8
9/16	1791.7	38.2	58.8
5/8	1791.7	38.2	58.8

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)
Fastener Size = 10-24 UNC
[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	1199.5	29.6	45.6
1/4	1599.3	39.5	60.8
5/16	1999.1	49.4	76.0
3/8	2398.9	59.3	91.2
7/16	2398.9	59.3	91.2
1/2	2398.9	59.3	91.2
9/16	2398.9	59.3	91.2
5/8	2398.9	59.3	91.2

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)
Fastener Size = 10-32 UNF
[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	833.0	20.6	31.7
3/16	1249.5	30.9	47.5
1/4	1666.0	41.2	63.3
5/16	2082.5	51.4	79.1
3/8	2499.0	61.7	95.0
7/16	2499.0	61.7	95.0
1/2	2499.0	61.7	95.0
9/16	2499.0	61.7	95.0
5/8	2499.0	61.7	95.0

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)
Fastener Size = 12-24 UNC
[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	1390.9	39.1	60.1
1/4	1854.5	52.1	80.1
5/16	2318.2	65.1	100.1
3/8	2781.8	78.1	120.2
7/16	3245.4	91.1	140.2
1/2	3245.4	91.1	140.2
9/16	3245.4	91.1	140.2
5/8	3245.4	91.1	140.2
3/4	3245.4	91.1	140.2

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)
Fastener Size = 12-28 UNF
[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	946.4	26.6	40.9
3/16	1419.6	39.9	61.3
1/4	1892.8	53.2	81.8
5/16	2366.0	66.4	102.2
3/8	2839.2	79.7	122.7
7/16	3312.4	93.0	143.1
1/2	3312.4	93.0	143.1
9/16	3312.4	93.0	143.1
5/8	3312.4	93.0	143.1
3/4	3312.4	93.0	143.1

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = 1/4-20 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	1601.5	52.0	80.1
1/4	2135.3	69.4	106.8
5/16	2669.1	86.7	133.5
3/8	3203.0	104.1	160.1
7/16	3736.8	121.4	186.8
1/2	4270.6	138.8	213.5
9/16	4270.6	138.8	213.5
5/8	4270.6	138.8	213.5
3/4	4270.6	138.8	213.5
7/8	4270.6	138.8	213.5

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = 1/4-28 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	1113.3	36.2	55.7
3/16	1670.0	54.3	83.5
1/4	2226.6	72.4	111.3
5/16	2783.3	90.5	139.2
3/8	3339.9	108.5	167.0
7/16	3896.6	126.6	194.8
1/2	4453.2	144.7	222.7
9/16	4453.2	144.7	222.7
5/8	4453.2	144.7	222.7
3/4	4453.2	144.7	222.7
7/8	4453.2	144.7	222.7
1	4453.2	144.7	222.7

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = 5/16-18 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	2035.2	82.7	127.2
1/4	2713.6	110.2	169.6
5/16	3391.9	137.8	212.0
3/8	4070.3	165.4	254.4
7/16	4748.7	192.9	296.8
1/2	5427.1	220.5	339.2
9/16	6105.5	248.0	381.6
5/8	6105.5	248.0	381.6
3/4	6105.5	248.0	381.6
7/8	6105.5	248.0	381.6
1	6105.5	248.0	381.6
1 1/8	6105.5	248.0	381.6

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = 5/16-24 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	2101.4	85.4	131.3
1/4	2801.9	113.8	175.1
5/16	3502.4	142.3	218.9
3/8	4202.9	170.7	262.7
7/16	4903.3	199.2	306.5
1/2	5603.8	227.7	350.2
9/16	6304.3	256.1	394.0
5/8	6304.3	256.1	394.0
3/4	6304.3	256.1	394.0
7/8	6304.3	256.1	394.0
1	6304.3	256.1	394.0
1 1/8	6304.3	256.1	394.0
1 1/4	6304.3	256.1	394.0

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = 3/8-16 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/4	3283.0	160.0	246.2
5/16	4103.7	200.1	307.8
3/8	4924.4	240.1	369.3
7/16	5745.2	280.1	430.9
1/2	6565.9	320.1	492.4
9/16	7386.7	360.1	554.0
5/8	8207.4	400.1	615.6
3/4	9848.9	480.1	738.7
7/8	9848.9	480.1	738.7
1	9848.9	480.1	738.7
1 1/8	9848.9	480.1	738.7
1 1/4	9848.9	480.1	738.7
1 3/8	9848.9	480.1	738.7

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = 3/8-24 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	2561.6	124.9	192.1
1/4	3415.5	166.5	256.2
5/16	4269.4	208.1	320.2
3/8	5123.3	249.8	384.2
7/16	5977.1	291.4	448.3
1/2	6831.0	333.0	512.3
9/16	7684.9	374.6	576.4
5/8	8538.8	416.3	640.4
3/4	10246.5	499.5	768.5
7/8	10246.5	499.5	768.5
1	10246.5	499.5	768.5
1 1/8	10246.5	499.5	768.5
1 1/4	10246.5	499.5	768.5
1 3/8	10246.5	499.5	768.5
1 1/2	10246.5	499.5	768.5

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = 7/16-14 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	4799.5	273.0	420.0
3/8	5759.4	327.6	503.9
7/16	6719.3	382.2	587.9
1/2	7679.2	436.8	671.9
9/16	8639.1	491.4	755.9
5/8	9599.0	545.9	839.9
3/4	11518.8	655.1	1007.9
7/8	13438.7	764.3	1175.9
1	13438.7	764.3	1175.9
1 1/8	13438.7	764.3	1175.9
1 1/4	13438.7	764.3	1175.9
1 3/8	13438.7	764.3	1175.9
1 1/2	13438.7	764.3	1175.9

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = 7/16-20 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	2982.1	169.6	260.9
1/4	3976.1	226.1	347.9
5/16	4970.1	282.7	434.9
3/8	5964.1	339.2	521.9
7/16	6958.1	395.7	608.8
1/2	7952.2	452.3	695.8
9/16	8946.2	508.8	782.8
5/8	9940.2	565.3	869.8
3/4	11928.2	678.4	1043.7
7/8	13916.3	791.5	1217.7
1	13916.3	791.5	1217.7
1 1/8	13916.3	791.5	1217.7
1 1/4	13916.3	791.5	1217.7
1 3/8	13916.3	791.5	1217.7
1 1/2	13916.3	791.5	1217.7
1 3/4	13916.3	791.5	1217.7

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = 1/2-13 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/4	4417.9	287.2	441.8
5/16	5522.3	359.0	552.2
3/8	6626.8	430.7	662.7
7/16	7731.3	502.5	773.1
1/2	8835.7	574.3	883.6
9/16	9940.2	646.1	994.0
5/8	11044.7	717.9	1104.5
3/4	13253.6	861.5	1325.4
7/8	15462.5	1005.1	1546.3
1	15462.5	1005.1	1546.3
1 1/8	15462.5	1005.1	1546.3
1 1/4	15462.5	1005.1	1546.3
1 3/8	15462.5	1005.1	1546.3
1 1/2	15462.5	1005.1	1546.3
1 3/4	15462.5	1005.1	1546.3
2	15462.5	1005.1	1546.3

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = 1/2-20 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	3442.3	223.7	344.2
1/4	4589.7	298.3	459.0
5/16	5737.1	372.9	573.7
3/8	6884.5	447.5	688.5
7/16	8031.9	522.1	803.2
1/2	9179.3	596.7	917.9
9/16	10326.8	671.2	1032.7
5/8	11474.2	745.8	1147.4
3/4	13769.0	895.0	1376.9
7/8	16063.8	1044.2	1606.4
1	18358.7	1193.3	1835.9
1 1/8	18358.7	1193.3	1835.9
1 1/4	18358.7	1193.3	1835.9
1 3/8	18358.7	1193.3	1835.9
1 1/2	18358.7	1193.3	1835.9
1 3/4	18358.7	1193.3	1835.9
2	18358.7	1193.3	1835.9

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = 9/16-12 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	6239.0	456.2	701.9
3/8	7486.8	547.5	842.3
7/16	8734.6	638.7	982.6
1/2	9982.4	730.0	1123.0
9/16	11230.2	821.2	1263.4
5/8	12478.0	912.5	1403.8
3/4	14973.6	1094.9	1684.5
7/8	17469.2	1277.4	1965.3
1	19964.8	1459.9	2246.0
1 1/8	19964.8	1459.9	2246.0
1 1/4	19964.8	1459.9	2246.0
1 3/8	19964.8	1459.9	2246.0
1 1/2	19964.8	1459.9	2246.0
1 3/4	19964.8	1459.9	2246.0
2	19964.8	1459.9	2246.0

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = 9/16-18 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	3875.9	283.4	436.0
1/4	5167.9	377.9	581.4
5/16	6459.9	472.4	726.7
3/8	7751.9	566.9	872.1
7/16	9043.9	661.3	1017.4
1/2	10335.8	755.8	1162.8
9/16	11627.8	850.3	1308.1
5/8	12919.8	944.8	1453.5
3/4	15503.8	1133.7	1744.2
7/8	18087.7	1322.7	2034.9
1	20671.7	1511.6	2325.6
1 1/8	20671.7	1511.6	2325.6
1 1/4	20671.7	1511.6	2325.6
1 3/8	20671.7	1511.6	2325.6
1 1/2	20671.7	1511.6	2325.6
1 3/4	20671.7	1511.6	2325.6
2	20671.7	1511.6	2325.6

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)
Fastener Size = 5/8-11 UNC
[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	6945.9	564.4	868.2
3/8	8335.0	677.2	1041.9
7/16	9724.2	790.1	1215.5
1/2	11113.4	903.0	1389.2
9/16	12502.6	1015.8	1562.8
5/8	13891.7	1128.7	1736.5
3/4	16670.1	1354.4	2083.8
7/8	19448.4	1580.2	2431.1
1	22226.8	1805.9	2778.3
1 1/8	25005.1	2031.7	3125.6
1 1/4	25005.1	2031.7	3125.6
1 3/8	25005.1	2031.7	3125.6
1 1/2	25005.1	2031.7	3125.6
1 3/4	25005.1	2031.7	3125.6
2	25005.1	2031.7	3125.6

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)
Fastener Size = 5/8-18 UNF
[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	4336.1	352.3	542.0
1/4	5781.5	469.7	722.7
5/16	7226.9	587.2	903.4
3/8	8672.3	704.6	1084.0
7/16	10117.6	822.1	1264.7
1/2	11563.0	939.5	1445.4
9/16	13008.4	1056.9	1626.1
5/8	14453.8	1174.4	1806.7
3/4	17344.5	1409.2	2168.1
7/8	20235.3	1644.1	2529.4
1	23126.0	1879.0	2890.8
1 1/8	26016.8	2113.9	3252.1
1 1/4	26016.8	2113.9	3252.1
1 3/8	26016.8	2113.9	3252.1
1 1/2	26016.8	2113.9	3252.1
1 3/4	26016.8	2113.9	3252.1
2	26016.8	2113.9	3252.1

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)
Fastener Size = 3/4-10 UNC
[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	8406.2	819.6	1260.9
3/8	10087.5	983.5	1513.1
7/16	11768.7	1147.4	1765.3
1/2	13449.9	1311.4	2017.5
9/16	15131.2	1475.3	2269.7
5/8	16812.4	1639.2	2521.9
3/4	20174.9	1967.1	3026.2
7/8	23537.4	2294.9	3530.6
1	26899.9	2622.7	4035.0
1 1/8	30262.4	2950.6	4539.4
1 1/4	33624.9	3278.4	5043.7
1 3/8	36987.3	3606.3	5548.1
1 1/2	36987.3	3606.3	5548.1
1 3/4	36987.3	3606.3	5548.1
2	36987.3	3606.3	5548.1

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)
Fastener Size = 3/4-16 UNF
[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/4	6964.5	679.0	1044.7
5/16	8705.6	848.8	1305.8
3/8	10446.8	1018.6	1567.0
7/16	12187.9	1188.3	1828.2
1/2	13929.0	1358.1	2089.4
9/16	15670.2	1527.8	2350.5
5/8	17411.3	1697.6	2611.7
3/4	20893.6	2037.1	3134.0
7/8	24375.8	2376.6	3656.4
1	27858.1	2716.2	4178.7
1 1/8	31340.3	3055.7	4701.0
1 1/4	34822.6	3395.2	5223.4
1 3/8	38304.9	3734.7	5745.7
1 1/2	38304.9	3734.7	5745.7
1 3/4	38304.9	3734.7	5745.7
2	38304.9	3734.7	5745.7

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = 7/8-9 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/8	11822.2	1344.8	2068.9
7/16	13792.6	1568.9	2413.7
1/2	15762.9	1793.0	2758.5
9/16	17733.3	2017.2	3103.3
5/8	19703.7	2241.3	3448.1
3/4	23644.4	2689.6	4137.8
7/8	27585.1	3137.8	4827.4
1	31525.9	3586.1	5517.0
1 1/8	35466.6	4034.3	6206.7
1 1/4	39407.4	4482.6	6896.3
1 3/8	43348.1	4930.8	7585.9
1 1/2	47288.8	5379.1	8275.5
1 3/4	47288.8	5379.1	8275.5
2	47288.8	5379.1	8275.5

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = 7/8-14 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/4	8134.8	925.3	1423.6
5/16	10168.5	1156.7	1779.5
3/8	12202.1	1388.0	2135.4
7/16	14235.8	1619.3	2491.3
1/2	16269.5	1850.7	2847.2
9/16	18303.2	2082.0	3203.1
5/8	20336.9	2313.3	3559.0
3/4	24404.3	2776.0	4270.7
7/8	28471.7	3238.7	4982.5
1	32539.0	3701.3	5694.3
1 1/8	36606.4	4164.0	6406.1
1 1/4	40673.8	4626.6	7117.9
1 3/8	44741.2	5089.3	7829.7
1 1/2	48808.6	5552.0	8541.5
1 3/4	48808.6	5552.0	8541.5
2	48808.6	5552.0	8541.5

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = 1-8 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
7/16	15785.5	2052.1	3157.1
1/2	18040.6	2345.3	3608.1
9/16	20295.7	2638.4	4059.1
5/8	22550.7	2931.6	4510.1
3/4	27060.9	3517.9	5412.2
7/8	31571.0	4104.2	6314.2
1	36081.2	4690.6	7216.2
1 1/8	40591.3	5276.9	8118.3
1 1/4	45101.5	5863.2	9020.3
1 3/8	49611.6	6449.5	9922.3
1 1/2	54121.8	7035.8	10824.4
1 3/4	63142.1	8208.5	12628.4
2	72162.4	9381.1	14432.5

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = 1-12 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	11607.9	1509.0	2321.6
3/8	13929.5	1810.8	2785.9
7/16	16251.1	2112.6	3250.2
1/2	18572.7	2414.5	3714.5
9/16	20894.3	2716.3	4178.9
5/8	23215.9	3018.1	4643.2
3/4	27859.1	3621.7	5571.8
7/8	32502.2	4225.3	6500.4
1	37145.4	4828.9	7429.1
1 1/8	41788.6	5432.5	8357.7
1 1/4	46431.8	6036.1	9286.4
1 3/8	51074.9	6639.7	10215.0
1 1/2	55718.1	7243.4	11143.6
1 3/4	65004.5	8450.6	13000.9
2	74290.8	9657.8	14858.2

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = 1 1/8-7 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
7/16	17733.8	2593.6	3990.1
1/2	20267.2	2964.1	4560.1
9/16	22800.6	3334.6	5130.1
5/8	25334.0	3705.1	5700.1
3/4	30400.8	4446.1	6840.2
7/8	35467.6	5187.1	7980.2
1	40534.4	5928.2	9120.2
1 1/8	45601.2	6669.2	10260.3
1 1/4	50668.0	7410.2	11400.3
1 3/8	55734.8	8151.2	12540.3
1 1/2	60801.6	8892.2	13680.4
1 3/4	70935.2	10374.3	15960.4
2	81068.8	11856.3	18240.5

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = 1 1/8-12 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	13141.9	1922.0	2956.9
3/8	15770.3	2306.4	3548.3
7/16	18398.7	2690.8	4139.7
1/2	21027.1	3075.2	4731.1
9/16	23655.5	3459.6	5322.5
5/8	26283.8	3844.0	5913.9
3/4	31540.6	4612.8	7096.6
7/8	36797.4	5381.6	8279.4
1	42054.1	6150.4	9462.2
1 1/8	47310.9	6919.2	10645.0
1 1/4	52567.7	7688.0	11827.7
1 3/8	57824.4	8456.8	13010.5
1 1/2	63081.2	9225.6	14193.3
1 3/4	73594.8	10763.2	16558.8
2	84108.3	12300.8	18924.4

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = 1 1/4-7 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
7/16	19881.4	3230.7	4970.3
1/2	22721.6	3692.3	5680.4
9/16	25561.8	4153.8	6390.4
5/8	28402.0	4615.3	7100.5
3/4	34082.4	5538.4	8520.6
7/8	39762.7	6461.4	9940.7
1	45443.1	7384.5	11360.8
1 1/8	51123.5	8307.6	12780.9
1 1/4	56803.9	9230.6	14201.0
1 3/8	62484.3	10153.7	15621.1
1 1/2	68164.7	11076.8	17041.2
1 3/4	79525.5	12922.9	19881.4
2	90886.3	14769.0	22721.6

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = 1 1/4-12 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	14675.9	2384.8	3669.0
3/8	17611.1	2861.8	4402.8
7/16	20546.3	3338.8	5136.6
1/2	23481.4	3815.7	5870.4
9/16	26416.6	4292.7	6604.2
5/8	29351.8	4769.7	7338.0
3/4	35222.2	5723.6	8805.5
7/8	41092.5	6677.5	10273.1
1	46962.9	7631.5	11740.7
1 1/8	52833.2	8585.4	13208.3
1 1/4	58703.6	9539.3	14675.9
1 3/8	64574.0	10493.3	16143.5
1 1/2	70444.3	11447.2	17611.1
1 3/4	82185.0	13355.1	20546.3
2	93925.8	15262.9	23481.4

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = 1 3/8-6 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
9/16	27980.5	5001.5	7694.7
5/8	31089.5	5557.2	8549.6
3/4	37307.4	6668.7	10259.5
7/8	43525.3	7780.1	11969.5
1	49743.2	8891.6	13679.4
1 1/8	55961.1	10003.0	15389.3
1 1/4	62179.0	11114.5	17099.2
1 3/8	68396.9	12225.9	18809.1
1 1/2	74614.8	13337.4	20519.1
1 3/4	87050.6	15560.3	23938.9
2	99486.4	17783.2	27358.8

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = 1 3/8-12 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	16209.9	2897.5	4457.7
3/8	19451.9	3477.0	5349.3
7/16	22693.8	4056.5	6240.8
1/2	25935.8	4636.0	7132.3
9/16	29177.8	5215.5	8023.9
5/8	32419.8	5795.0	8915.4
3/4	38903.7	6954.0	10698.5
7/8	45387.7	8113.0	12481.6
1	51871.6	9272.1	14264.7
1 1/8	58355.6	10431.1	16047.8
1 1/4	64839.5	11590.1	17830.9
1 3/8	71323.5	12749.1	19614.0
1 1/2	77807.4	13908.1	21397.0
1 3/4	90775.3	16226.1	24963.2
2	103743.2	18544.1	28529.4

