EMT Tripod Rocket Launcher

This article describes the design and construction of a rocket launcher made largely from low cost, readily available EMT. "Electrical Metallic Tubing" is available in a multitude of sizes (see Table 1) and can be purchased inexpensively from hardware and home improvement shops. EMT is an excellent construction material due to its excellent strength, low weight and ductility. The ductility of EMT steel allows for easy "squeezing" of the tubing to form flattened lugs that are perfect for bolted joints.

As described in this article, the launcher is fitted with a "rail" mounted to a mast. The "I' shaped guide rail interfaces to "C" clips that are mounted on the rocket. The benefit of this rail setup is that the "C"clips are small and lightweight and as such offer minimal performance loss to the rocket. However, instead of using such a system, a traditional round guide rod may be used.

The launcher is designed with the capability to "tilt" the pad (base) in any direction to adjust the angle of launch.

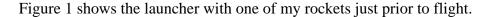




Figure 1– Author with EMT Tripod Launcher

Figure 2 illustrates the base assembly of the launcher. Included in the figure are the sizes of EMT used and the bolted joint details. As shown, the base is made from aluminum plate, although a steel plate may be used, or even a wooden plate, providing a metal shield is used to protect the base from the hot blast of the rocket motor.

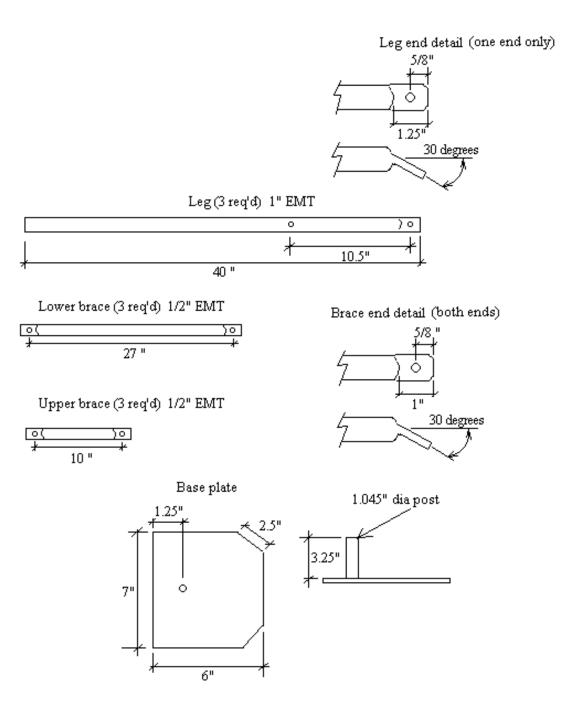


Figure 2 – Launcher base assembly

Figure 3 provides further details of the launcher base assembly components, including key dimensions. For this particular design, the "post" is drilled and tapped at the bottom end and attached to the "base plate" with a single bolt.

Figures 4 & 5 provide details of the guide rail and mast assembly. The guide rail is made from two 5 foot lengths of standard "curtain rail". Launch lugs are attached to the rocket by cutting a 0.11" x 0.34" rectangular slot or an 11/32" round hole into the rocket body. Epoxy putty is then applied on the portion of lug protruding inside the rocket body.

Figure 6 is a photo of the process of bonding the curtain rail to the mast. The zinc coating is removed from the mast (by grinding or filing) in the region of the bond. As well, the paint is stripped off of the bonded side of the curtain rail. To hold the rail in position while the epoxy cures, tie-wraps may be employed (as illustrated) or a few wraps of suitable tape.



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Figure 3 – Launch pad construction details

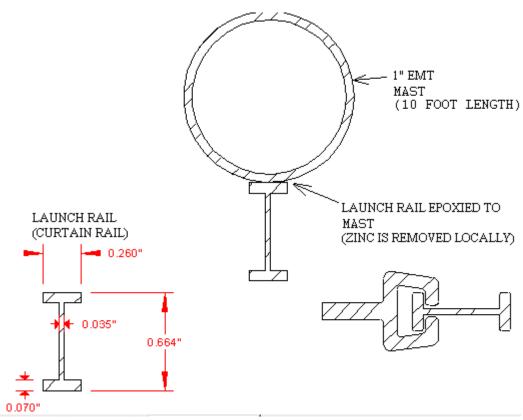


Figure 4 – Launch pad guide rail details

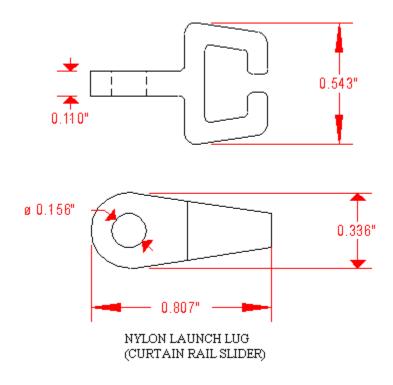


Figure 5 – Launch Lug details

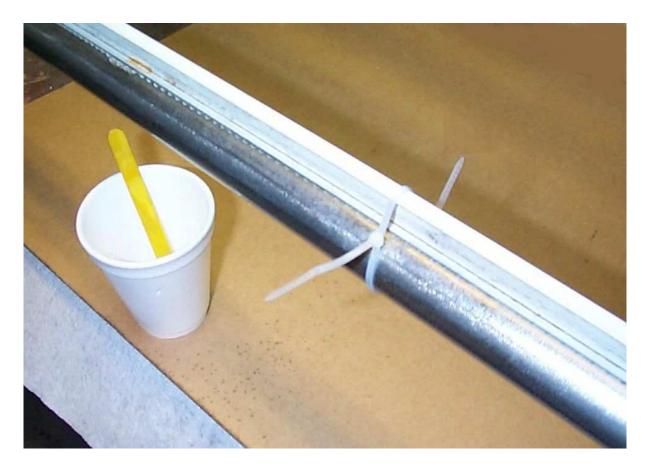


Figure 6 – Bonding guide rail to mast

Electrical Metallic Tubing (EMT)									
Dimensions and Weight *									
Nominal	Outside	Inside	Wall	Weight	Nominal	Outside	Inside	Wall	Mass
Size (NPS)	Diameter	Diameter	Thickness	per foot	Size (Metric)	Diameter	Diameter	Thickness	per metre
	(in.)	(in.)	(in.)	(lb.)		(mm)	(mm)	(mm)	(kg.)
1/2"	0.706	0.622	0.042	0.295	16	17.9	15.8	1.1	0.44
3/4"	0.922	0.824	0.049	0.445	21	23.4	20.9	1.2	0.66
1"	1.163	1.049	0.057	0.650	27	29.5	26.6	1.4	0.97
1-1/4"	1.510	1.380	0.065	0.960	35	38.4	35.1	1.7	1.43
1-1/2"	1.740	1.610	0.065	1.110	41	44.2	40.9	1.7	1.65
2"	2.197	2.067	0.065	1.410	53	56	52	1.7	2.10
2-1/2"	2.875	2.731	0.072	2.300	63	73	69	1.8	3.42
3"	3.500	3.356	0.072	2.700	78	89	85	1.8	4.02
3-1/2"	4.000	3.834	0.083	3.260	91	102	97	2.1	4.85
4"	4.500	4.334	0.083	4.000	103	114	110	2.1	5.95
Tolerance on O.D. : 1/2 through 2: +/- 0.005 in. 3-1/2 and 4: +/- 0.020 in. * Ref. ANSI C80.3 2-1/2: +/- 0.010 in. 3: +/- 0.015 in.									

Table 1 – Electrical Metallic Tubing sizes and dimensions