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TECHNICAL MANUAL

EXPLOSIVE ORDNANCE DISPOSAL PROCEDURES
ORDNANCE LOW-ORDER DISRUPTION TECHNIQUES; MAIN CHARGE
DISRUPTOR

Published under authority of the Secretaries of the Army, Navy, and Air Force.
(Prepared by the Naval Explosive Ordnance Disposal Technology Division, 2008 Stump
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SECTION 1. INTRODUCTION.

1. PURPOSE. This manual is a general guide for the use of the main charge disrupter (MCD) tool (an explosive-formed penetrator (EFP)) as a low-order disruption technique.

2. SCOPE. This manual presents a description and general procedures for employing the MCD. Applicable conditions for use, techniques, results, target bombs, insensitive munitions (IMs), tactics, and limitations are covered. The MCD has proven effective in explosive filler disruption for an assortment of munitions.

3. INTRODUCTION. The United States-developed MCD (figure 1) was modeled after the United Kingdom's Baldrick tool. The Baldrick is a NATO tool, however, it has not been approved for U.S. use. The MCD is packaged in a container containing 12 MCDs (Container, EX 788 Mod 0), 12 stands (figure 2), 12 detonator holders, two explosive packers, and 24 tie straps. The MCD tool is an aluminum cylinder with a copper hemispherical-shaped liner -- similar in appearance to a Misznay-Schardin liner (figure 3). The MCD is issued empty; it is field-filled with the proper amount of plastic explosive for the mission, operation, or application. A nylon pad is attached to the liner to provide a cushion, dampening slightly the velocity of the explosive wave of the detonation, and reducing the velocity of the liner. The detonator holder has an opening through the middle of the holder for insertion of a blasting cap centered at the apex of the liner.

4. GENERAL. When clearing an ordnance-contaminated area, the course of action is to render safe munitions, use the standoff munitions disruption technique (SMUD), or hand-emplaced explosive charges for ordnance detonation (blow-in-place (BIP)). The MCD offers an alternative method as some procedures have drawbacks; performing render safe procedures (RSPs) may be time-consuming. Using the SMUD technique requires a good aim, and ricochets and other down-range dangers must be considered. As with SMUD, the MCD was developed to produce deflagrations (low orders) that consume all or most of the explosives contained in large munitions during rapid clearing operations. The MCD was designed for rapid clearance and quick positioning; it is "standoff friendly" (i.e., the standoff does not need to be exact, but placed approximately 6 inches (152 millimeters) from the target). The MCD can also be used for baseplate removal on Mk 82 and Mk 83 bombs.

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SECTION II. DESCRIPTION.

5. TECHNIQUE.

- a. General. The MCD is used against high-explosive (HE) bombs and large projectiles. The MCD disrupts the main charge of the munition by rapid deflagration of the explosive filler. As with SMUD, the MCD is used only against HE-filled munitions. The disruption-reaction effects from the penetration of the EFP on the HE-filled munitions are detonation, violent deflagration, deflagration, slight reaction, no chemical reaction, and burnout. As the EFP penetrates the HE filler, the explosive is compressed and the deflagration-to-detonation transition (DDT) process begins. If the munition case is sufficiently weakened, the detonation process ends and the deflagration continues to consume all or part of the filler. For the definition of DDT, refer to the 60-series manual on general information on ordnance low-order disruption techniques. Reactions of the fillers are classified as:

Category A. No chemical reaction. The MCD may not have penetrated the casing. If penetration occurred, the shock must have been insufficient to induce the deflagration process. Explosive may be exposed. No further reaction.

Category B. Slight reaction. A negligible deflagration or explosive contribution is evident.

Category C. Deflagration. A substantial amount of the HE-filler is consumed. Casing remains somewhat intact or splits into large fragments traveling a short distance; baseplate and nose segments are usually intact. After deflagration, a shallow crater is visible. The crater can contain the casing or large fragments.

Category D. Violent deflagration. Casing fragments/splits; large fragments travel several hundred meters; all or almost all of the filler is consumed. The indication of a violent deflagration may also mean the ordnance has undergone a DDT. A shallow crater with no large fragments may be a visible indication of a DDT, or a crater that is shallow at one end and deeper at the other is an indication that a DDT has occurred.

Category E. Detonation. MCD causes detonation evidenced by a large blast reaction and noise. Casing ruptures into small, high-velocity fragments which travel long distances.