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = 1 1/2-6 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
9/16	30741.7	5994.6	9222.5
5/8	34157.5	6660.7	10247.2
3/4	40988.9	7992.8	12296.7
7/8	47820.4	9325.0	14346.1
1	54651.9	10657.1	16395.6
1 1/8	61483.4	11989.3	18445.0
1 1/4	68314.9	13321.4	20494.5
1 3/8	75146.4	14653.5	22543.9
1 1/2	81977.9	15985.7	24593.4
1 3/4	95640.9	18650.0	28692.3
2	109303.9	21314.3	32791.2

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = 1 1/2-12 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	17743.9	3460.1	5323.2
3/8	21292.6	4152.1	6387.8
7/16	24841.4	4844.1	7452.4
1/2	28390.2	5536.1	8517.1
9/16	31939.0	6228.1	9581.7
5/8	35487.7	6920.1	10646.3
3/4	42585.3	8304.1	12775.6
7/8	49682.8	9688.1	14904.8
1	56780.4	11072.2	17034.1
1 1/8	63877.9	12456.2	19163.4
1 1/4	70975.5	13840.2	21292.6
1 3/8	78073.0	15224.2	23421.9
1 1/2	85170.5	16608.3	25551.2
1 3/4	99365.6	19376.3	29809.7
2	113560.7	22144.3	34068.2

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = 1 3/4-5 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/8	39763.2	9046.1	13917.1
3/4	47715.9	10855.4	16700.6
7/8	55668.5	12664.6	19484.0
1	63621.2	14473.8	22267.4
1 1/8	71573.8	16283.0	25050.8
1 1/4	79526.5	18092.3	27834.3
1 3/8	87479.1	19901.5	30617.7
1 1/2	95431.8	21710.7	33401.1
1 3/4	111337.1	25329.2	38968.0
2	127242.4	28947.6	44534.8

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = 2-4 1/2 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/4	54654.9	14210.3	21862.0
7/8	63764.0	16578.6	25505.6
1	72873.2	18947.0	29149.3
1 1/8	81982.3	21315.4	32792.9
1 1/4	91091.5	23683.8	36436.6
1 3/8	100200.6	26052.2	40080.2
1 1/2	109309.8	28420.5	43723.9
1 3/4	127528.0	33157.3	51011.2
2	145746.3	37894.0	58298.5

Aluminum 7075-T6/T651

$$F_{su} = 45.6 \text{ ksi}$$

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = 0-80 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	154.9	1.2	1.9
1/8	309.8	2.4	3.7

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = 1-64 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	187.7	1.8	2.7
1/8	375.5	3.6	5.5

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = 1-72 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	191.0	1.8	2.8
1/8	382.0	3.6	5.6
3/16	573.0	5.4	8.4

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = 2-56 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	222.0	2.5	3.8
1/8	444.1	5.0	7.6
3/16	666.1	7.4	11.5

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = 2-64 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	226.5	2.5	3.9
1/8	453.0	5.1	7.8
3/16	679.6	7.6	11.7

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = 3-48 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	510.4	6.6	10.1
3/16	765.5	9.9	15.2
1/4	1020.7	13.1	20.2

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = 3-56 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	260.8	3.4	5.2
1/8	521.7	6.7	10.3
3/16	782.5	10.1	15.5
1/4	1043.4	13.4	20.7

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = 4-40 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	571.8	8.3	12.8
3/16	857.7	12.5	19.2
1/4	1143.7	16.7	25.6
5/16	1143.7	16.7	25.6

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = 4-48 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	587.9	8.6	13.2
3/16	881.9	12.8	19.8
1/4	1175.9	17.1	26.3
5/16	1175.9	17.1	26.3

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = 5-40 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	649.4	10.6	16.2
3/16	974.1	15.8	24.4
1/4	1298.9	21.1	32.5
5/16	1623.6	26.4	40.6

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = 5-44 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	657.8	10.7	16.4
3/16	986.7	16.0	24.7
1/4	1315.6	21.4	32.9
5/16	1644.5	26.7	41.1
3/8	1644.5	26.7	41.1

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = 6-32 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	702.6	12.6	19.4
3/16	1053.8	18.9	29.1
1/4	1405.1	25.2	38.8
5/16	1756.4	31.5	48.5
3/8	1756.4	31.5	48.5

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = 6-40 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	727.0	13.0	20.1
3/16	1090.5	19.6	30.1
1/4	1454.1	26.1	40.1
5/16	1817.6	32.6	50.2
3/8	1817.6	32.6	50.2

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = 8-32 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	857.7	18.3	28.1
3/16	1286.6	27.4	42.2
1/4	1715.5	36.6	56.3
5/16	2144.4	45.7	70.3
3/8	2144.4	45.7	70.3
7/16	2144.4	45.7	70.3

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = 8-36 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	871.5	18.6	28.6
3/16	1307.2	27.9	42.9
1/4	1743.0	37.2	57.2
5/16	2178.7	46.4	71.5
3/8	2178.7	46.4	71.5
7/16	2178.7	46.4	71.5
1/2	2178.7	46.4	71.5

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = 10-24 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	1458.5	36.0	55.4
1/4	1944.7	48.0	73.9
5/16	2430.9	60.0	92.4
3/8	2917.1	72.1	110.8
7/16	2917.1	72.1	110.8
1/2	2917.1	72.1	110.8

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = 10-32 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	1012.9	25.0	38.5
3/16	1519.4	37.5	57.7
1/4	2025.9	50.0	77.0
5/16	2532.4	62.5	96.2
3/8	3038.8	75.1	115.5
7/16	3038.8	75.1	115.5
1/2	3038.8	75.1	115.5
9/16	3038.8	75.1	115.5

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = 12-24 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	1691.3	47.5	73.1
1/4	2255.1	63.3	97.4
5/16	2818.9	79.2	121.8
3/8	3382.6	95.0	146.1
7/16	3382.6	95.0	146.1
1/2	3382.6	95.0	146.1
9/16	3382.6	95.0	146.1
5/8	3382.6	95.0	146.1

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = 12-28 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	1150.8	32.3	49.7
3/16	1726.2	48.5	74.6
1/4	2301.7	64.6	99.4
5/16	2877.1	80.8	124.3
3/8	3452.5	96.9	149.1
7/16	4027.9	113.1	174.0
1/2	4027.9	113.1	174.0
9/16	4027.9	113.1	174.0
5/8	4027.9	113.1	174.0

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = 1/4-20 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	1947.4	63.3	97.4
1/4	2596.5	84.4	129.8
5/16	3245.7	105.5	162.3
3/8	3894.8	126.6	194.7
7/16	4543.9	147.7	227.2
1/2	5193.1	168.8	259.7
9/16	5193.1	168.8	259.7
5/8	5193.1	168.8	259.7
3/4	5193.1	168.8	259.7

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = 1/4-28 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	1353.8	44.0	67.7
3/16	2030.7	66.0	101.5
1/4	2707.6	88.0	135.4
5/16	3384.4	110.0	169.2
3/8	4061.3	132.0	203.1
7/16	4738.2	154.0	236.9
1/2	5415.1	176.0	270.8
9/16	5415.1	176.0	270.8
5/8	5415.1	176.0	270.8
3/4	5415.1	176.0	270.8

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = 5/16-18 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	2474.8	100.5	154.7
1/4	3299.7	134.0	206.2
5/16	4124.6	167.6	257.8
3/8	4949.5	201.1	309.3
7/16	5774.4	234.6	360.9
1/2	6599.4	268.1	412.5
9/16	6599.4	268.1	412.5
5/8	6599.4	268.1	412.5
3/4	6599.4	268.1	412.5
7/8	6599.4	268.1	412.5

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = 5/16-24 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	2555.3	103.8	159.7
1/4	3407.1	138.4	212.9
5/16	4258.9	173.0	266.2
3/8	5110.7	207.6	319.4
7/16	5962.5	242.2	372.7
1/2	6814.2	276.8	425.9
9/16	7666.0	311.4	479.1
5/8	7666.0	311.4	479.1
3/4	7666.0	311.4	479.1
7/8	7666.0	311.4	479.1
1	7666.0	311.4	479.1

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = 3/8-16 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/4	3992.1	194.6	299.4
5/16	4990.1	243.3	374.3
3/8	5988.1	291.9	449.1
7/16	6986.1	340.6	524.0
1/2	7984.2	389.2	598.8
9/16	8982.2	437.9	673.7
5/8	9980.2	486.5	748.5
3/4	11976.3	583.8	898.2
7/8	11976.3	583.8	898.2
1	11976.3	583.8	898.2
1 1/8	11976.3	583.8	898.2

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = 3/8-24 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	3114.9	151.9	233.6
1/4	4153.2	202.5	311.5
5/16	5191.6	253.1	389.4
3/8	6229.9	303.7	467.2
7/16	7268.2	354.3	545.1
1/2	8306.5	404.9	623.0
9/16	9344.8	455.6	700.9
5/8	10383.1	506.2	778.7
3/4	12459.7	607.4	934.5
7/8	12459.7	607.4	934.5
1	12459.7	607.4	934.5
1 1/8	12459.7	607.4	934.5
1 1/4	12459.7	607.4	934.5

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = 7/16-14 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	5836.2	331.9	510.7
3/8	7003.5	398.3	612.8
7/16	8170.7	464.7	714.9
1/2	9337.9	531.1	817.1
9/16	10505.2	597.5	919.2
5/8	11672.4	663.9	1021.3
3/4	14006.9	796.6	1225.6
7/8	16341.4	929.4	1429.9
1	16341.4	929.4	1429.9
1 1/8	16341.4	929.4	1429.9
1 1/4	16341.4	929.4	1429.9
1 3/8	16341.4	929.4	1429.9

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = 7/16-20 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	3626.2	206.2	317.3
1/4	4834.9	275.0	423.1
5/16	6043.6	343.7	528.8
3/8	7252.4	412.5	634.6
7/16	8461.1	481.2	740.3
1/2	9669.8	550.0	846.1
9/16	10878.5	618.7	951.9
5/8	12087.3	687.5	1057.6
3/4	14504.7	825.0	1269.2
7/8	16922.2	962.4	1480.7
1	19339.6	1099.9	1692.2
1 1/8	19339.6	1099.9	1692.2
1 1/4	19339.6	1099.9	1692.2
1 3/8	19339.6	1099.9	1692.2
1 1/2	19339.6	1099.9	1692.2

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = 1/2-13 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/4	5372.1	349.2	537.2
5/16	6715.2	436.5	671.5
3/8	8058.2	523.8	805.8
7/16	9401.2	611.1	940.1
1/2	10744.2	698.4	1074.4
9/16	12087.3	785.7	1208.7
5/8	13430.3	873.0	1343.0
3/4	16116.4	1047.6	1611.6
7/8	18802.4	1222.2	1880.2
1	21488.5	1396.8	2148.8
1 1/8	21488.5	1396.8	2148.8
1 1/4	21488.5	1396.8	2148.8
1 3/8	21488.5	1396.8	2148.8
1 1/2	21488.5	1396.8	2148.8

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = 1/2-20 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	4185.8	272.1	418.6
1/4	5581.0	362.8	558.1
5/16	6976.3	453.5	697.6
3/8	8371.6	544.2	837.2
7/16	9766.8	634.8	976.7
1/2	11162.1	725.5	1116.2
9/16	12557.3	816.2	1255.7
5/8	13952.6	906.9	1395.3
3/4	16743.1	1088.3	1674.3
7/8	19533.6	1269.7	1953.4
1	22324.2	1451.1	2232.4
1 1/8	22324.2	1451.1	2232.4
1 1/4	22324.2	1451.1	2232.4
1 3/8	22324.2	1451.1	2232.4
1 1/2	22324.2	1451.1	2232.4
1 3/4	22324.2	1451.1	2232.4
2	22324.2	1451.1	2232.4

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = 9/16-12 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	7586.6	554.8	853.5
3/8	9104.0	665.7	1024.2
7/16	10621.3	776.7	1194.9
1/2	12138.6	887.6	1365.6
9/16	13655.9	998.6	1536.3
5/8	15173.3	1109.5	1707.0
3/4	18207.9	1331.5	2048.4
7/8	21242.6	1553.4	2389.8
1	24277.2	1775.3	2731.2
1 1/8	24277.2	1775.3	2731.2
1 1/4	24277.2	1775.3	2731.2
1 3/8	24277.2	1775.3	2731.2
1 1/2	24277.2	1775.3	2731.2
1 3/4	24277.2	1775.3	2731.2
2	24277.2	1775.3	2731.2

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = 9/16-18 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	4713.1	344.6	530.2
1/4	6284.2	459.5	707.0
5/16	7855.2	574.4	883.7
3/8	9426.3	689.3	1060.5
7/16	10997.3	804.2	1237.2
1/2	12568.4	919.1	1413.9
9/16	14139.4	1033.9	1590.7
5/8	15710.5	1148.8	1767.4
3/4	18852.6	1378.6	2120.9
7/8	21994.7	1608.4	2474.4
1	25136.8	1838.1	2827.9
1 1/8	25136.8	1838.1	2827.9
1 1/4	25136.8	1838.1	2827.9
1 3/8	25136.8	1838.1	2827.9
1 1/2	25136.8	1838.1	2827.9
1 3/4	25136.8	1838.1	2827.9
2	25136.8	1838.1	2827.9

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = 5/8-11 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	8446.2	686.3	1055.8
3/8	10135.4	823.5	1266.9
7/16	11824.6	960.8	1478.1
1/2	13513.9	1098.0	1689.2
9/16	15203.1	1235.3	1900.4
5/8	16892.3	1372.5	2111.5
3/4	20270.8	1647.0	2533.9
7/8	23649.3	1921.5	2956.2
1	27027.7	2196.0	3378.5
1 1/8	30406.2	2470.5	3800.8
1 1/4	30406.2	2470.5	3800.8
1 3/8	30406.2	2470.5	3800.8
1 1/2	30406.2	2470.5	3800.8
1 3/4	30406.2	2470.5	3800.8
2	30406.2	2470.5	3800.8

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = 5/8-18 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	5272.7	428.4	659.1
1/4	7030.3	571.2	878.8
5/16	8787.9	714.0	1098.5
3/8	10545.5	856.8	1318.2
7/16	12303.1	999.6	1537.9
1/2	14060.6	1142.4	1757.6
9/16	15818.2	1285.2	1977.3
5/8	17575.8	1428.0	2197.0
3/4	21091.0	1713.6	2636.4
7/8	24606.1	1999.2	3075.8
1	28121.3	2284.9	3515.2
1 1/8	31636.4	2570.5	3954.6
1 1/4	31636.4	2570.5	3954.6
1 3/8	31636.4	2570.5	3954.6
1 1/2	31636.4	2570.5	3954.6
1 3/4	31636.4	2570.5	3954.6
2	31636.4	2570.5	3954.6

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = 3/4-10 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	10222.0	996.6	1533.3
3/8	12266.3	1196.0	1840.0
7/16	14310.7	1395.3	2146.6
1/2	16355.1	1594.6	2453.3
9/16	18399.5	1794.0	2759.9
5/8	20443.9	1993.3	3066.6
3/4	24532.7	2391.9	3679.9
7/8	28621.5	2790.6	4293.2
1	32710.3	3189.3	4906.5
1 1/8	36799.0	3587.9	5519.9
1 1/4	40887.8	3986.6	6133.2
1 3/8	44976.6	4385.2	6746.5
1 1/2	44976.6	4385.2	6746.5
1 3/4	44976.6	4385.2	6746.5
2	44976.6	4385.2	6746.5

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = 3/4-16 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/4	8468.9	825.7	1270.3
5/16	10586.1	1032.1	1587.9
3/8	12703.3	1238.6	1905.5
7/16	14820.5	1445.0	2223.1
1/2	16937.7	1651.4	2540.7
9/16	19054.9	1857.9	2858.2
5/8	21172.1	2064.3	3175.8
3/4	25406.6	2477.1	3811.0
7/8	29641.0	2890.0	4446.1
1	33875.4	3302.9	5081.3
1 1/8	38109.8	3715.7	5716.5
1 1/4	42344.3	4128.6	6351.6
1 3/8	46578.7	4541.4	6986.8
1 1/2	46578.7	4541.4	6986.8
1 3/4	46578.7	4541.4	6986.8
2	46578.7	4541.4	6986.8

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = 7/8-9 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/8	14375.8	1635.2	2515.8
7/16	16771.8	1907.8	2935.1
1/2	19167.7	2180.3	3354.4
9/16	21563.7	2452.9	3773.6
5/8	23959.7	2725.4	4192.9
3/4	28751.6	3270.5	5031.5
7/8	33543.5	3815.6	5870.1
1	38335.5	4360.7	6708.7
1 1/8	43127.4	4905.7	7547.3
1 1/4	47919.3	5450.8	8385.9
1 3/8	52711.3	5995.9	9224.5
1 1/2	57503.2	6541.0	10063.1
1 3/4	57503.2	6541.0	10063.1
2	57503.2	6541.0	10063.1

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = 7/8-14 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/4	9891.9	1125.2	1731.1
5/16	12364.8	1406.5	2163.8
3/8	14837.8	1687.8	2596.6
7/16	17310.8	1969.1	3029.4
1/2	19783.7	2250.4	3462.2
9/16	22256.7	2531.7	3894.9
5/8	24729.7	2813.0	4327.7
3/4	29675.6	3375.6	5193.2
7/8	34621.5	3938.2	6058.8
1	39567.5	4500.8	6924.3
1 1/8	44513.4	5063.4	7789.8
1 1/4	49459.3	5626.0	8655.4
1 3/8	54405.3	6188.6	9520.9
1 1/2	59351.2	6751.2	10386.5
1 3/4	59351.2	6751.2	10386.5
2	59351.2	6751.2	10386.5

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = 1-8 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
7/16	19195.2	2495.4	3839.0
1/2	21937.4	2851.9	4387.5
9/16	24679.5	3208.3	4935.9
5/8	27421.7	3564.8	5484.3
3/4	32906.0	4277.8	6581.2
7/8	38390.4	4990.8	7678.1
1	43874.7	5703.7	8774.9
1 1/8	49359.1	6416.7	9871.8
1 1/4	54843.4	7129.6	10968.7
1 3/8	60327.8	7842.6	12065.6
1 1/2	65812.1	8555.6	13162.4
1 3/4	76780.8	9981.5	15356.2
2	87749.5	11407.4	17549.9

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = 1-12 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	14115.3	1835.0	2823.1
3/8	16938.3	2202.0	3387.7
7/16	19761.4	2569.0	3952.3
1/2	22584.4	2936.0	4516.9
9/16	25407.5	3303.0	5081.5
5/8	28230.5	3670.0	5646.1
3/4	33876.6	4404.0	6775.3
7/8	39522.7	5138.0	7904.5
1	45168.8	5871.9	9033.8
1 1/8	50814.9	6605.9	10163.0
1 1/4	56461.0	7339.9	11292.2
1 3/8	62107.1	8073.9	12421.4
1 1/2	67753.2	8807.9	13550.6
1 3/4	79045.4	10275.9	15809.1
2	90337.6	11743.9	18067.5

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = 1 1/8-7 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
7/16	21564.3	3153.8	4852.0
1/2	24644.9	3604.3	5545.1
9/16	27725.5	4054.9	6238.2
5/8	30806.1	4505.4	6931.4
3/4	36967.4	5406.5	8317.7
7/8	43128.6	6307.6	9703.9
1	49289.8	7208.6	11090.2
1 1/8	55451.1	8109.7	12476.5
1 1/4	61612.3	9010.8	13862.8
1 3/8	67773.5	9911.9	15249.0
1 1/2	73934.7	10813.0	16635.3
1 3/4	86257.2	12615.1	19407.9
2	98579.7	14417.3	22180.4

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = 1 1/8-12 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	15980.6	2337.2	3595.6
3/8	19176.7	2804.6	4314.8
7/16	22372.8	3272.0	5033.9
1/2	25568.9	3739.5	5753.0
9/16	28765.0	4206.9	6472.1
5/8	31961.1	4674.3	7191.3
3/4	38353.4	5609.2	8629.5
7/8	44745.6	6544.0	10067.8
1	51137.8	7478.9	11506.0
1 1/8	57530.1	8413.8	12944.3
1 1/4	63922.3	9348.6	14382.5
1 3/8	70314.5	10283.5	15820.8
1 1/2	76706.8	11218.4	17259.0
1 3/4	89491.2	13088.1	20135.5
2	102275.7	14957.8	23012.0

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = 1 1/4-7 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
7/16	24175.7	3928.6	6043.9
1/2	27629.4	4489.8	6907.4
9/16	31083.1	5051.0	7770.8
5/8	34536.8	5612.2	8634.2
3/4	41444.1	6734.7	10361.0
7/8	48351.5	7857.1	12087.9
1	55258.9	8979.6	13814.7
1 1/8	62166.2	10102.0	15541.6
1 1/4	69073.6	11224.5	17268.4
1 3/8	75980.9	12346.9	18995.2
1 1/2	82888.3	13469.3	20722.1
1 3/4	96703.0	15714.2	24175.7
2	110517.7	17959.1	27629.4

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = 1 1/4-12 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	17845.9	2900.0	4461.5
3/8	21415.1	3479.9	5353.8
7/16	24984.3	4059.9	6246.1
1/2	28553.4	4639.9	7138.4
9/16	32122.6	5219.9	8030.7
5/8	35691.8	5799.9	8922.9
3/4	42830.1	6959.9	10707.5
7/8	49968.5	8119.9	12492.1
1	57106.9	9279.9	14276.7
1 1/8	64245.2	10439.8	16061.3
1 1/4	71383.6	11599.8	17845.9
1 3/8	78521.9	12759.8	19630.5
1 1/2	85660.3	13919.8	21415.1
1 3/4	99937.0	16239.8	24984.3
2	114213.7	18559.7	28553.4

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = 1 3/8-6 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
9/16	34024.3	6081.9	9356.7
5/8	37804.8	6757.6	10396.3
3/4	45365.8	8109.1	12475.6
7/8	52926.8	9460.7	14554.9
1	60487.7	10812.2	16634.1
1 1/8	68048.7	12163.7	18713.4
1 1/4	75609.7	13515.2	20792.7
1 3/8	83170.6	14866.7	22871.9
1 1/2	90731.6	16218.3	24951.2
1 3/4	105853.5	18921.3	29109.7
2	120975.4	21624.4	33268.2

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = 1 1/8-12 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	19711.2	3523.4	5420.6
3/8	23653.5	4228.1	6504.7
7/16	27595.7	4932.7	7588.8
1/2	31537.9	5637.4	8672.9
9/16	35480.2	6342.1	9757.1
5/8	39422.4	7046.8	10841.2
3/4	47306.9	8456.1	13009.4
7/8	55191.4	9865.5	15177.6
1	63075.9	11274.8	17345.9
1 1/8	70960.4	12684.2	19514.1
1 1/4	78844.9	14093.5	21682.3
1 3/8	86729.4	15502.9	23850.6
1 1/2	94613.8	16912.2	26018.8
1 3/4	110382.8	19730.9	30355.3
2	126151.8	22549.6	34691.7

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = 1 1/2-6 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
9/16	37381.9	7289.5	11214.6
5/8	41535.5	8099.4	12460.6
3/4	49842.6	9719.3	14952.8
7/8	58149.7	11339.2	17444.9
1	66456.7	12959.1	19937.0
1 1/8	74763.8	14578.9	22429.2
1 1/4	83070.9	16198.8	24921.3
1 3/8	91378.0	17818.7	27413.4
1 1/2	99685.1	19438.6	29905.5
1 3/4	116299.3	22678.4	34889.8
2	132913.5	25918.1	39874.0

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = 1 1/2-12 UNF

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	21576.5	4207.4	6473.0
3/8	25891.8	5048.9	7767.6
7/16	30207.2	5890.4	9062.1
1/2	34522.5	6731.9	10356.7
9/16	38837.8	7573.4	11651.3
5/8	43153.1	8414.8	12945.9
3/4	51783.7	10097.8	15535.1
7/8	60414.3	11780.8	18124.3
1	69044.9	13463.8	20713.5
1 1/8	77675.5	15146.7	23302.7
1 1/4	86306.1	16829.7	25891.8
1 3/8	94936.8	18512.7	28481.0
1 1/2	103567.4	20195.6	31070.2
1 3/4	120828.6	23561.6	36248.6
2	138089.8	26927.5	41427.0

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = 1 3/4-5 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/8	48352.1	11000.1	16923.2
3/4	58022.5	13200.1	20307.9
7/8	67692.9	15400.1	23692.5
1	77363.4	17600.2	27077.2
1 1/8	87033.8	19800.2	30461.8
1 1/4	96704.2	22000.2	33846.5
1 3/8	106374.6	24200.2	37231.1
1 1/2	116045.0	26400.2	40615.8
1 3/4	135385.9	30800.3	47385.1
2	154726.7	35200.3	54154.3

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = 2-4 1/2 UNC

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/4	66460.3	17279.7	26584.1
7/8	77537.1	20159.6	31014.8
1	88613.8	23039.6	35445.5
1 1/8	99690.5	25919.5	39876.2
1 1/4	110767.2	28799.5	44306.9
1 3/8	121843.9	31679.4	48737.6
1 1/2	132920.7	34559.4	53168.3
1 3/4	155074.1	40319.3	62029.6
2	177227.5	46079.2	70891.0

Metric Units

(M fasteners)

Tables by Length of Thread Engagement

Aluminum 6061-T6

$F_{su} = 27 \text{ ksi}$

Tables by Length of Thread Engagement

Aluminum 6061-T6 ($F_{su} = 27 \text{ ksi}$, $K = 0.20$)

Length of Thread Engagement (in) = $0.0625 = 1/16$

[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M1.1	65.3	0.4	0.6
M1.2	72.2	0.4	0.7
M1.4	83.8	0.6	0.9
M1.6	95.5	0.8	1.2
M1.8	109.4	1.0	1.6
M2	121.1	1.2	1.9
M2.2	132.7	1.5	2.3
M2.5	153.6	2.0	3.0
M3	186.1	2.9	4.4

Aluminum 6061-T6 ($F_{su} = 27 \text{ ksi}$, $K = 0.20$)

Length of Thread Engagement (in) = $0.125 = 1/8$

[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M2	242.1	2.5	3.8
M2.2	265.5	3.0	4.6
M2.5	307.2	3.9	6.0
M3	372.2	5.7	8.8
M3.5	432.7	7.8	11.9
M4	493.3	10.1	15.5
M4.5	558.4	12.9	19.8
M5	623.4	16.0	24.5
M6	744.4	22.9	35.2
M7	883.6	31.7	48.7

Aluminum 6061-T6 ($F_{su} = 27 \text{ ksi}$, $K = 0.20$)

Length of Thread Engagement (in) = $0.1875 = 3/16$

[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M3	558.3	8.6	13.2
M3.5	649.1	11.6	17.9
M4	739.9	15.1	23.3
M4.5	837.6	19.3	29.7
M5	935.1	23.9	36.8
M6	1116.6	34.3	52.8
M7	1325.4	47.5	73.1
M8	1500.3	61.4	94.5
M9	1709.0	78.7	121.1
M10	1883.9	96.4	148.3
M11	2092.6	117.8	181.2

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.25 = 1/4$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M4	986.5	20.2	31.1
M4.5	1116.8	25.7	39.6
M5	1246.7	31.9	49.1
M6	1488.9	45.7	70.3
M7	1767.1	63.3	97.4
M8	2000.4	81.9	126.0
M9	2278.6	105.0	161.5
M10	2511.9	128.6	197.8
M11	2790.1	157.1	241.7
M12	3023.1	185.7	285.6
M14	3534.6	253.3	389.6
M16	4091.2	335.0	515.4

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.3125 = 5/16$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M5	1558.4	39.9	61.4
M6	1861.1	57.2	87.9
M7	2208.9	79.1	121.8
M8	2500.4	102.4	157.5
M9	2848.3	131.2	201.8
M10	3139.8	160.7	247.2
M11	3487.7	196.4	302.1
M12	3778.8	232.1	357.1
M14	4418.2	316.6	487.0
M16	5113.9	418.8	644.3
M18	5696.6	524.8	807.4
M20	6392.3	654.3	1006.7
M22	7088.1	798.1	1227.9

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.375 = 3/8$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M6	2233.3	68.6	105.5
M7	2650.7	95.0	146.1
M8	3000.5	122.9	189.0
M9	3418.0	157.4	242.2
M10	3767.8	192.8	296.7
M11	4185.2	235.6	362.5
M12	4534.6	278.5	428.5
M14	5301.9	379.9	584.5
M16	6136.7	502.5	773.1
M18	6835.9	629.8	968.9
M20	7670.8	785.2	1208.0
M22	8505.7	957.7	1473.4
M24	9204.9	1130.7	1739.5
M27	10457.2	1445.1	2223.2

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.4375 = 7/16$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M7	3092.5	110.8	170.5
M8	3500.6	143.3	220.5
M9	3987.6	183.7	282.6
M10	4395.7	225.0	346.1
M11	4882.7	274.9	422.9
M12	5290.4	324.9	499.9
M14	6185.5	443.2	681.9
M16	7159.5	586.3	902.0
M18	7975.3	734.7	1130.4
M20	8949.3	916.1	1409.3
M22	9923.3	1117.3	1719.0
M24	10739.0	1319.1	2029.4
M27	12200.1	1685.9	2593.7
M30	13503.3	2073.3	3189.8
M33	14964.3	2527.4	3888.4

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 0.5 = 1/2
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M8	4000.7	163.8	252.0
M9	4557.3	209.9	323.0
M10	5023.7	257.1	395.6
M11	5580.3	314.2	483.3
M12	6046.1	371.3	571.3
M14	7069.1	506.5	779.3
M16	8182.3	670.0	1030.8
M18	9114.6	839.7	1291.8
M20	10227.7	1046.9	1610.7
M22	11340.9	1277.0	1964.6
M24	12273.2	1507.6	2319.3
M27	13942.9	1926.8	2964.2
M30	15432.3	2369.5	3645.4
M33	17102.1	2888.5	4443.8
M36	18590.9	3425.4	5269.9
M39	20260.7	4044.2	6221.8

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 0.5625 = 9/16
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M9	5126.9	236.2	363.3
M10	5651.7	289.3	445.0
M11	6277.8	353.4	543.7
M12	6801.9	417.8	642.7
M14	7952.8	569.8	876.7
M16	9205.1	753.8	1159.7
M18	10253.9	944.7	1453.3
M20	11506.2	1177.8	1812.0
M22	12758.5	1436.6	2210.1
M24	13807.3	1696.0	2609.3
M27	15685.8	2167.6	3334.8
M30	17361.4	2665.7	4101.1
M33	19239.8	3249.6	4999.3
M36	20914.8	3853.6	5928.6
M39	22793.3	4549.7	6999.5
M42	24468.2	5259.7	8091.9
M45	26346.7	6068.0	9335.4

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.625 = 5/8$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M10	6279.6	321.4	494.5
M11	6975.4	392.7	604.2
M12	7557.7	464.2	714.1
M14	8836.4	633.2	974.1
M16	10227.9	837.6	1288.6
M18	11393.2	1049.6	1614.8
M20	12784.7	1308.7	2013.3
M22	14176.1	1596.2	2455.7
M24	15341.5	1884.5	2899.2
M27	17428.7	2408.4	3705.3
M30	19290.4	2961.9	4556.8
M33	21377.6	3610.6	5554.8
M36	23238.7	4281.8	6587.3
M39	25325.8	5055.2	7777.2
M42	27186.9	5844.1	8990.9
M45	29274.1	6742.3	10372.7
M48	31135.2	7649.0	11767.6
M52	33918.1	9027.0	13887.7

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.75 = 3/4$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M11	8370.4	471.2	725.0
M12	9069.2	557.0	856.9
M14	10603.7	759.8	1168.9
M16	12273.5	1005.1	1546.3
M18	13671.9	1259.5	1937.7
M20	15341.6	1570.4	2416.0
M22	17011.4	1915.5	2946.8
M24	18409.8	2261.4	3479.0
M27	20914.4	2890.1	4446.4
M30	23148.5	3554.3	5468.1
M33	25653.1	4332.8	6665.8
M36	27886.4	5138.1	7904.8
M39	30391.0	6066.2	9332.7
M42	32624.3	7012.9	10789.1
M45	35128.9	8090.7	12447.3
M48	37362.2	9178.7	14121.1
M52	40701.7	10832.4	16665.3
M56	43770.7	12545.3	19300.5
M60	47110.2	14466.9	22256.8
M64	50178.3	16436.4	25286.7
M68	53517.8	18625.9	28655.2

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.875 = 7/8$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M14	12371.0	886.4	1363.7
M16	14319.0	1172.6	1804.0
M18	15950.5	1469.5	2260.7
M20	17898.5	1832.1	2818.7
M22	19846.6	2234.7	3438.0
M24	21478.1	2638.2	4058.8
M27	24400.1	3371.8	5187.4
M30	27006.6	4146.7	6379.5
M33	29928.6	5054.9	7776.7
M36	32534.1	5994.5	9222.3
M39	35456.2	7077.3	10888.1
M42	38061.7	8181.8	12587.3
M45	40983.7	9439.2	14521.8
M48	43589.2	10708.5	16474.7
M52	47485.3	12637.8	19442.8
M56	51065.8	14636.2	22517.2
M60	54961.9	16878.0	25966.2
M64	58541.4	19175.8	29501.2
M68	62437.4	21730.2	33431.1

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 1.00
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M16	16364.6	1340.1	2061.7
M18	18229.2	1679.4	2583.7
M20	20455.5	2093.9	3221.3
M22	22681.8	2553.9	3929.1
M24	24546.4	3015.1	4638.7
M27	27885.8	3853.5	5928.5
M30	30864.7	4739.1	7290.9
M33	34204.2	5777.0	8887.7
M36	37181.9	6850.8	10539.7
M39	40521.4	8088.3	12443.6
M42	43499.1	9350.6	14385.5
M45	46838.5	10787.6	16596.3
M48	49816.3	12238.3	18828.2
M52	54268.9	14443.2	22220.3
M56	58360.9	16727.1	25733.9
M60	62813.5	19289.2	29675.7
M64	66904.4	21915.1	33715.6
M68	71357.1	24834.5	38206.9

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 1.125 = 1 1/8
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M16	16364.6	1340.1	2061.7
M18	20507.8	1889.3	2906.6
M20	23012.4	2355.6	3624.0
M22	25517.0	2873.2	4420.3
M24	27614.6	3392.0	5218.5
M27	31371.6	4335.2	6669.5
M30	34722.7	5331.4	8202.2
M33	38479.7	6499.1	9998.7
M36	41829.6	7707.2	11857.2
M39	45586.5	9099.4	13999.0
M42	48936.4	10519.4	16183.7
M45	52693.4	12136.1	18670.9
M48	56043.3	13768.1	21181.7
M52	61052.5	16248.6	24997.9
M56	65656.0	18817.9	28950.7
M60	70665.2	21700.3	33385.2
M64	75267.5	24654.5	37930.1
M68	80276.7	27938.8	42982.8

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 1.25 = 1 1/4
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M20	25569.3	2617.3	4026.7
M22	28352.3	3192.4	4911.4
M24	30682.9	3768.9	5798.4
M27	34857.3	4816.9	7410.6
M30	38580.8	5923.8	9113.6
M33	42755.2	7221.3	11109.6
M36	46477.3	8563.5	13174.7
M39	50651.7	10110.4	15554.5
M42	54373.8	11688.2	17981.9
M45	58548.2	13484.5	20745.4
M48	62270.3	15297.9	23535.2
M52	67836.1	18054.0	27775.4
M56	72951.1	20908.8	32167.4
M60	78516.9	24111.5	37094.6
M64	83630.5	27393.9	42144.5
M68	89196.3	31043.1	47758.7

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 1.375 = 1 3/8
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M20	25569.3	2617.3	4026.7
M22	31187.5	3511.7	5402.6
M24	33751.2	4145.8	6378.2
M27	38343.0	5298.6	8151.7
M30	42438.9	6516.2	10024.9
M33	47030.7	7943.4	12220.6
M36	51125.1	9419.9	14492.1
M39	55716.9	11121.4	17109.9
M42	59811.2	12857.1	19780.1
M45	64403.0	14833.0	22820.0
M48	68497.4	16827.7	25888.8
M52	74619.8	19859.4	30553.0
M56	80246.2	22999.7	35384.2
M60	86368.6	26522.6	40804.1
M64	91993.6	30133.3	46359.0
M68	98116.0	34147.4	52534.5

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 1.5 = 1 1/2
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M22	31187.5	3511.7	5402.6
M24	36819.5	4522.7	6958.0
M27	41828.8	5780.3	8892.7
M30	46297.0	7108.6	10936.3
M33	51306.2	8665.5	13331.5
M36	55772.8	10276.2	15809.6
M39	60782.0	12132.5	18665.3
M42	65248.6	14025.9	21578.3
M45	70257.8	16181.4	24894.5
M48	74724.4	18357.5	28242.3
M52	81403.4	21664.8	33330.5
M56	87541.3	25090.6	38600.9
M60	94220.3	28933.8	44513.5
M64	100356.6	32872.7	50573.4
M68	107035.6	37251.8	57310.4

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 1.75 = 1 3/4
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M27	48800.2	6743.7	10374.8
M30	54013.2	8293.4	12759.0
M33	59857.3	10109.8	15553.5
M36	65068.3	11989.0	18444.5
M39	70912.4	14154.6	21776.2
M42	76123.4	16363.5	25174.7
M45	81967.5	18878.3	29043.6
M48	87178.5	21417.1	32949.3
M52	94970.6	25275.6	38885.6
M56	102131.6	29272.4	45034.4
M60	109923.7	33756.1	51932.5
M64	117082.7	38351.5	59002.3
M68	124874.9	43460.4	66862.1

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 2.00
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M30	61729.3	9478.1	14581.7
M33	68408.3	11554.0	17775.4
M36	74363.7	13701.7	21079.5
M39	81042.7	16176.6	24887.1
M42	86998.1	18701.2	28771.0
M45	93677.1	21575.2	33192.7
M48	99632.5	24476.7	37656.4
M52	108537.8	28886.4	44440.7
M56	116721.8	33454.1	51467.9
M60	125627.1	38578.4	59351.4
M64	133808.8	43830.3	67431.2
M68	142714.1	49669.0	76413.9

AISI 304 Stainless Steel

$$F_{su} = 50 \text{ ksi}$$

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.0625 = 1/16$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M2	224.2	2.3	3.5
M2.2	245.8	2.8	4.3
M2.5	284.5	3.6	5.6
M3	344.6	5.3	8.1

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.125 = 1/8$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M4	913.5	18.7	28.8
M4.5	1034.1	23.8	36.6
M5	1154.4	29.5	45.4
M6	1378.6	42.3	65.1
M7	1636.2	58.6	90.2

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.1875 = 3/16$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M6	2067.9	63.5	97.7
M7	2454.4	87.9	135.3
M8	2778.3	113.8	175.0
M9	3164.8	145.8	224.3
M10	3488.7	178.6	274.7
M11	3875.2	218.2	335.6

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.25 = 1/4$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M7	3272.5	117.2	180.4
M8	3704.4	151.7	233.3
M9	4219.7	194.4	299.0
M10	4651.6	238.1	366.3
M11	5166.9	290.9	447.5
M12	5598.3	343.8	529.0
M14	6545.5	469.0	721.6
M16	7576.2	620.4	954.5

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.3125 = 5/16$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M9	5274.6	243.0	373.8
M10	5814.5	297.6	457.8
M11	6458.7	363.6	559.4
M12	6997.9	429.8	661.2
M14	8181.9	586.3	901.9
M16	9470.3	775.5	1193.1
M18	10549.3	971.9	1495.2
M20	11837.7	1211.7	1864.2
M22	13126.0	1478.0	2273.8

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.375 = 3/8$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M11	7750.4	436.3	671.3
M12	8397.4	515.7	793.5
M14	9818.3	703.5	1082.3
M16	11364.3	930.6	1431.7
M18	12659.1	1166.2	1794.2
M20	14205.2	1454.1	2237.0
M22	15751.3	1773.6	2728.6
M24	17046.1	2093.8	3221.3
M27	19365.2	2676.1	4117.0

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.4375 = 7/16$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M12	9797.0	601.7	925.7
M14	11454.6	820.8	1262.7
M16	13258.4	1085.7	1670.3
M18	14769.0	1360.6	2093.2
M20	16572.7	1696.4	2609.9
M22	18376.5	2069.2	3183.3
M24	19887.1	2442.8	3758.2
M27	22592.7	3122.1	4803.2
M30	25006.1	3839.5	5907.0
M33	27711.7	4680.4	7200.7

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 0.5 = 1/2
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M14	13091.0	938.0	1443.1
M16	15152.4	1240.8	1909.0
M18	16878.8	1555.0	2392.3
M20	18940.3	1938.8	2982.7
M22	21001.7	2364.8	3638.1
M24	22728.1	2791.8	4295.1
M27	25820.2	3568.1	5489.3
M30	28578.4	4388.0	6750.8
M33	31670.5	5349.1	8229.3
M36	34427.7	6343.4	9759.0
M39	37519.8	7489.2	11521.8

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 0.5625 = 9/16
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M16	17046.5	1395.9	2147.6
M18	18988.7	1749.4	2691.3
M20	21307.8	2181.1	3355.6
M22	23626.9	2660.3	4092.8
M24	25569.1	3140.8	4832.0
M27	29047.8	4014.1	6175.5
M30	32150.7	4936.5	7594.7
M33	35629.3	6017.7	9258.0
M36	38731.1	7136.3	10978.9
M39	42209.7	8425.3	12962.0
M42	45311.5	9740.2	14984.9
M45	48790.2	11237.1	17287.9

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.625 = 5/8$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M18	21098.6	1943.7	2990.3
M20	23675.3	2423.5	3728.4
M22	26252.1	2955.9	4547.6
M24	28410.1	3489.7	5368.8
M27	32275.3	4460.1	6861.7
M30	35723.0	5485.0	8438.5
M33	39588.1	6686.3	10286.7
M36	43034.6	7929.2	12198.8
M39	46899.7	9361.5	14402.3
M42	50346.1	10822.4	16649.9
M45	54211.3	12485.7	19208.7
M48	57657.7	14164.7	21791.9
M52	62811.2	16716.7	25718.0

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.75 = 3/4$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M20	28410.4	2908.1	4474.1
M22	31502.5	3547.1	5457.1
M24	34092.2	4187.7	6442.6
M27	38730.3	5352.1	8234.0
M30	42867.6	6582.0	10126.2
M33	47505.8	8023.6	12344.0
M36	51641.5	9515.0	14638.5
M39	56279.7	11233.8	17282.7
M42	60415.4	12986.9	19979.9
M45	65053.5	14982.8	23050.5
M48	69189.2	16997.7	26150.3
M52	75373.5	20060.0	30861.6
M56	81056.8	23232.0	35741.6
M60	87241.0	26790.6	41216.2
M64	92922.8	30437.7	46827.2
M68	99107.0	34492.4	53065.2

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 0.875 = 7/8
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M24	39774.2	4885.6	7516.4
M27	45185.4	6244.1	9606.3
M30	50012.2	7679.0	11813.9
M33	55423.4	9360.9	14401.4
M36	60248.4	11100.9	17078.3
M39	65659.6	13106.1	20163.2
M42	70484.6	15151.4	23309.9
M45	75895.8	17479.9	26892.2
M48	80720.8	19830.6	30508.6
M52	87935.7	23403.4	36005.2
M56	94566.3	27104.0	41698.5
M60	101781.2	31255.6	48085.6
M64	108409.9	35510.7	54631.8
M68	115624.9	40241.1	61909.4

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 1.00
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M27	51640.4	7136.1	10978.7
M30	57156.8	8776.0	13501.6
M33	63341.0	10698.1	16458.7
M36	68855.3	12686.7	19518.0
M39	75039.5	14978.4	23043.6
M42	80553.8	17315.9	26639.8
M45	86738.1	19977.1	30734.0
M48	92252.3	22663.6	34867.0
M52	100498.0	26746.7	41148.8
M56	108075.7	30976.0	47655.4
M60	116321.4	35720.7	54955.0
M64	123897.1	40583.6	62436.3
M68	132142.7	45989.8	70753.6

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 1.125 = 1 1/8
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M30	64301.4	9873.0	15189.3
M33	71258.6	12035.4	18516.0
M36	77462.2	14272.6	21957.8
M39	84419.5	16850.7	25924.1
M42	90623.0	19480.4	29969.8
M45	97580.3	22474.2	34575.7
M48	103783.9	25496.5	39225.4
M52	113060.2	30090.0	46292.4
M56	121585.2	34848.0	53612.4
M60	130861.6	40185.8	61824.4
M64	139384.2	45656.6	70240.9
M68	148660.6	51738.6	79597.8

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 1.25 = 1/4
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M33	79176.3	13372.7	20573.4
M36	86069.1	15858.4	24397.5
M39	93799.4	18723.0	28804.5
M42	100692.3	21644.9	33299.8
M45	108422.6	24971.3	38417.4
M48	115315.4	28329.5	43583.8
M52	125622.5	33433.4	51436.0
M56	135094.7	38720.0	59569.3
M60	145401.7	44650.9	68693.7
M64	154871.3	50729.5	78045.4
M68	165178.4	57487.3	88442.0

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 1.375 = 1 3/8
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M36	94676.0	17444.2	26837.3
M39	103179.4	20595.3	31685.0
M42	110761.5	23809.4	36629.8
M45	119264.8	27468.5	42259.2
M48	126847.0	31162.4	47942.2
M52	138184.7	36776.7	56579.6
M56	148604.1	42592.1	65526.2
M60	159941.9	49116.0	75563.1
M64	170358.5	55802.5	85849.9
M68	181696.2	63236.0	97286.2

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 1.5 = 1 1/2
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M39	112559.3	22467.5	34565.5
M42	120830.7	25973.8	39959.8
M45	130107.1	29965.6	46100.9
M48	138378.5	33995.3	52300.5
M52	150747.0	40120.1	61723.2
M56	162113.6	46464.1	71483.2
M60	174482.1	53581.1	82432.5
M64	185845.6	60875.4	93654.5
M68	198214.1	68984.7	106130.4

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 1.75 = 1 3/4
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M45	151791.6	34959.9	53784.4
M48	161441.6	39661.2	61017.3
M52	175871.5	46806.7	72010.4
M56	189132.5	54208.1	83397.0
M60	203562.4	62511.3	96171.2
M64	216819.9	71021.3	109263.6
M68	231249.8	80482.2	123818.8

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 2.00
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M52	200996.0	53493.4	82297.6
M56	216151.5	61952.1	95310.9
M60	232642.8	71441.5	109910.0
M64	247794.2	81167.2	124872.6
M68	264285.5	91979.7	141507.2

ASTM A36 Steel

$$F_{su} = 34.8 \text{ ksi}$$

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.0625 = 1/16$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M1.4	108.1	0.8	1.2
M1.6	123.1	1.0	1.6
M1.8	141.1	1.3	2.0
M2	156.0	1.6	2.5
M2.2	171.1	1.9	3.0
M2.5	198.0	2.5	3.9
M3	239.9	3.7	5.7

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.125 = 1/8$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M2.5	396.0	5.1	7.8
M3	479.7	7.4	11.3
M3.5	557.8	10.0	15.4
M4	635.8	13.0	20.0
M4.5	719.7	16.6	25.5
M5	803.5	20.6	31.6
M6	959.5	29.5	45.3
M7	1138.8	40.8	62.8

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.1875 = 3/16$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M4	953.7	19.5	30.0
M4.5	1079.6	24.9	38.3
M5	1205.2	30.8	47.4
M6	1439.2	44.2	68.0
M7	1708.2	61.2	94.2
M8	1933.7	79.2	121.8
M9	2202.7	101.5	156.1
M10	2428.1	124.3	191.2
M11	2697.1	151.8	233.6

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.25 = \frac{1}{4}$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M5	1606.9	41.1	63.3
M6	1919.0	58.9	90.7
M7	2277.7	81.6	125.5
M8	2578.2	105.6	162.4
M9	2936.9	135.3	208.1
M10	3237.5	165.7	254.9
M11	3596.2	202.5	311.5
M12	3896.4	239.3	368.2
M14	4555.7	326.4	502.2
M16	5273.0	431.8	664.3

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.3125 = \frac{5}{16}$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M7	2847.1	102.0	156.9
M8	3222.8	132.0	203.0
M9	3671.1	169.1	260.2
M10	4046.9	207.1	318.7
M11	4495.2	253.1	389.4
M12	4870.5	299.1	460.2
M14	5694.6	408.0	627.7
M16	6591.3	539.8	830.4
M18	7342.3	676.4	1040.6
M20	8239.0	843.4	1297.5
M22	9135.7	1028.7	1582.6

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.375 = 3/8$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M8	3867.4	158.3	243.6
M9	4405.4	202.9	312.2
M10	4856.2	248.5	382.4
M11	5394.3	303.7	467.2
M12	5844.6	359.0	552.2
M14	6833.5	489.6	753.3
M16	7909.6	647.7	996.5
M18	8810.8	811.7	1248.8
M20	9886.8	1012.0	1557.0
M22	10962.9	1234.4	1899.1
M24	11864.1	1457.3	2242.0
M27	13478.2	1862.5	2865.4

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.4375 = 7/16$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M9	5139.6	236.7	364.2
M10	5665.6	290.0	446.1
M11	6293.3	354.3	545.1
M12	6818.7	418.8	644.3
M14	7972.4	571.3	878.8
M16	9227.8	755.7	1162.6
M18	10279.2	947.0	1456.9
M20	11534.6	1180.7	1816.5
M22	12790.0	1440.1	2215.6
M24	13841.4	1700.2	2615.7
M27	15724.5	2173.0	3343.0
M30	17404.2	2672.3	4111.2
M33	19287.3	3257.6	5011.7

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.5 = 1/2$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M10	6475.0	331.4	509.8
M11	7192.4	404.9	623.0
M12	7792.8	478.6	736.3
M14	9111.3	652.9	1004.4
M16	10546.1	863.6	1328.6
M18	11747.7	1082.3	1665.0
M20	13182.4	1349.4	2076.0
M22	14617.2	1645.9	2532.1
M24	15818.8	1943.1	2989.4
M27	17970.9	2483.4	3820.6
M30	19890.6	3054.1	4698.6
M33	22042.7	3723.0	5727.6
M36	23961.6	4415.0	6792.3
M39	26113.8	5212.5	8019.2

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.5625 = 9/16$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M11	8091.4	455.5	700.8
M12	8766.9	538.4	828.4
M14	10250.3	734.5	1129.9
M16	11864.3	971.6	1494.7
M18	13216.1	1217.5	1873.2
M20	14830.2	1518.1	2335.5
M22	16444.3	1851.6	2848.6
M24	17796.1	2186.0	3363.0
M27	20217.2	2793.8	4298.2
M30	22376.9	3435.8	5285.9
M33	24798.0	4188.3	6443.6
M36	26956.9	4966.9	7641.3
M39	29378.0	5864.0	9021.6
M42	31536.8	6779.2	10429.5
M45	33957.9	7821.0	12032.3

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.625 = 5/8$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M12	9741.0	598.3	920.4
M14	11389.2	816.1	1255.5
M16	13182.6	1079.5	1660.8
M18	14684.6	1352.8	2081.3
M20	16478.0	1686.7	2595.0
M22	18271.5	2057.3	3165.1
M24	19773.5	2428.9	3736.7
M27	22463.6	3104.2	4775.7
M30	24863.2	3817.6	5873.2
M33	27553.3	4653.7	7159.5
M36	29952.1	5518.7	8490.3
M39	32642.2	6515.6	10024.0
M42	35040.9	7532.4	11588.3
M45	37731.1	8690.0	13369.3
M48	40129.8	9858.7	15167.2
M52	43716.6	11634.8	17899.7

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.75 = 3/4$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M16	15819.1	1295.4	1993.0
M18	17621.5	1623.4	2497.5
M20	19773.6	2024.1	3114.0
M22	21925.7	2468.8	3798.2
M24	23728.1	2914.6	4484.1
M27	26956.3	3725.1	5730.9
M30	29835.8	4581.1	7047.8
M33	33064.0	5584.4	8591.4
M36	35942.5	6622.5	10188.4
M39	39170.6	7818.7	12028.8
M42	42049.1	9038.9	13906.0
M45	45277.3	10428.0	16043.1
M48	48155.7	11830.4	18200.6
M52	52459.9	13961.8	21479.7
M56	56415.5	16169.5	24876.1
M60	60719.8	18646.2	28686.5
M64	64674.3	21184.6	32591.8
M68	68978.5	24006.7	36933.4

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 0.875 = 7/8
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M16	18455.6	1511.3	2325.1
M18	20558.4	1894.0	2913.8
M20	23069.2	2361.4	3633.0
M22	25580.0	2880.3	4431.2
M24	27682.8	3400.4	5231.4
M27	31449.0	4345.9	6686.0
M30	34808.5	5344.6	8222.5
M33	38574.7	6515.2	10023.3
M36	41932.9	7726.2	11886.5
M39	45699.1	9121.8	14033.6
M42	49057.3	10545.4	16223.7
M45	52823.5	12166.0	18717.0
M48	56181.7	13802.1	21234.0
M52	61203.3	16288.7	25059.6
M56	65818.1	18864.4	29022.2
M60	70839.7	21753.9	33467.6
M64	75453.3	24715.4	38023.7
M68	80474.9	28007.8	43088.9

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 1.00
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M20	26364.8	2698.8	4151.9
M22	29234.3	3291.7	5064.2
M24	31637.5	3886.2	5978.7
M27	35941.7	4966.8	7641.2
M30	39781.1	6108.1	9397.1
M33	44085.4	7445.9	11455.2
M36	47923.3	8830.0	13584.6
M39	52227.5	10424.9	16038.4
M42	56065.5	12051.9	18541.3
M45	60369.7	13904.0	21390.8
M48	64207.6	15773.8	24267.4
M52	69946.6	18615.7	28639.6
M56	75220.7	21559.3	33168.2
M60	80959.7	24861.6	38248.7
M64	86232.4	28246.2	43455.7
M68	91971.3	32008.9	49244.5

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $1.125 = 1 \frac{1}{8}$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M22	32888.6	3703.2	5697.2
M24	35592.2	4372.0	6726.1
M27	40434.5	5587.6	8596.3
M30	44753.8	6871.6	10571.8
M33	49596.0	8376.7	12887.2
M36	53913.7	9933.7	15282.6
M39	58756.0	11728.1	18043.2
M42	63073.6	13558.3	20859.0
M45	67915.9	15642.0	24064.7
M48	72233.6	17745.6	27300.9
M52	78689.9	20942.7	32219.5
M56	84623.3	24254.2	37314.2
M60	91079.6	27969.3	43029.8
M64	97011.4	31777.0	48887.6
M68	103467.8	36010.0	55400.1

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $1.25 = 1 \frac{1}{4}$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M24	39546.9	4857.7	7473.4
M27	44927.2	6208.4	9551.4
M30	49726.4	7635.2	11746.4
M33	55106.7	9307.4	14319.1
M36	59904.1	11037.5	16980.7
M39	65284.4	13031.2	20048.0
M42	70081.8	15064.8	23176.7
M45	75462.1	17380.1	26738.5
M48	80259.5	19717.3	30334.3
M52	87433.2	23269.6	35799.4
M56	94025.9	26949.2	41460.2
M60	101199.6	31077.0	47810.8
M64	107790.5	35307.7	54319.6
M68	114964.2	40011.2	61555.6

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $1.375 = 1 \frac{3}{8}$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M27	49419.9	6829.3	10506.6
M30	54699.0	8398.7	12921.0
M33	60617.4	10238.1	15751.0
M36	65894.5	12141.2	18678.8
M39	71812.8	14334.3	22052.8
M42	77090.0	16571.3	25494.3
M45	83008.3	19118.1	29412.4
M48	88285.5	21689.0	33367.7
M52	96176.6	25596.6	39379.4
M56	103428.5	29644.1	45606.3
M60	111319.6	34184.7	52591.9
M64	118569.5	38838.5	59751.6
M68	126460.6	44012.3	67711.2

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $1.5 = 1 \frac{1}{2}$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M27	53912.6	7450.1	11461.7
M30	59671.7	9162.2	14095.7
M33	66128.0	11168.9	17182.9
M36	71884.9	13244.9	20376.8
M39	78341.3	15637.4	24057.6
M42	84098.2	18077.8	27812.0
M45	90554.5	20856.1	32086.3
M48	96311.4	23660.8	36401.2
M52	104919.9	27923.6	42959.3
M56	112831.1	32339.0	49752.3
M60	121439.5	37292.5	57373.0
M64	129348.5	42369.3	65183.5
M68	137957.0	48013.4	73866.7

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 1.75 = 1 3/4
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M33	77149.4	13030.3	20046.7
M36	83865.8	15452.4	23773.0
M39	91398.2	18243.6	28067.2
M42	98114.5	21090.8	32447.3
M45	105646.9	24332.1	37434.0
M48	112363.3	27604.2	42468.0
M52	122406.5	32577.5	50119.2
M56	131636.2	37728.8	58044.3
M60	141679.4	43507.9	66935.2
M64	150906.6	49430.8	76047.4
M68	160949.8	56015.6	86177.9

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 2.00
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M36	95846.6	17659.9	27169.1
M39	104455.0	20849.9	32076.7
M42	112130.9	24103.7	37082.7
M45	120739.4	27808.1	42781.7
M48	128415.2	31547.7	48534.9
M52	139893.2	37231.4	57279.1
M56	150441.4	43118.6	66336.4
M60	161919.4	49723.3	76497.3
M64	172464.7	56492.4	86911.4
M68	183942.7	64017.8	98489.0

Aluminum 2024-T4/T351

$$F_{su} = 37.5 \text{ ksi}$$

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.0625 = 1/16$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M1.6	132.7	1.1	1.7
M1.8	152.0	1.4	2.2
M2	168.1	1.7	2.6
M2.2	184.4	2.1	3.2
M2.5	213.4	2.7	4.2
M3	258.5	4.0	6.1

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.125 = 1/8$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M3	517.0	7.9	12.2
M3.5	601.0	10.8	16.6
M4	685.1	14.0	21.6
M4.5	775.5	17.9	27.5
M5	865.8	22.2	34.1
M6	1033.9	31.8	48.8
M7	1227.2	44.0	67.6

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.1875 = 3/16$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M4	1027.6	21.0	32.4
M4.5	1163.3	26.8	41.2
M5	1298.7	33.2	51.1
M6	1550.9	47.6	73.3
M7	1840.8	65.9	101.5
M8	2083.7	85.3	131.3
M9	2373.6	109.3	168.2
M10	2616.5	133.9	206.0
M11	2906.4	163.6	251.7

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 0.25 = 1/4
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M6	2067.9	63.5	97.7
M7	2454.4	87.9	135.3
M8	2778.3	113.8	175.0
M9	3164.8	145.8	224.3
M10	3488.7	178.6	274.7
M11	3875.2	218.2	335.6
M12	4198.7	257.9	396.7
M14	4909.1	351.8	541.2
M16	5682.2	465.3	715.9

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 0.3125 = 5/16
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M7	3068.0	109.9	169.1
M8	3472.8	142.2	218.8
M9	3956.0	182.2	280.3
M10	4360.9	223.2	343.4
M11	4844.0	272.7	419.6
M12	5248.4	322.3	495.9
M14	6136.4	439.7	676.5
M16	7102.7	581.6	894.8
M18	7912.0	728.9	1121.4
M20	8878.2	908.8	1398.1
M22	9844.5	1108.5	1705.4

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 0.375 = 3/8
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M8	4167.4	170.6	262.5
M9	4747.2	218.7	336.4
M10	5233.0	267.8	412.0
M11	5812.8	327.3	503.5
M12	6298.1	386.8	595.1
M14	7363.7	527.6	811.7
M16	8523.2	698.0	1073.8
M18	9494.4	874.7	1345.7
M20	10653.9	1090.6	1677.8
M22	11813.4	1330.2	2046.4
M24	12784.6	1570.4	2416.0

M27

14523.9

2007.0

3087.8

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)**Length of Thread Engagement (in) = $0.4375 = 7/16$** **[NOT TO BE USED FOR FLIGHT HARDWARE]**

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M9	5538.4	255.1	392.5
M10	6105.2	312.5	480.7
M11	6781.6	381.8	587.4
M12	7347.7	451.3	694.3
M14	8591.0	615.6	947.0
M16	9943.8	814.3	1252.8
M18	11076.7	1020.5	1569.9
M20	12429.5	1272.3	1957.4
M22	13782.3	1551.9	2387.5
M24	14915.3	1832.1	2818.6
M27	16944.5	2341.5	3602.4
M30	18754.6	2879.6	4430.2
M33	20783.8	3510.3	5400.5

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)**Length of Thread Engagement (in) = $0.5 = 1/2$** **[NOT TO BE USED FOR FLIGHT HARDWARE]**

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M11	7750.4	436.3	671.3
M12	8397.4	515.7	793.5
M14	9818.3	703.5	1082.3
M16	11364.3	930.6	1431.7
M18	12659.1	1166.2	1794.2
M20	14205.2	1454.1	2237.0
M22	15751.3	1773.6	2728.6
M24	17046.1	2093.8	3221.3
M27	19365.2	2676.1	4117.0
M30	21433.8	3291.0	5063.1
M33	23752.9	4011.8	6172.0
M36	25820.7	4757.5	7319.3
M39	28139.8	5616.9	8641.4

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.5625 = 9/16$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M12	9447.1	580.2	892.6
M14	11045.5	791.5	1217.6
M16	12784.8	1046.9	1610.7
M18	14241.5	1312.0	2018.5
M20	15980.8	1635.8	2516.7
M22	17720.2	1995.3	3069.6
M24	19176.8	2355.6	3624.0
M27	21785.8	3010.6	4631.6
M30	24113.0	3702.4	5696.0
M33	26722.0	4513.3	6943.5
M36	29048.3	5352.2	8234.2
M39	31657.3	6319.0	9721.5
M42	33983.6	7305.1	11238.7
M45	36592.6	8427.8	12965.9

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.625 = 5/8$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M14	12272.8	879.4	1352.9
M16	14205.4	1163.3	1789.7
M18	15823.9	1457.8	2242.8
M20	17756.5	1817.6	2796.3
M22	19689.1	2217.0	3410.7
M24	21307.6	2617.3	4026.6
M27	24206.5	3345.1	5146.3
M30	26792.2	4113.8	6328.9
M33	29691.1	5014.8	7715.0
M36	32275.9	5946.9	9149.1
M39	35174.8	7021.1	10801.7
M42	37759.6	8116.8	12487.4
M45	40658.5	9364.3	14406.5
M48	43243.3	10623.5	16343.9
M52	47108.4	12537.5	19288.5

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.75 = 3/4$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M16	17046.5	1395.9	2147.6
M18	18988.7	1749.4	2691.3
M20	21307.8	2181.1	3355.6
M22	23626.9	2660.3	4092.8
M24	25569.1	3140.8	4832.0
M27	29047.8	4014.1	6175.5
M30	32150.7	4936.5	7594.7
M33	35629.3	6017.7	9258.0
M36	38731.1	7136.3	10978.9
M39	42209.7	8425.3	12962.0
M42	45311.5	9740.2	14984.9
M45	48790.2	11237.1	17287.9
M48	51891.9	12748.3	19612.7
M52	56530.1	15045.0	23146.2
M56	60792.6	17424.0	26806.2
M60	65430.8	20092.9	30912.2
M64	69692.1	22828.3	35120.4
M68	74330.3	25869.3	39798.9

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.875 = 7/8$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M18	22153.5	2040.9	3139.9
M20	24859.1	2544.6	3914.8
M22	27564.7	3103.7	4775.0
M24	29830.6	3664.2	5637.3
M27	33889.0	4683.1	7204.8
M30	37509.1	5759.3	8860.4
M33	41567.5	7020.7	10801.0
M36	45186.3	8325.7	12808.7
M39	49244.7	9829.6	15122.4
M42	52863.4	11363.6	17482.4
M45	56921.8	13110.0	20169.2
M48	60540.6	14873.0	22881.5
M52	65951.8	17552.5	27003.9
M56	70924.7	20328.0	31273.9
M60	76335.9	23441.7	36064.2
M64	81307.5	26633.0	40973.8
M68	86718.7	30180.8	46432.0

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 1.00
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M20	28410.4	2908.1	4474.1
M22	31502.5	3547.1	5457.1
M24	34092.2	4187.7	6442.6
M27	38730.3	5352.1	8234.0
M30	42867.6	6582.0	10126.2
M33	47505.8	8023.6	12344.0
M36	51641.5	9515.0	14638.5
M39	56279.7	11233.8	17282.7
M42	60415.4	12986.9	19979.9
M45	65053.5	14982.8	23050.5
M48	69189.2	16997.7	26150.3
M52	75373.5	20060.0	30861.6
M56	81056.8	23232.0	35741.6
M60	87241.0	26790.6	41216.2
M64	92922.8	30437.7	46827.2
M68	99107.0	34492.4	53065.2

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 1.125 = 1 1/8
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M22	35440.3	3990.5	6139.3
M24	38353.7	4711.2	7247.9
M27	43571.6	6021.1	9263.3
M30	48226.0	7404.8	11392.0
M33	53444.0	9026.6	13887.0
M36	58096.7	10704.4	16468.3
M39	63314.6	12638.0	19443.1
M42	67967.3	14610.3	22477.4
M45	73185.2	16855.7	25931.8
M48	77837.9	19122.4	29419.1
M52	84795.2	22567.5	34719.3
M56	91188.9	26136.0	40209.3
M60	98146.2	30139.4	46368.3
M64	104538.2	34242.4	52680.6
M68	111495.4	38803.9	59698.3

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 1.25 = 1 ¼
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M27	48412.9	6690.1	10292.5
M30	53584.5	8227.5	12657.8
M33	59382.2	10029.5	15430.0
M36	64551.8	11893.8	18298.2
M39	70349.6	14042.2	21603.4
M42	75519.2	16233.7	24974.9
M45	81316.9	18728.5	28813.1
M48	86486.6	21247.1	32687.8
M52	94216.9	25075.0	38577.0
M56	101321.0	29040.0	44677.0
M60	109051.3	33488.2	51520.3
M64	116153.5	38047.1	58534.1
M68	123883.8	43115.5	66331.5

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 1.375 = 1 3/8
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M27	53254.2	7359.1	11321.8
M30	58942.9	9050.3	13923.5
M33	65320.4	11032.5	16973.0
M36	71007.0	13083.2	20128.0
M39	77384.5	15446.4	23763.8
M42	83071.1	17857.0	27472.3
M45	89448.6	20601.4	31694.4
M48	95135.2	23371.8	35956.6
M52	103638.5	27582.5	42434.7
M56	111453.1	31944.0	49144.7
M60	119956.4	36837.0	56672.3
M64	127768.9	41851.8	64387.5
M68	136272.2	47427.0	72964.6

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 1.5 = 1 1/2
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M30	64301.4	9873.0	15189.3
M33	71258.6	12035.4	18516.0
M36	77462.2	14272.6	21957.8
M39	84419.5	16850.7	25924.1
M42	90623.0	19480.4	29969.8
M45	97580.3	22474.2	34575.7
M48	103783.9	25496.5	39225.4
M52	113060.2	30090.0	46292.4
M56	121585.2	34848.0	53612.4
M60	130861.6	40185.8	61824.4
M64	139384.2	45656.6	70240.9
M68	148660.6	51738.6	79597.8

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 1.75 = 1 3/4
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M36	90372.6	16651.3	25617.4
M39	98489.4	19659.1	30244.8
M42	105726.9	22727.1	34964.8
M45	113843.7	26219.9	40338.3
M48	121081.2	29745.9	45763.0
M52	131903.6	35105.1	54007.8
M56	141849.4	40656.0	62547.8
M60	152671.8	46883.5	72128.4
M64	162614.9	53266.0	81947.7
M68	173437.3	60361.7	92864.1

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 2.00
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M39	112559.3	22467.5	34565.5
M42	120830.7	25973.8	39959.8
M45	130107.1	29965.6	46100.9
M48	138378.5	33995.3	52300.5
M52	150747.0	40120.1	61723.2
M56	162113.6	46464.1	71483.2
M60	174482.1	53581.1	82432.5
M64	185845.6	60875.4	93654.5
M68	198214.1	68984.7	106130.4

Aluminum 7075-T6/T651

$$F_{su} = 45.6 \text{ ksi}$$

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 0.0625 = 1/16
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M1.8	184.8	1.7	2.6
M2	204.5	2.1	3.2
M2.2	224.2	2.5	3.9
M2.5	259.4	3.3	5.1
M3	314.3	4.8	7.4

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 0.125 = 1/8
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M3.5	730.9	13.1	20.1
M4	833.1	17.1	26.2
M4.5	943.1	21.7	33.4
M5	1052.8	26.9	41.4
M6	1257.3	38.6	59.4
M7	1492.3	53.5	82.3

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 0.1875 = 3/16
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M5	1579.2	40.4	62.2
M6	1885.9	57.9	89.1
M7	2238.4	80.2	123.4
M8	2533.8	103.7	159.6
M9	2886.3	133.0	204.5
M10	3181.7	162.8	250.5
M11	3534.2	199.0	306.1

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 0.25 = 1/4
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M7	2984.5	106.9	164.5
M8	3378.4	138.3	212.8
M9	3848.4	177.3	272.7
M10	4242.2	217.1	334.0
M11	4712.2	265.3	408.1
M12	5105.6	313.6	482.4
M14	5969.5	427.7	658.1
M16	6909.5	565.8	870.5

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.3125 = 5/16$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M8	4223.0	172.9	266.0
M9	4810.5	221.6	340.9
M10	5302.8	271.4	417.5
M11	5890.3	331.6	510.2
M12	6382.0	392.0	603.0
M14	7461.9	534.7	822.6
M16	8636.9	707.3	1088.1
M18	9620.9	886.3	1363.6
M20	10795.9	1105.1	1700.1
M22	11971.0	1347.9	2073.7

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.375 = 3/8$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M10	6363.4	325.7	501.1
M11	7068.4	397.9	612.2
M12	7658.4	470.4	723.6
M14	8954.2	641.6	987.1
M16	10364.3	848.7	1305.7
M18	11545.1	1063.6	1636.3
M20	12955.1	1326.1	2040.2
M22	14365.1	1617.5	2488.4
M24	15546.0	1909.6	2937.8
M27	17661.0	2440.6	3754.7

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.4375 = 7/16$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M11	8246.4	464.3	714.3
M12	8934.9	548.8	844.2
M14	10446.6	748.5	1151.6
M16	12091.6	990.2	1523.4
M18	13469.3	1240.9	1909.0
M20	15114.3	1547.1	2380.2
M22	16759.3	1887.1	2903.2
M24	18137.0	2227.9	3427.5
M27	20604.5	2847.3	4380.5
M30	22805.6	3501.6	5387.1
M33	25273.1	4268.6	6567.0

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 0.5 = 1/2
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M14	11939.0	855.5	1316.1
M16	13819.0	1131.6	1741.0
M18	15393.5	1418.1	2181.8
M20	17273.5	1768.2	2720.2
M22	19153.5	2156.7	3317.9
M24	20728.0	2546.1	3917.1
M27	23548.0	3254.1	5006.3
M30	26063.5	4001.9	6156.7
M33	28883.5	4878.4	7505.2
M36	31398.0	5785.1	8900.2
M39	34218.0	6830.1	10507.9

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 0.5625 = 9/16
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M14	13431.4	962.4	1480.6
M16	15546.4	1273.1	1958.6
M18	17317.7	1595.4	2454.5
M20	19432.7	1989.2	3060.3
M22	21547.7	2426.2	3732.7
M24	23319.0	2864.4	4406.7
M27	26491.5	3660.8	5632.1
M30	29321.4	4502.1	6926.3
M33	32493.9	5488.2	8443.3
M36	35322.8	6508.3	10012.8
M39	38495.3	7683.9	11821.4
M42	41324.1	8883.1	13666.2
M45	44496.6	10248.2	15766.5

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.625 = 5/8$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M16	17273.8	1414.5	2176.2
M18	19241.9	1772.7	2727.2
M20	21591.9	2210.2	3400.3
M22	23941.9	2695.8	4147.4
M24	25910.0	3182.7	4896.4
M27	29435.1	4067.6	6257.8
M30	32579.4	5002.3	7695.9
M33	36104.4	6097.9	9381.5
M36	39247.5	7231.4	11125.3
M39	42772.5	8537.7	13134.9
M42	45915.7	9870.1	15184.7
M45	49440.7	11386.9	17518.4
M48	52583.8	12918.2	19874.2
M52	57283.8	15245.6	23454.8

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = $0.75 = 3/4$
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M20	25910.3	2652.2	4080.4
M22	28730.3	3235.0	4976.9
M24	31092.0	3819.2	5875.7
M27	35322.1	4881.1	7509.4
M30	39095.2	6002.8	9235.1
M33	43325.3	7317.5	11257.7
M36	47097.0	8677.7	13350.3
M39	51327.0	10245.2	15761.8
M42	55098.8	11844.1	18221.7
M45	59328.8	13664.3	21022.0
M48	63100.6	15501.9	23849.0
M52	68740.6	18294.7	28145.8
M56	73923.8	21187.6	32596.3
M60	79563.8	24433.0	37589.2
M64	84745.6	27759.2	42706.4
M68	90385.6	31457.0	48395.5

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 0.875 = 7/8
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M22	33518.7	3774.1	5806.4
M24	36274.1	4455.7	6854.9
M27	41209.1	5694.6	8761.0
M30	45611.1	7003.3	10774.3
M33	50546.1	8537.1	13134.0
M36	54946.5	10124.0	15575.4
M39	59881.6	11952.7	18388.8
M42	64281.9	13818.1	21258.6
M45	69217.0	15941.7	24525.7
M48	73617.4	18085.5	27823.9
M52	80197.4	21343.9	32836.7
M56	86244.4	24718.9	38029.0
M60	92824.5	28505.2	43854.1
M64	98869.9	32385.7	49824.2
M68	105449.9	36699.9	56461.4

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 1.00
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M24	41456.1	5092.2	7834.2
M27	47096.1	6508.2	10012.6
M30	52127.0	8003.8	12313.5
M33	57767.0	9756.7	15010.3
M36	62796.0	11570.3	17800.5
M39	68436.1	13660.3	21015.8
M42	73465.1	15792.1	24295.5
M45	79105.1	18219.1	28029.4
M48	84134.1	20669.2	31798.7
M52	91654.2	24393.0	37527.7
M56	98565.1	28250.1	43461.8
M60	106085.1	32577.3	50118.9
M64	112994.1	37012.3	56941.9
M68	120514.2	41942.7	64527.3

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 1.125 = 1 1/8
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M27	52983.1	7321.7	11264.1
M30	58642.9	9004.2	13852.6
M33	64987.9	10976.3	16886.6
M36	70645.5	13016.6	20025.5
M39	76990.6	15367.8	23642.8
M42	82648.2	17766.1	27332.5
M45	88993.2	20496.5	31533.0
M48	94650.9	23252.8	35773.6
M52	103110.9	27442.1	42218.6
M56	110885.7	31781.4	48894.5
M60	119345.7	36649.5	56383.8
M64	127118.4	41638.8	64059.7
M68	135578.4	47185.6	72593.2

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 1.25 = 1 1/4
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M30	65158.7	10004.7	15391.8
M33	72208.8	12195.9	18762.9
M36	78495.0	14462.9	22250.6
M39	85545.1	17075.3	26269.7
M42	91831.4	19740.1	30369.4
M45	98881.4	22773.9	35036.7
M48	105167.7	25836.5	39748.4
M52	114567.7	30491.2	46909.6
M56	123206.3	35312.7	54327.2
M60	132606.4	40721.6	62648.7
M64	141242.7	46265.3	71177.4
M68	150642.7	52428.4	80659.1

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 1.375 = 1 3/8
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M33	79429.6	13415.5	20639.2
M36	86344.5	15909.2	24475.6
M39	94099.6	18782.9	28896.7
M42	101014.5	21714.1	33406.4
M45	108769.5	25051.2	38540.4
M48	115684.4	28420.1	43723.2
M52	126024.5	33540.4	51600.6
M56	135527.0	38844.0	59759.9
M60	145867.0	44793.8	68913.6
M64	155366.9	50891.8	78295.1
M68	165707.0	57671.2	88725.0

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 1.5 = 1 1/2
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M36	94194.1	17355.4	26700.7
M39	102654.1	20490.4	31523.7
M42	110197.6	23688.1	36443.3
M45	118657.7	27328.6	42044.1
M48	126201.2	31003.8	47698.1
M52	137481.2	36589.5	56291.5
M56	147847.6	42375.2	65192.6
M60	159127.7	48866.0	75178.4
M64	169491.2	55518.4	85412.9
M68	180771.2	62914.1	96790.9

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)
Length of Thread Engagement (in) = 1.75 = 1 3/4
[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M42	128563.9	27636.2	42517.2
M45	138433.9	31883.4	49051.4
M48	147234.7	36171.0	55647.8
M52	160394.8	42687.7	65673.5
M56	172488.9	49437.8	76058.1
M60	185648.9	57010.3	87708.2
M64	197739.7	64771.4	99648.4
M68	210899.8	73399.8	112922.7

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Length of Thread Engagement (in) = 2.00

[NOT TO BE USED FOR FLIGHT HARDWARE]

Fastener Size	Pullout Load (lb)	Assembly Torque (lb-in)	100% Torque (lb-in)
M48	168268.3	41338.3	63597.5
M52	183308.3	48786.0	75055.4
M56	197130.1	56500.3	86923.5
M60	212170.2	65154.6	100237.9
M64	225988.3	74024.5	113883.9
M68	241028.3	83885.5	129054.5

Tables by Fastener Size

Aluminum 6061-T6

$$F_{su} = 27 \text{ ksi}$$

Tables by Fastener Size

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = M1.1

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	65.3	0.4	0.6

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = M1.2

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	72.2	0.4	0.7

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = M1.4

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	83.8	0.6	0.9

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = M1.6

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	95.5	0.8	1.2

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = M1.8

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	109.4	1.0	1.6

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = M2

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	121.1	1.2	1.9
1/8	242.1	2.5	3.8

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = M2.2

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	132.7	1.5	2.3
1/8	265.5	3.0	4.6

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = M2.5

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	153.6	2.0	3.0
1/8	307.2	3.9	6.0

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = M3

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	186.1	2.9	4.4
1/8	372.2	5.7	8.8
3/16	558.3	8.6	13.2

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = M3.5

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	432.7	7.8	11.9
3/16	649.1	11.6	17.9

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = M4

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	493.3	10.1	15.5
3/16	739.9	15.1	23.3
1/4	986.5	20.2	31.1

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = M4.5

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	558.4	12.9	19.8
3/16	837.6	19.3	29.7
1/4	1116.8	25.7	39.6

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = M5

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	623.4	16.0	24.5
3/16	935.1	23.9	36.8
1/4	1246.7	31.9	49.1
5/16	1558.4	39.9	61.4

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = M6

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	744.4	22.9	35.2
3/16	1116.6	34.3	52.8
1/4	1488.9	45.7	70.3
5/16	1861.1	57.2	87.9
3/8	2233.3	68.6	105.5

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = M7

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	883.6	31.7	48.7
3/16	1325.4	47.5	73.1
1/4	1767.1	63.3	97.4
5/16	2208.9	79.1	121.8
3/8	2650.7	95.0	146.1
7/16	3092.5	110.8	170.5

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = M8

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	1500.3	61.4	94.5
1/4	2000.4	81.9	126.0
5/16	2500.4	102.4	157.5
3/8	3000.5	122.9	189.0
7/16	3500.6	143.3	220.5
1/2	4000.7	163.8	252.0

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = M9

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	1709.0	78.7	121.1
1/4	2278.6	105.0	161.5
5/16	2848.3	131.2	201.8
3/8	3418.0	157.4	242.2
7/16	3987.6	183.7	282.6
1/2	4557.3	209.9	323.0
9/16	5126.9	236.2	363.3

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = M10

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	1883.9	96.4	148.3
1/4	2511.9	128.6	197.8
5/16	3139.8	160.7	247.2
3/8	3767.8	192.8	296.7
7/16	4395.7	225.0	346.1
1/2	5023.7	257.1	395.6
9/16	5651.7	289.3	445.0
5/8	6279.6	321.4	494.5

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = M11

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	2092.6	117.8	181.2
1/4	2790.1	157.1	241.7
5/16	3487.7	196.4	302.1
3/8	4185.2	235.6	362.5
7/16	4882.7	274.9	422.9
1/2	5580.3	314.2	483.3
9/16	6277.8	353.4	543.7
5/8	6975.4	392.7	604.2
3/4	8370.4	471.2	725.0

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = M12

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/4	3023.1	185.7	285.6
5/16	3778.8	232.1	357.1
3/8	4534.6	278.5	428.5
7/16	5290.4	324.9	499.9
1/2	6046.1	371.3	571.3
9/16	6801.9	417.8	642.7
5/8	7557.7	464.2	714.1
3/4	9069.2	557.0	856.9

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = M14

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/4	3534.6	253.3	389.6
5/16	4418.2	316.6	487.0
3/8	5301.9	379.9	584.5
7/16	6185.5	443.2	681.9
1/2	7069.1	506.5	779.3
9/16	7952.8	569.8	876.7
5/8	8836.4	633.2	974.1
3/4	10603.7	759.8	1168.9
7/8	12371.0	886.4	1363.7

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = M16

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/4	4091.2	335.0	515.4
5/16	5113.9	418.8	644.3
3/8	6136.7	502.5	773.1
7/16	7159.5	586.3	902.0
1/2	8182.3	670.0	1030.8
9/16	9205.1	753.8	1159.7
5/8	10227.9	837.6	1288.6
3/4	12273.5	1005.1	1546.3
7/8	14319.0	1172.6	1804.0
1	16364.6	1340.1	2061.7
1 1/8	18410.2	1507.6	2319.4

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = M18

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	5696.6	524.8	807.4
3/8	6835.9	629.8	968.9
7/16	7975.3	734.7	1130.4
1/2	9114.6	839.7	1291.8
9/16	10253.9	944.7	1453.3
5/8	11393.2	1049.6	1614.8
3/4	13671.9	1259.5	1937.7
7/8	15950.5	1469.5	2260.7
1	18229.2	1679.4	2583.7
1 1/8	20507.8	1889.3	2906.6

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = M20

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	6392.3	654.3	1006.7
3/8	7670.8	785.2	1208.0
7/16	8949.3	916.1	1409.3
1/2	10227.7	1046.9	1610.7
9/16	11506.2	1177.8	1812.0
5/8	12784.7	1308.7	2013.3
3/4	15341.6	1570.4	2416.0
7/8	17898.5	1832.1	2818.7
1	20455.5	2093.9	3221.3
1 1/8	23012.4	2355.6	3624.0
1 1/4	25569.3	2617.3	4026.7
1 3/8	28126.3	2879.1	4429.3

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = M22

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	7088.1	798.1	1227.9
3/8	8505.7	957.7	1473.4
7/16	9923.3	1117.3	1719.0
1/2	11340.9	1277.0	1964.6
9/16	12758.5	1436.6	2210.1
5/8	14176.1	1596.2	2455.7
3/4	17011.4	1915.5	2946.8
7/8	19846.6	2234.7	3438.0
1	22681.8	2553.9	3929.1
1 1/8	25517.0	2873.2	4420.3
1 1/4	28352.3	3192.4	4911.4
1 3/8	31187.5	3511.7	5402.6
1 1/2	34022.7	3830.9	5893.7

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = M24

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/8	9204.9	1130.7	1739.5
7/16	10739.0	1319.1	2029.4
1/2	12273.2	1507.6	2319.3
9/16	13807.3	1696.0	2609.3
5/8	15341.5	1884.5	2899.2
3/4	18409.8	2261.4	3479.0
7/8	21478.1	2638.2	4058.8
1	24546.4	3015.1	4638.7
1 1/8	27614.6	3392.0	5218.5
1 1/4	30682.9	3768.9	5798.4
1 3/8	33751.2	4145.8	6378.2
1 1/2	36819.5	4522.7	6958.0

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = M27

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/8	10457.2	1445.1	2223.2
7/16	12200.1	1685.9	2593.7
1/2	13942.9	1926.8	2964.2
9/16	15685.8	2167.6	3334.8
5/8	17428.7	2408.4	3705.3
3/4	20914.4	2890.1	4446.4
7/8	24400.1	3371.8	5187.4
1	27885.8	3853.5	5928.5
1 1/8	31371.6	4335.2	6669.5
1 1/4	34857.3	4816.9	7410.6
1 3/8	38343.0	5298.6	8151.7
1 1/2	41828.8	5780.3	8892.7
1 3/4	48800.2	6743.7	10374.8

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = M30

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
7/16	13503.3	2073.3	3189.8
1/2	15432.3	2369.5	3645.4
9/16	17361.4	2665.7	4101.1
5/8	19290.4	2961.9	4556.8
3/4	23148.5	3554.3	5468.1
7/8	27006.6	4146.7	6379.5
1	30864.7	4739.1	7290.9
1 1/8	34722.7	5331.4	8202.2
1 1/4	38580.8	5923.8	9113.6
1 3/8	42438.9	6516.2	10024.9
1 1/2	46297.0	7108.6	10936.3
1 3/4	54013.2	8293.4	12759.0
2	61729.3	9478.1	14581.7

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = M33

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
7/16	14964.3	2527.4	3888.4
1/2	17102.1	2888.5	4443.8
9/16	19239.8	3249.6	4999.3
5/8	21377.6	3610.6	5554.8
3/4	25653.1	4332.8	6665.8
7/8	29928.6	5054.9	7776.7
1	34204.2	5777.0	8887.7
1 1/8	38479.7	6499.1	9998.7
1 1/4	42755.2	7221.3	11109.6
1 3/8	47030.7	7943.4	12220.6
1 1/2	51306.2	8665.5	13331.5
1 3/4	59857.3	10109.8	15553.5
2	68408.3	11554.0	17775.4

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = M36

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/2	18590.9	3425.4	5269.9
9/16	20914.8	3853.6	5928.6
5/8	23238.7	4281.8	6587.3
3/4	27886.4	5138.1	7904.8
7/8	32534.1	5994.5	9222.3
1	37181.9	6850.8	10539.7
1 1/8	41829.6	7707.2	11857.2
1 1/4	46477.3	8563.5	13174.7
1 3/8	51125.1	9419.9	14492.1
1 1/2	55772.8	10276.2	15809.6
1 3/4	65068.3	11989.0	18444.5
2	74363.7	13701.7	21079.5

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = M39

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/2	20260.7	4044.2	6221.8
9/16	22793.3	4549.7	6999.5
5/8	25325.8	5055.2	7777.2
3/4	30391.0	6066.2	9332.7
7/8	35456.2	7077.3	10888.1
1	40521.4	8088.3	12443.6
1 1/8	45586.5	9099.4	13999.0
1 1/4	50651.7	10110.4	15554.5
1 3/8	55716.9	11121.4	17109.9
1 1/2	60782.0	12132.5	18665.3
1 3/4	70912.4	14154.6	21776.2
2	81042.7	16176.6	24887.1

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = M42

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
9/16	24468.2	5259.7	8091.9
5/8	27186.9	5844.1	8990.9
3/4	32624.3	7012.9	10789.1
7/8	38061.7	8181.8	12587.3
1	43499.1	9350.6	14385.5
1 1/8	48936.4	10519.4	16183.7
1 1/4	54373.8	11688.2	17981.9
1 3/8	59811.2	12857.1	19780.1
1 1/2	65248.6	14025.9	21578.3
1 3/4	76123.4	16363.5	25174.7
2	86998.1	18701.2	28771.0

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = M45

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
9/16	26346.7	6068.0	9335.4
5/8	29274.1	6742.3	10372.7
3/4	35128.9	8090.7	12447.3
7/8	40983.7	9439.2	14521.8
1	46838.5	10787.6	16596.3
1 1/8	52693.4	12136.1	18670.9
1 1/4	58548.2	13484.5	20745.4
1 3/8	64403.0	14833.0	22820.0
1 1/2	70257.8	16181.4	24894.5
1 3/4	81967.5	18878.3	29043.6
2	93677.1	21575.2	33192.7

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = M48

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/8	31135.2	7649.0	11767.6
3/4	37362.2	9178.7	14121.1
7/8	43589.2	10708.5	16474.7
1	49816.3	12238.3	18828.2
1 1/8	56043.3	13768.1	21181.7
1 1/4	62270.3	15297.9	23535.2
1 3/8	68497.4	16827.7	25888.8
1 1/2	74724.4	18357.5	28242.3
1 3/4	87178.5	21417.1	32949.3
2	99632.5	24476.7	37656.4

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = M52

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/8	33918.1	9027.0	13887.7
3/4	40701.7	10832.4	16665.3
7/8	47485.3	12637.8	19442.8
1	54268.9	14443.2	22220.3
1 1/8	61052.5	16248.6	24997.9
1 1/4	67836.1	18054.0	27775.4
1 3/8	74619.8	19859.4	30553.0
1 1/2	81403.4	21664.8	33330.5
1 3/4	94970.6	25275.6	38885.6
2	108537.8	28886.4	44440.7

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = M56

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/4	43770.7	12545.3	19300.5
7/8	51065.8	14636.2	22517.2
1	58360.9	16727.1	25733.9
1 1/8	65656.0	18817.9	28950.7
1 1/4	72951.1	20908.8	32167.4
1 3/8	80246.2	22999.7	35384.2
1 1/2	87541.3	25090.6	38600.9
1 3/4	102131.6	29272.4	45034.4
2	116721.8	33454.1	51467.9

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = M60

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/4	47110.2	14466.9	22256.8
7/8	54961.9	16878.0	25966.2
1	62813.5	19289.2	29675.7
1 1/8	70665.2	21700.3	33385.2
1 1/4	78516.9	24111.5	37094.6
1 3/8	86368.6	26522.6	40804.1
1 1/2	94220.3	28933.8	44513.5
1 3/4	109923.7	33756.1	51932.5
2	125627.1	38578.4	59351.4

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = M64

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/4	50178.3	16436.4	25286.7
7/8	58541.4	19175.8	29501.2
1	66904.4	21915.1	33715.6
1 1/8	75267.5	24654.5	37930.1
1 1/4	83630.5	27393.9	42144.5
1 3/8	91993.6	30133.3	46359.0
1 1/2	100356.6	32872.7	50573.4
1 3/4	117082.7	38351.5	59002.3
2	133808.8	43830.3	67431.2

Aluminum 6061-T6 ($F_{su} = 27$ ksi, $K = 0.20$)

Fastener Size = M68

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/4	53517.8	18625.9	28655.2
7/8	62437.4	21730.2	33431.1
1	71357.1	24834.5	38206.9
1 1/8	80276.7	27938.8	42982.8
1 1/4	89196.3	31043.1	47758.7
1 3/8	98116.0	34147.4	52534.5
1 1/2	107035.6	37251.8	57310.4
1 3/4	124874.9	43460.4	66862.1
2	142714.1	49669.0	76413.9

AISI 304 Stainless Steel

$$F_{su} = 50 \text{ ksi}$$

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)

Fastener Size = M2

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	224.2	2.3	3.5

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)

Fastener Size = M2.2

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	245.8	2.8	4.3

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)

Fastener Size = M2.5

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	284.5	3.6	5.6

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)

Fastener Size = M3

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	344.6	5.3	8.1

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)

Fastener Size = M4

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	913.5	18.7	28.8

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)

Fastener Size = M4.5

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	1034.1	23.8	36.6

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)

Fastener Size = M5

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	1154.4	29.5	45.4

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)

Fastener Size = M6

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	1378.6	42.3	65.1
3/16	2067.9	63.5	97.7

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)

Fastener Size = M7

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	1636.2	58.6	90.2
3/16	2454.4	87.9	135.3
1/4	3272.5	117.2	180.4

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)

Fastener Size = M8

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	2778.3	113.8	175.0
1/4	3704.4	151.7	233.3

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)

Fastener Size = M9

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	3164.8	145.8	224.3
1/4	4219.7	194.4	299.0
5/16	5274.6	243.0	373.8

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)

Fastener Size = M10

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	3488.7	178.6	274.7
1/4	4651.6	238.1	366.3
5/16	5814.5	297.6	457.8

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)

Fastener Size = M11

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	3875.2	218.2	335.6
1/4	5166.9	290.9	447.5
5/16	6458.7	363.6	559.4
3/8	7750.4	436.3	671.3

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)

Fastener Size = M12

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/4	5598.3	343.8	529.0
5/16	6997.9	429.8	661.2
3/8	8397.4	515.7	793.5
7/16	9797.0	601.7	925.7

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)

Fastener Size = M14

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/4	6545.5	469.0	721.6
5/16	8181.9	586.3	901.9
3/8	9818.3	703.5	1082.3
7/16	11454.6	820.8	1262.7
1/2	13091.0	938.0	1443.1

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)

Fastener Size = M16

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/4	7576.2	620.4	954.5
5/16	9470.3	775.5	1193.1
3/8	11364.3	930.6	1431.7
7/16	13258.4	1085.7	1670.3
1/2	15152.4	1240.8	1909.0
9/16	17046.5	1395.9	2147.6

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)

Fastener Size = M18

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	10549.3	971.9	1495.2
3/8	12659.1	1166.2	1794.2
7/16	14769.0	1360.6	2093.2
1/2	16878.8	1555.0	2392.3
9/16	18988.7	1749.4	2691.3
5/8	21098.6	1943.7	2990.3

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)

Fastener Size = M20

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	11837.7	1211.7	1864.2
3/8	14205.2	1454.1	2237.0
7/16	16572.7	1696.4	2609.9
1/2	18940.3	1938.8	2982.7
9/16	21307.8	2181.1	3355.6
5/8	23675.3	2423.5	3728.4
3/4	28410.4	2908.1	4474.1

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)

Fastener Size = M22

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	13126.0	1478.0	2273.8
3/8	15751.3	1773.6	2728.6
7/16	18376.5	2069.2	3183.3
1/2	21001.7	2364.8	3638.1
9/16	23626.9	2660.3	4092.8
5/8	26252.1	2955.9	4547.6
3/4	31502.5	3547.1	5457.1

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)

Fastener Size = M24

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/8	17046.1	2093.8	3221.3
7/16	19887.1	2442.8	3758.2
1/2	22728.1	2791.8	4295.1
9/16	25569.1	3140.8	4832.0
5/8	28410.1	3489.7	5368.8
3/4	34092.2	4187.7	6442.6
7/8	39774.2	4885.6	7516.4

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)**Fastener Size = M27****[NOT TO BE USED FOR FLIGHT HARDWARE]**

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/8	19365.2	2676.1	4117.0
7/16	22592.7	3122.1	4803.2
1/2	25820.2	3568.1	5489.3
9/16	29047.8	4014.1	6175.5
5/8	32275.3	4460.1	6861.7
3/4	38730.3	5352.1	8234.0
7/8	45185.4	6244.1	9606.3
1	51640.4	7136.1	10978.7

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)**Fastener Size = M30****[NOT TO BE USED FOR FLIGHT HARDWARE]**

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
7/16	25006.1	3839.5	5907.0
1/2	28578.4	4388.0	6750.8
9/16	32150.7	4936.5	7594.7
5/8	35723.0	5485.0	8438.5
3/4	42867.6	6582.0	10126.2
7/8	50012.2	7679.0	11813.9
1	57156.8	8776.0	13501.6
1 1/8	64301.4	9873.0	15189.3

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)**Fastener Size = M33****[NOT TO BE USED FOR FLIGHT HARDWARE]**

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
7/16	27711.7	4680.4	7200.7
1/2	31670.5	5349.1	8229.3
9/16	35629.3	6017.7	9258.0
5/8	39588.1	6686.3	10286.7
3/4	47505.8	8023.6	12344.0
7/8	55423.4	9360.9	14401.4
1	63341.0	10698.1	16458.7
1 1/8	71258.6	12035.4	18516.0
1 1/4	79176.3	13372.7	20573.4

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)**Fastener Size = M36****[NOT TO BE USED FOR FLIGHT HARDWARE]**

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/2	34427.7	6343.4	9759.0
9/16	38731.1	7136.3	10978.9
5/8	43034.6	7929.2	12198.8
3/4	51641.5	9515.0	14638.5
7/8	60248.4	11100.9	17078.3
1	68855.3	12686.7	19518.0
1 1/8	77462.2	14272.6	21957.8
1 1/4	86069.1	15858.4	24397.5
1 3/8	94676.0	17444.2	26837.3

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)**Fastener Size = M39****[NOT TO BE USED FOR FLIGHT HARDWARE]**

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/2	37519.8	7489.2	11521.8
9/16	42209.7	8425.3	12962.0
5/8	46899.7	9361.5	14402.3
3/4	56279.7	11233.8	17282.7
7/8	65659.6	13106.1	20163.2
1	75039.5	14978.4	23043.6
1 1/8	84419.5	16850.7	25924.1
1 1/4	93799.4	18723.0	28804.5
1 3/8	103179.4	20595.3	31685.0
1 1/2	112559.3	22467.5	34565.5

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)**Fastener Size = M42****[NOT TO BE USED FOR FLIGHT HARDWARE]**

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
9/16	45311.5	9740.2	14984.9
5/8	50346.1	10822.4	16649.9
3/4	60415.4	12986.9	19979.9
7/8	70484.6	15151.4	23309.9
1	80553.8	17315.9	26639.8
1 1/8	90623.0	19480.4	29969.8
1 1/4	100692.3	21644.9	33299.8
1 3/8	110761.5	23809.4	36629.8
1 1/2	120830.7	25973.8	39959.8

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)**Fastener Size = M45****[NOT TO BE USED FOR FLIGHT HARDWARE]**

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
9/16	48790.2	11237.1	17287.9
5/8	54211.3	12485.7	19208.7
3/4	65053.5	14982.8	23050.5
7/8	75895.8	17479.9	26892.2
1	86738.1	19977.1	30734.0
1 1/8	97580.3	22474.2	34575.7
1 1/4	108422.6	24971.3	38417.4
1 3/8	119264.8	27468.5	42259.2
1 1/2	130107.1	29965.6	46100.9
1 3/4	151791.6	34959.9	53784.4

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)**Fastener Size = M48****[NOT TO BE USED FOR FLIGHT HARDWARE]**

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/8	57657.7	14164.7	21791.9
3/4	69189.2	16997.7	26150.3
7/8	80720.8	19830.6	30508.6
1	92252.3	22663.6	34867.0
1 1/8	103783.9	25496.5	39225.4
1 1/4	115315.4	28329.5	43583.8
1 3/8	126847.0	31162.4	47942.2
1 1/2	138378.5	33995.3	52300.5
1 3/4	161441.6	39661.2	61017.3

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)**Fastener Size = M52****[NOT TO BE USED FOR FLIGHT HARDWARE]**

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/8	62811.2	16716.7	25718.0
3/4	75373.5	20060.0	30861.6
7/8	87935.7	23403.4	36005.2
1	100498.0	26746.7	41148.8
1 1/8	113060.2	30090.0	46292.4
1 1/4	125622.5	33433.4	51436.0
1 3/8	138184.7	36776.7	56579.6
1 1/2	150747.0	40120.1	61723.2
1 3/4	175871.5	46806.7	72010.4
2	200996.0	53493.4	82297.6

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)**Fastener Size = M56****[NOT TO BE USED FOR FLIGHT HARDWARE]**

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/4	81056.8	23232.0	35741.6
7/8	94566.3	27104.0	41698.5
1	108075.7	30976.0	47655.4
1 1/8	121585.2	34848.0	53612.4
1 1/4	135094.7	38720.0	59569.3
1 3/8	148604.1	42592.1	65526.2
1 1/2	162113.6	46464.1	71483.2
1 3/4	189132.5	54208.1	83397.0
2	216151.5	61952.1	95310.9

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)**Fastener Size = M60****[NOT TO BE USED FOR FLIGHT HARDWARE]**

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/4	87241.0	26790.6	41216.2
7/8	101781.2	31255.6	48085.6
1	116321.4	35720.7	54955.0
1 1/8	130861.6	40185.8	61824.4
1 1/4	145401.7	44650.9	68693.7
1 3/8	159941.9	49116.0	75563.1
1 1/2	174482.1	53581.1	82432.5
1 3/4	203562.4	62511.3	96171.2
2	232642.8	71441.5	109910.0

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)**Fastener Size = M64****[NOT TO BE USED FOR FLIGHT HARDWARE]**

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/4	92922.8	30437.7	46827.2
7/8	108409.9	35510.7	54631.8
1	123897.1	40583.6	62436.3
1 1/8	139384.2	45656.6	70240.9
1 1/4	154871.3	50729.5	78045.4
1 3/8	170358.5	55802.5	85849.9
1 1/2	185845.6	60875.4	93654.5
1 3/4	216819.9	71021.3	109263.6
2	247794.2	81167.2	124872.6

304 Stainless Steel ($F_{su} = 50$ ksi, $K = 0.20$)

Fastener Size = M68

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/4	99107.0	34492.4	53065.2
7/8	115624.9	40241.1	61909.4
1	132142.7	45989.8	70753.6
1 1/8	148660.6	51738.6	79597.8
1 1/4	165178.4	57487.3	88442.0
1 3/8	181696.2	63236.0	97286.2
1 1/2	198214.1	68984.7	106130.4
1 3/4	231249.8	80482.2	123818.8
2	264285.5	91979.7	141507.2

ASTM A36 Steel

$$F_{su} = 34.8 \text{ ksi}$$

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = M1.4

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	108.1	0.8	1.2

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = M1.6

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	123.1	1.0	1.6

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = M1.8

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	141.1	1.3	2.0

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = M2

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	156.0	1.6	2.5

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = M2.2

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	171.1	1.9	3.0

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = M2.5

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	198.0	2.5	3.9
1/8	396.0	5.1	7.8

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = M3

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	239.9	3.7	5.7
1/8	479.7	7.4	11.3

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = M3.5

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	557.8	10.0	15.4

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = M4

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	635.8	13.0	20.0
3/16	953.7	19.5	30.0

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = M4.5

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	719.7	16.6	25.5
3/16	1079.6	24.9	38.3

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = M5

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	803.5	20.6	31.6
3/16	1205.2	30.8	47.4
1/4	1606.9	41.1	63.3

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = M6

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	959.5	29.5	45.3
3/16	1439.2	44.2	68.0
1/4	1919.0	58.9	90.7

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = M7

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	1138.8	40.8	62.8
3/16	1708.2	61.2	94.2
1/4	2277.7	81.6	125.5
5/16	2847.1	102.0	156.9

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = M8

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	1933.7	79.2	121.8
1/4	2578.2	105.6	162.4
5/16	3222.8	132.0	203.0
3/8	3867.4	158.3	243.6

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = M9

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	2202.7	101.5	156.1
1/4	2936.9	135.3	208.1
5/16	3671.1	169.1	260.2
3/8	4405.4	202.9	312.2
7/16	5139.6	236.7	364.2

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = M10

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	2428.1	124.3	191.2
1/4	3237.5	165.7	254.9
5/16	4046.9	207.1	318.7
3/8	4856.2	248.5	382.4
7/16	5665.6	290.0	446.1
1/2	6475.0	331.4	509.8

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = M11

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	2697.1	151.8	233.6
1/4	3596.2	202.5	311.5
5/16	4495.2	253.1	389.4
3/8	5394.3	303.7	467.2
7/16	6293.3	354.3	545.1
1/2	7192.4	404.9	623.0
9/16	8091.4	455.5	700.8

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = M12

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/4	3896.4	239.3	368.2
5/16	4870.5	299.1	460.2
3/8	5844.6	359.0	552.2
7/16	6818.7	418.8	644.3
1/2	7792.8	478.6	736.3
9/16	8766.9	538.4	828.4
5/8	9741.0	598.3	920.4

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = M14

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/4	4555.7	326.4	502.2
5/16	5694.6	408.0	627.7
3/8	6833.5	489.6	753.3
7/16	7972.4	571.3	878.8
1/2	9111.3	652.9	1004.4
9/16	10250.3	734.5	1129.9
5/8	11389.2	816.1	1255.5

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = M16

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/4	5273.0	431.8	664.3
5/16	6591.3	539.8	830.4
3/8	7909.6	647.7	996.5
7/16	9227.8	755.7	1162.6
1/2	10546.1	863.6	1328.6
9/16	11864.3	971.6	1494.7
5/8	13182.6	1079.5	1660.8
3/4	15819.1	1295.4	1993.0
7/8	18455.6	1511.3	2325.1

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = M18

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	7342.3	676.4	1040.6
3/8	8810.8	811.7	1248.8
7/16	10279.2	947.0	1456.9
1/2	11747.7	1082.3	1665.0
9/16	13216.1	1217.5	1873.2
5/8	14684.6	1352.8	2081.3
3/4	17621.5	1623.4	2497.5
7/8	20558.4	1894.0	2913.8

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = M20

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	8239.0	843.4	1297.5
3/8	9886.8	1012.0	1557.0
7/16	11534.6	1180.7	1816.5
1/2	13182.4	1349.4	2076.0
9/16	14830.2	1518.1	2335.5
5/8	16478.0	1686.7	2595.0
3/4	19773.6	2024.1	3114.0
7/8	23069.2	2361.4	3633.0
1	26364.8	2698.8	4151.9

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = M22

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	9135.7	1028.7	1582.6
3/8	10962.9	1234.4	1899.1
7/16	12790.0	1440.1	2215.6
1/2	14617.2	1645.9	2532.1
9/16	16444.3	1851.6	2848.6
5/8	18271.5	2057.3	3165.1
3/4	21925.7	2468.8	3798.2
7/8	25580.0	2880.3	4431.2
1	29234.3	3291.7	5064.2
1 1/8	32888.6	3703.2	5697.2

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = M24

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/8	11864.1	1457.3	2242.0
7/16	13841.4	1700.2	2615.7
1/2	15818.8	1943.1	2989.4
9/16	17796.1	2186.0	3363.0
5/8	19773.5	2428.9	3736.7
3/4	23728.1	2914.6	4484.1
7/8	27682.8	3400.4	5231.4
1	31637.5	3886.2	5978.7
1 1/8	35592.2	4372.0	6726.1
1 1/4	39546.9	4857.7	7473.4

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = M27

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/8	13478.2	1862.5	2865.4
7/16	15724.5	2173.0	3343.0
1/2	17970.9	2483.4	3820.6
9/16	20217.2	2793.8	4298.2
5/8	22463.6	3104.2	4775.7
3/4	26956.3	3725.1	5730.9
7/8	31449.0	4345.9	6686.0
1	35941.7	4966.8	7641.2
1 1/8	40434.5	5587.6	8596.3
1 1/4	44927.2	6208.4	9551.4
1 3/8	49419.9	6829.3	10506.6
1 1/2	53912.6	7450.1	11461.7

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = M30

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
7/16	17404.2	2672.3	4111.2
1/2	19890.6	3054.1	4698.6
9/16	22376.9	3435.8	5285.9
5/8	24863.2	3817.6	5873.2
3/4	29835.8	4581.1	7047.8
7/8	34808.5	5344.6	8222.5
1	39781.1	6108.1	9397.1
1 1/8	44753.8	6871.6	10571.8
1 1/4	49726.4	7635.2	11746.4
1 3/8	54699.0	8398.7	12921.0
1 1/2	59671.7	9162.2	14095.7

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = M33

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
7/16	19287.3	3257.6	5011.7
1/2	22042.7	3723.0	5727.6
9/16	24798.0	4188.3	6443.6
5/8	27553.3	4653.7	7159.5
3/4	33064.0	5584.4	8591.4
7/8	38574.7	6515.2	10023.3
1	44085.4	7445.9	11455.2
1 1/8	49596.0	8376.7	12887.2
1 1/4	55106.7	9307.4	14319.1
1 3/8	60617.4	10238.1	15751.0
1 1/2	66128.0	11168.9	17182.9
1 3/4	77149.4	13030.3	20046.7

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = M36

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/2	23961.6	4415.0	6792.3
9/16	26956.9	4966.9	7641.3
5/8	29952.1	5518.7	8490.3
3/4	35942.5	6622.5	10188.4
7/8	41932.9	7726.2	11886.5
1	47923.3	8830.0	13584.6
1 1/8	53913.7	9933.7	15282.6
1 1/4	59904.1	11037.5	16980.7
1 3/8	65894.5	12141.2	18678.8
1 1/2	71884.9	13244.9	20376.8
1 3/4	83865.8	15452.4	23773.0
2	95846.6	17659.9	27169.1

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = M39

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/2	26113.8	5212.5	8019.2
9/16	29378.0	5864.0	9021.6
5/8	32642.2	6515.6	10024.0
3/4	39170.6	7818.7	12028.8
7/8	45699.1	9121.8	14033.6
1	52227.5	10424.9	16038.4
1 1/8	58756.0	11728.1	18043.2
1 1/4	65284.4	13031.2	20048.0
1 3/8	71812.8	14334.3	22052.8
1 1/2	78341.3	15637.4	24057.6
1 3/4	91398.2	18243.6	28067.2
2	104455.0	20849.9	32076.7

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = M42

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
9/16	31536.8	6779.2	10429.5
5/8	35040.9	7532.4	11588.3
3/4	42049.1	9038.9	13906.0
7/8	49057.3	10545.4	16223.7
1	56065.5	12051.9	18541.3
1 1/8	63073.6	13558.3	20859.0
1 1/4	70081.8	15064.8	23176.7
1 3/8	77090.0	16571.3	25494.3
1 1/2	84098.2	18077.8	27812.0
1 3/4	98114.5	21090.8	32447.3
2	112130.9	24103.7	37082.7

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = M45

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
9/16	33957.9	7821.0	12032.3
5/8	37731.1	8690.0	13369.3
3/4	45277.3	10428.0	16043.1
7/8	52823.5	12166.0	18717.0
1	60369.7	13904.0	21390.8
1 1/8	67915.9	15642.0	24064.7
1 1/4	75462.1	17380.1	26738.5
1 3/8	83008.3	19118.1	29412.4
1 1/2	90554.5	20856.1	32086.3
1 3/4	105646.9	24332.1	37434.0
2	120739.4	27808.1	42781.7

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = M48

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/8	40129.8	9858.7	15167.2
3/4	48155.7	11830.4	18200.6
7/8	56181.7	13802.1	21234.0
1	64207.6	15773.8	24267.4
1 1/8	72233.6	17745.6	27300.9
1 1/4	80259.5	19717.3	30334.3
1 3/8	88285.5	21689.0	33367.7
1 1/2	96311.4	23660.8	36401.2
1 3/4	112363.3	27604.2	42468.0
2	128415.2	31547.7	48534.9

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = M52

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/8	43716.6	11634.8	17899.7
3/4	52459.9	13961.8	21479.7
7/8	61203.3	16288.7	25059.6
1	69946.6	18615.7	28639.6
1 1/8	78689.9	20942.7	32219.5
1 1/4	87433.2	23269.6	35799.4
1 3/8	96176.6	25596.6	39379.4
1 1/2	104919.9	27923.6	42959.3
1 3/4	122406.5	32577.5	50119.2
2	139893.2	37231.4	57279.1

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = M56

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/4	56415.5	16169.5	24876.1
7/8	65818.1	18864.4	29022.2
1	75220.7	21559.3	33168.2
1 1/8	84623.3	24254.2	37314.2
1 1/4	94025.9	26949.2	41460.2
1 3/8	103428.5	29644.1	45606.3
1 1/2	112831.1	32339.0	49752.3
1 3/4	131636.2	37728.8	58044.3
2	150441.4	43118.6	66336.4

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = M60

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/4	60719.8	18646.2	28686.5
7/8	70839.7	21753.9	33467.6
1	80959.7	24861.6	38248.7
1 1/8	91079.6	27969.3	43029.8
1 1/4	101199.6	31077.0	47810.8
1 3/8	111319.6	34184.7	52591.9
1 1/2	121439.5	37292.5	57373.0
1 3/4	141679.4	43507.9	66935.2
2	161919.4	49723.3	76497.3

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = M64

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/4	64674.3	21184.6	32591.8
7/8	75453.3	24715.4	38023.7
1	86232.4	28246.2	43455.7
1 1/8	97011.4	31777.0	48887.6
1 1/4	107790.5	35307.7	54319.6
1 3/8	118569.5	38838.5	59751.6
1 1/2	129348.5	42369.3	65183.5
1 3/4	150906.6	49430.8	76047.4
2	172464.7	56492.4	86911.4

ASTM A36 Steel ($F_{su} = 34.8$ ksi, $K = 0.20$)

Fastener Size = M68

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/4	68978.5	24006.7	36933.4
7/8	80474.9	28007.8	43088.9
1	91971.3	32008.9	49244.5
1 1/8	103467.8	36010.0	55400.1
1 1/4	114964.2	40011.2	61555.6
1 3/8	126460.6	44012.3	67711.2
1 1/2	137957.0	48013.4	73866.7
1 3/4	160949.8	56015.6	86177.9
2	183942.7	64017.8	98489.0

Aluminum 2024-T4/T351

$$F_{su} = 37.5 \text{ ksi}$$

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = M1.6

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	132.7	1.1	1.7

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = M1.8

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	152.0	1.4	2.2

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = M2

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	168.1	1.7	2.6

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = M2.2

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	184.4	2.1	3.2

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = M2.5

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	213.4	2.7	4.2

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = M3

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	258.5	4.0	6.1
1/8	517.0	7.9	12.2

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = M3.5

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	601.0	10.8	16.6

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = M4

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	685.1	14.0	21.6
3/16	1027.6	21.0	32.4

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = M4.5

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	775.5	17.9	27.5
3/16	1163.3	26.8	41.2

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = M5

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	865.8	22.2	34.1
3/16	1298.7	33.2	51.1

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = M6

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	1033.9	31.8	48.8
3/16	1550.9	47.6	73.3
1/4	2067.9	63.5	97.7

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = M7

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	1227.2	44.0	67.6
3/16	1840.8	65.9	101.5
1/4	2454.4	87.9	135.3
5/16	3068.0	109.9	169.1

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = M8

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	2083.7	85.3	131.3
1/4	2778.3	113.8	175.0
5/16	3472.8	142.2	218.8
3/8	4167.4	170.6	262.5

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = M9

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	2373.6	109.3	168.2
1/4	3164.8	145.8	224.3
5/16	3956.0	182.2	280.3
3/8	4747.2	218.7	336.4
7/16	5538.4	255.1	392.5

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = M10

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	2616.5	133.9	206.0
1/4	3488.7	178.6	274.7
5/16	4360.9	223.2	343.4
3/8	5233.0	267.8	412.0
7/16	6105.2	312.5	480.7

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = M11

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	2906.4	163.6	251.7
1/4	3875.2	218.2	335.6
5/16	4844.0	272.7	419.6
3/8	5812.8	327.3	503.5
7/16	6781.6	381.8	587.4
1/2	7750.4	436.3	671.3

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = M12

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/4	4198.7	257.9	396.7
5/16	5248.4	322.3	495.9
3/8	6298.1	386.8	595.1
7/16	7347.7	451.3	694.3
1/2	8397.4	515.7	793.5
9/16	9447.1	580.2	892.6

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = M14

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/4	4909.1	351.8	541.2
5/16	6136.4	439.7	676.5
3/8	7363.7	527.6	811.7
7/16	8591.0	615.6	947.0
1/2	9818.3	703.5	1082.3
9/16	11045.5	791.5	1217.6
5/8	12272.8	879.4	1352.9

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = M16

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/4	5682.2	465.3	715.9
5/16	7102.7	581.6	894.8
3/8	8523.2	698.0	1073.8
7/16	9943.8	814.3	1252.8
1/2	11364.3	930.6	1431.7
9/16	12784.8	1046.9	1610.7
5/8	14205.4	1163.3	1789.7
3/4	17046.5	1395.9	2147.6

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = M18

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	7912.0	728.9	1121.4
3/8	9494.4	874.7	1345.7
7/16	11076.7	1020.5	1569.9
1/2	12659.1	1166.2	1794.2
9/16	14241.5	1312.0	2018.5
5/8	15823.9	1457.8	2242.8
3/4	18988.7	1749.4	2691.3
7/8	22153.5	2040.9	3139.9

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = M20

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	8878.2	908.8	1398.1
3/8	10653.9	1090.6	1677.8
7/16	12429.5	1272.3	1957.4
1/2	14205.2	1454.1	2237.0
9/16	15980.8	1635.8	2516.7
5/8	17756.5	1817.6	2796.3
3/4	21307.8	2181.1	3355.6
7/8	24859.1	2544.6	3914.8
1	28410.4	2908.1	4474.1

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = M22

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	9844.5	1108.5	1705.4
3/8	11813.4	1330.2	2046.4
7/16	13782.3	1551.9	2387.5
1/2	15751.3	1773.6	2728.6
9/16	17720.2	1995.3	3069.6
5/8	19689.1	2217.0	3410.7
3/4	23626.9	2660.3	4092.8
7/8	27564.7	3103.7	4775.0
1	31502.5	3547.1	5457.1
1 1/8	35440.3	3990.5	6139.3

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = M24

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/8	12784.6	1570.4	2416.0
7/16	14915.3	1832.1	2818.6
1/2	17046.1	2093.8	3221.3
9/16	19176.8	2355.6	3624.0
5/8	21307.6	2617.3	4026.6
3/4	25569.1	3140.8	4832.0
7/8	29830.6	3664.2	5637.3
1	34092.2	4187.7	6442.6
1 1/8	38353.7	4711.2	7247.9

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = M27

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/8	14523.9	2007.0	3087.8
7/16	16944.5	2341.5	3602.4
1/2	19365.2	2676.1	4117.0
9/16	21785.8	3010.6	4631.6
5/8	24206.5	3345.1	5146.3
3/4	29047.8	4014.1	6175.5
7/8	33889.0	4683.1	7204.8
1	38730.3	5352.1	8234.0
1 1/8	43571.6	6021.1	9263.3
1 1/4	48412.9	6690.1	10292.5
1 3/8	53254.2	7359.1	11321.8

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = M30

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
7/16	18754.6	2879.6	4430.2
1/2	21433.8	3291.0	5063.1
9/16	24113.0	3702.4	5696.0
5/8	26792.2	4113.8	6328.9
3/4	32150.7	4936.5	7594.7
7/8	37509.1	5759.3	8860.4
1	42867.6	6582.0	10126.2
1 1/8	48226.0	7404.8	11392.0
1 1/4	53584.5	8227.5	12657.8
1 3/8	58942.9	9050.3	13923.5
1 1/2	64301.4	9873.0	15189.3

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = M33

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
7/16	20783.8	3510.3	5400.5
1/2	23752.9	4011.8	6172.0
9/16	26722.0	4513.3	6943.5
5/8	29691.1	5014.8	7715.0
3/4	35629.3	6017.7	9258.0
7/8	41567.5	7020.7	10801.0
1	47505.8	8023.6	12344.0
1 1/8	53444.0	9026.6	13887.0
1 1/4	59382.2	10029.5	15430.0
1 3/8	65320.4	11032.5	16973.0
1 1/2	71258.6	12035.4	18516.0

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = M36

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/2	25820.7	4757.5	7319.3
9/16	29048.3	5352.2	8234.2
5/8	32275.9	5946.9	9149.1
3/4	38731.1	7136.3	10978.9
7/8	45186.3	8325.7	12808.7
1	51641.5	9515.0	14638.5
1 1/8	58096.7	10704.4	16468.3
1 1/4	64551.8	11893.8	18298.2
1 3/8	71007.0	13083.2	20128.0
1 1/2	77462.2	14272.6	21957.8
1 3/4	90372.6	16651.3	25617.4

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = M39

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/2	28139.8	5616.9	8641.4
9/16	31657.3	6319.0	9721.5
5/8	35174.8	7021.1	10801.7
3/4	42209.7	8425.3	12962.0
7/8	49244.7	9829.6	15122.4
1	56279.7	11233.8	17282.7
1 1/8	63314.6	12638.0	19443.1
1 1/4	70349.6	14042.2	21603.4
1 3/8	77384.5	15446.4	23763.8
1 1/2	84419.5	16850.7	25924.1
1 3/4	98489.4	19659.1	30244.8
2	112559.3	22467.5	34565.5

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = M42

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
9/16	33983.6	7305.1	11238.7
5/8	37759.6	8116.8	12487.4
3/4	45311.5	9740.2	14984.9
7/8	52863.4	11363.6	17482.4
1	60415.4	12986.9	19979.9
1 1/8	67967.3	14610.3	22477.4
1 1/4	75519.2	16233.7	24974.9
1 3/8	83071.1	17857.0	27472.3
1 1/2	90623.0	19480.4	29969.8
1 3/4	105726.9	22727.1	34964.8
2	120830.7	25973.8	39959.8

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = M45

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
9/16	36592.6	8427.8	12965.9
5/8	40658.5	9364.3	14406.5
3/4	48790.2	11237.1	17287.9
7/8	56921.8	13110.0	20169.2
1	65053.5	14982.8	23050.5
1 1/8	73185.2	16855.7	25931.8
1 1/4	81316.9	18728.5	28813.1
1 3/8	89448.6	20601.4	31694.4
1 1/2	97580.3	22474.2	34575.7
1 3/4	113843.7	26219.9	40338.3
2	130107.1	29965.6	46100.9

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = M48

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/8	43243.3	10623.5	16343.9
3/4	51891.9	12748.3	19612.7
7/8	60540.6	14873.0	22881.5
1	69189.2	16997.7	26150.3
1 1/8	77837.9	19122.4	29419.1
1 1/4	86486.6	21247.1	32687.8
1 3/8	95135.2	23371.8	35956.6
1 1/2	103783.9	25496.5	39225.4
1 3/4	121081.2	29745.9	45763.0
2	138378.5	33995.3	52300.5

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = M52

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/8	47108.4	12537.5	19288.5
3/4	56530.1	15045.0	23146.2
7/8	65951.8	17552.5	27003.9
1	75373.5	20060.0	30861.6
1 1/8	84795.2	22567.5	34719.3
1 1/4	94216.9	25075.0	38577.0
1 3/8	103638.5	27582.5	42434.7
1 1/2	113060.2	30090.0	46292.4
1 3/4	131903.6	35105.1	54007.8
2	150747.0	40120.1	61723.2

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = M56

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/4	60792.6	17424.0	26806.2
7/8	70924.7	20328.0	31273.9
1	81056.8	23232.0	35741.6
1 1/8	91188.9	26136.0	40209.3
1 1/4	101321.0	29040.0	44677.0
1 3/8	111453.1	31944.0	49144.7
1 1/2	121585.2	34848.0	53612.4
1 3/4	141849.4	40656.0	62547.8
2	162113.6	46464.1	71483.2

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = M60

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/4	65430.8	20092.9	30912.2
7/8	76335.9	23441.7	36064.2
1	87241.0	26790.6	41216.2
1 1/8	98146.2	30139.4	46368.3
1 1/4	109051.3	33488.2	51520.3
1 3/8	119956.4	36837.0	56672.3
1 1/2	130861.6	40185.8	61824.4
1 3/4	152671.8	46883.5	72128.4
2	174482.1	53581.1	82432.5

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = M64

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/4	69692.1	22828.3	35120.4
7/8	81307.5	26633.0	40973.8
1	92922.8	30437.7	46827.2
1 1/8	104538.2	34242.4	52680.6
1 1/4	116153.5	38047.1	58534.1
1 3/8	127768.9	41851.8	64387.5
1 1/2	139384.2	45656.6	70240.9
1 3/4	162614.9	53266.0	81947.7
2	185845.6	60875.4	93654.5

Aluminum 2024-T4/T351 ($F_{su} = 37.5$ ksi, $K = 0.20$)

Fastener Size = M68

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/4	74330.3	25869.3	39798.9
7/8	86718.7	30180.8	46432.0
1	99107.0	34492.4	53065.2
1 1/8	111495.4	38803.9	59698.3
1 1/4	123883.8	43115.5	66331.5
1 3/8	136272.2	47427.0	72964.6
1 1/2	148660.6	51738.6	79597.8
1 3/4	173437.3	60361.7	92864.1
2	198214.1	68984.7	106130.4

Aluminum 7075-T6/T651

$$F_{su} = 45.6 \text{ ksi}$$

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = M1.8

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	184.8	1.7	2.6

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = M2

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	204.5	2.1	3.2

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = M2.2

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	224.2	2.5	3.9

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = M2.5

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	259.4	3.3	5.1

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = M3

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/16	314.3	4.8	7.4

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = M3.5

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	730.9	13.1	20.1

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = M4

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	833.1	17.1	26.2

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = M4.5

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	943.1	21.7	33.4

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = M5

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	1052.8	26.9	41.4
3/16	1579.2	40.4	62.2

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = M6

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	1257.3	38.6	59.4
3/16	1885.9	57.9	89.1

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = M7

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/8	1492.3	53.5	82.3
3/16	2238.4	80.2	123.4
1/4	2984.5	106.9	164.5

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = M8

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	2533.8	103.7	159.6
1/4	3378.4	138.3	212.8
5/16	4223.0	172.9	266.0

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = M9

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	2886.3	133.0	204.5
1/4	3848.4	177.3	272.7
5/16	4810.5	221.6	340.9

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = M10

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	3181.7	162.8	250.5
1/4	4242.2	217.1	334.0
5/16	5302.8	271.4	417.5
3/8	6363.4	325.7	501.1

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = M11

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/16	3534.2	199.0	306.1
1/4	4712.2	265.3	408.1
5/16	5890.3	331.6	510.2
3/8	7068.4	397.9	612.2
7/16	8246.4	464.3	714.3

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = M12

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/4	5105.6	313.6	482.4
5/16	6382.0	392.0	603.0
3/8	7658.4	470.4	723.6
7/16	8934.9	548.8	844.2

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = M14

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/4	5969.5	427.7	658.1
5/16	7461.9	534.7	822.6
3/8	8954.2	641.6	987.1
7/16	10446.6	748.5	1151.6
1/2	11939.0	855.5	1316.1
9/16	13431.4	962.4	1480.6

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = M16

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/4	6909.5	565.8	870.5
5/16	8636.9	707.3	1088.1
3/8	10364.3	848.7	1305.7
7/16	12091.6	990.2	1523.4
1/2	13819.0	1131.6	1741.0
9/16	15546.4	1273.1	1958.6
5/8	17273.8	1414.5	2176.2

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = M18

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	9620.9	886.3	1363.6
3/8	11545.1	1063.6	1636.3
7/16	13469.3	1240.9	1909.0
1/2	15393.5	1418.1	2181.8
9/16	17317.7	1595.4	2454.5
5/8	19241.9	1772.7	2727.2

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = M20

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	10795.9	1105.1	1700.1
3/8	12955.1	1326.1	2040.2
7/16	15114.3	1547.1	2380.2
1/2	17273.5	1768.2	2720.2
9/16	19432.7	1989.2	3060.3
5/8	21591.9	2210.2	3400.3
3/4	25910.3	2652.2	4080.4

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = M22

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/16	11971.0	1347.9	2073.7
3/8	14365.1	1617.5	2488.4
7/16	16759.3	1887.1	2903.2
1/2	19153.5	2156.7	3317.9
9/16	21547.7	2426.2	3732.7
5/8	23941.9	2695.8	4147.4
3/4	28730.3	3235.0	4976.9
7/8	33518.7	3774.1	5806.4

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = M24

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/8	15546.0	1909.6	2937.8
7/16	18137.0	2227.9	3427.5
1/2	20728.0	2546.1	3917.1
9/16	23319.0	2864.4	4406.7
5/8	25910.0	3182.7	4896.4
3/4	31092.0	3819.2	5875.7
7/8	36274.1	4455.7	6854.9
1	41456.1	5092.2	7834.2

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = M27

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/8	17661.0	2440.6	3754.7
7/16	20604.5	2847.3	4380.5
1/2	23548.0	3254.1	5006.3
9/16	26491.5	3660.8	5632.1
5/8	29435.1	4067.6	6257.8
3/4	35322.1	4881.1	7509.4
7/8	41209.1	5694.6	8761.0
1	47096.1	6508.2	10012.6
1 1/8	52983.1	7321.7	11264.1

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = M30

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
7/16	22805.6	3501.6	5387.1
1/2	26063.5	4001.9	6156.7
9/16	29321.4	4502.1	6926.3
5/8	32579.4	5002.3	7695.9
3/4	39095.2	6002.8	9235.1
7/8	45611.1	7003.3	10774.3
1	52127.0	8003.8	12313.5
1 1/8	58642.9	9004.2	13852.6
1 1/4	65158.7	10004.7	15391.8

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = M33

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
7/16	25273.1	4268.6	6567.0
1/2	28883.5	4878.4	7505.2
9/16	32493.9	5488.2	8443.3
5/8	36104.4	6097.9	9381.5
3/4	43325.3	7317.5	11257.7
7/8	50546.1	8537.1	13134.0
1	57767.0	9756.7	15010.3
1 1/8	64987.9	10976.3	16886.6
1 1/4	72208.8	12195.9	18762.9
1 3/8	79429.6	13415.5	20639.2

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = M36

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/2	31398.0	5785.1	8900.2
9/16	35322.8	6508.3	10012.8
5/8	39247.5	7231.4	11125.3
3/4	47097.0	8677.7	13350.3
7/8	54946.5	10124.0	15575.4
1	62796.0	11570.3	17800.5
1 1/8	70645.5	13016.6	20025.5
1 1/4	78495.0	14462.9	22250.6
1 3/8	86344.5	15909.2	24475.6
1 1/2	94194.1	17355.4	26700.7

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = M39

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
1/2	34218.0	6830.1	10507.9
9/16	38495.3	7683.9	11821.4
5/8	42772.5	8537.7	13134.9
3/4	51327.0	10245.2	15761.8
7/8	59881.6	11952.7	18388.8
1	68436.1	13660.3	21015.8
1 1/8	76990.6	15367.8	23642.8
1 1/4	85545.1	17075.3	26269.7
1 3/8	94099.6	18782.9	28896.7
1 1/2	102654.1	20490.4	31523.7

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = M42

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
9/16	41324.1	8883.1	13666.2
5/8	45915.7	9870.1	15184.7
3/4	55098.8	11844.1	18221.7
7/8	64281.9	13818.1	21258.6
1	73465.1	15792.1	24295.5
1 1/8	82648.2	17766.1	27332.5
1 1/4	91831.4	19740.1	30369.4
1 3/8	101014.5	21714.1	33406.4
1 1/2	110197.6	23688.1	36443.3
1 3/4	128563.9	27636.2	42517.2

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = M45

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
9/16	44496.6	10248.2	15766.5
5/8	49440.7	11386.9	17518.4
3/4	59328.8	13664.3	21022.0
7/8	69217.0	15941.7	24525.7
1	79105.1	18219.1	28029.4
1 1/8	88993.2	20496.5	31533.0
1 1/4	98881.4	22773.9	35036.7
1 3/8	108769.5	25051.2	38540.4
1 1/2	118657.7	27328.6	42044.1
1 3/4	138433.9	31883.4	49051.4

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = M48

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/8	52583.8	12918.2	19874.2
3/4	63100.6	15501.9	23849.0
7/8	73617.4	18085.5	27823.9
1	84134.1	20669.2	31798.7
1 1/8	94650.9	23252.8	35773.6
1 1/4	105167.7	25836.5	39748.4
1 3/8	115684.4	28420.1	43723.2
1 1/2	126201.2	31003.8	47698.1
1 3/4	147234.7	36171.0	55647.8
2	168268.3	41338.3	63597.5

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = M52

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
5/8	57283.8	15245.6	23454.8
3/4	68740.6	18294.7	28145.8
7/8	80197.4	21343.9	32836.7
1	91654.2	24393.0	37527.7
1 1/8	103110.9	27442.1	42218.6
1 1/4	114567.7	30491.2	46909.6
1 3/8	126024.5	33540.4	51600.6
1 1/2	137481.2	36589.5	56291.5
1 3/4	160394.8	42687.7	65673.5
2	183308.3	48786.0	75055.4

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = M56

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/4	73923.8	21187.6	32596.3
7/8	86244.4	24718.9	38029.0
1	98565.1	28250.1	43461.8
1 1/8	110885.7	31781.4	48894.5
1 1/4	123206.3	35312.7	54327.2
1 3/8	135527.0	38844.0	59759.9
1 1/2	147847.6	42375.2	65192.6
1 3/4	172488.9	49437.8	76058.1
2	197130.1	56500.3	86923.5

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = M60

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/4	79563.8	24433.0	37589.2
7/8	92824.5	28505.2	43854.1
1	106085.1	32577.3	50118.9
1 1/8	119345.7	36649.5	56383.8
1 1/4	132606.4	40721.6	62648.7
1 3/8	145867.0	44793.8	68913.6
1 1/2	159127.7	48866.0	75178.4
1 3/4	185648.9	57010.3	87708.2
2	212170.2	65154.6	100237.9

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = M64

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/4	84745.6	27759.2	42706.4
7/8	98869.9	32385.7	49824.2
1	112994.1	37012.3	56941.9
1 1/8	127118.4	41638.8	64059.7
1 1/4	141242.7	46265.3	71177.4
1 3/8	155366.9	50891.8	78295.1
1 1/2	169491.2	55518.4	85412.9
1 3/4	197739.7	64771.4	99648.4
2	225988.3	74024.5	113883.9

Aluminum 7075-T6/T651 ($F_{su} = 45.6$ ksi, $K = 0.20$)

Fastener Size = M68

[NOT TO BE USED FOR FLIGHT HARDWARE]

Thread Engagement (in)	Pullout Load (lb)	Assembly Torque (lb-in)	100 % Torque (lb-in)
3/4	90385.6	31457.0	48395.5
7/8	105449.9	36699.9	56461.4
1	120514.2	41942.7	64527.3
1 1/8	135578.4	47185.6	72593.2
1 1/4	150642.7	52428.4	80659.1
1 3/8	165707.0	57671.2	88725.0
1 1/2	180771.2	62914.1	96790.9
1 3/4	210899.8	73399.8	112922.7
2	241028.3	83885.5	129054.5