Category Burn. The main charge either burns to total consumption, the main charge burns until a booster heats sufficiently to detonate the main charge, or the main charge is partially consumed.

- b. Results. With Categories B, C, and D, filler disruption occurs with less blast and fragmentation than a Category E or an intentional detonation. However, Categories C and D may still produce a violent explosion, resulting in a blast

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- and long fragmentation travel. Filler disruption may leave the area littered with disrupted munitions casings containing varying amounts of explosives and possibly armed fuzes, burning munitions, and other hazardous munitions residue. A Category E produces the nearly normal designed blast and fragmentation, and results in complete destruction of the munition. A Category A is not desirable, as the munition will have to be reattached until favorable results are achieved.
- c. Target munitions. Tables 1 through 9 (see list of figures) show the test results of the MCD. Tables 10 through 20 (see list of figures) show the results of the Baldrick tool. Testing has proven that both tools have similar characteristics and produce nearly identical results. Tables are grouped corresponding to the bomb weight and Mk/BLU number. The MCD was tested against bombs in pristine condition and against dropped bombs containing boosters and fuzes. The Baldrick was tested against bombs; some bombs contained boosters and armed fuzes, some contained boosters, and others had neither boosters or fuzes. The H6-filled bombs were also thermally protected; it appears the thermal protection did not significantly alter the deflagration results. There is no predicted outcome of HE-filled munitions; the tables are the results of the munitions that have been tested and what should be expected. The target munition wall thickness generally determines results and the vulnerability to penetration. The fill generally determines the volatility for the reaction. For a definition of volatility, refer to the 60-series manual on general information on ordnance low-order disruption techniques.
 - d. Insensitive Munitions (IMs). IMs are designed to withstand such stimuli as heat, shock, impact, and fragmentation/bullet impact. The munition is usually designed to two different design technologies; the first is to design the case with some means of venting the case, such as employing vent holes filled with a fusible filler that melts when heated or a stress riser (weakened area) and other means of venting the case; and the second is to design the explosive to make it resistant to detonation from bullet and fragmentation impact requirements of IMs. Refer to the 60-series manual on description of and disposal procedures for conventional explosives and related hazardous materials for further information. With a vented case design, the case will rupture with very little pressure buildup. The stress riser or vent will have to be attacked or the case will not allow pressure buildup and will not sustain a deflagration. Attacking a munition with stress risers or a venting design should be at that vent or stress riser - as attacking any other area of the case will result in an unacceptable result. Attacking the stress riser or vent is also the weakest point of the case, granting easy penetration for the EFP.
 - e. Use. The MCD should be considered for use in exceptional circumstances where there is a requirement for rapid clearance of multiple unexploded ordnance (UXO) items or when filler disruption is deemed essential. The possibility of a detonation of the target munition must be considered, even though a less violent reaction is probable. After the ordnance experiences deflagration, there will be residue of fuzes in unknown conditions, boosters, explosives, and case fragments when a munition deflagrates. Hazardous

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residue in the area can be rendered safe, removed, or disposed of after all the UXO targets have been attacked.

- f. Procedure. The MCD uses 2, 4, or 6 ounces of plastic explosive; the correct amount of plastic explosive may be determined by using the label on each MCD. The label contains three divisions (2, 4, 6); when placed on an M112 block of C4, it will allow for precise cutting of the desired amount. The correct amount may also be determined by using a 1.25-pound block and dividing it into ten 2-ounce segments.

NOTE

If the MCD is dropped during assembly procedures, it will be necessary to reinspect, ensuring the liner is securely in the housing and the explosive is still packed firmly against the liner.

(1) Assembly procedures - MCD (figure 1).

- (a) Remove label from MCD.
- (b) Remove foam detonator holder.
- (c) Inspect MCD; ensure:
 1. The MCD is clear of foreign objects.
 2. There are no dents, cracks, or damage to housing or liner.
 3. The liner is firmly seated in housing.
 4. There is no significant corrosion (no white or green powder) at liner/housing interface.
- (d) Using explosive packer (figure 4), or wooden dowel, pack MCD firmly and evenly around liner with required amount of plastic explosive, taking care to leave no voids in explosive.
- (e) Replace foam detonator holder.

NOTE

Navy and Marine Corps units are restricted from storing explosive-loaded MCDs onboard ships or on-shore magazines.

(2) Assembly procedures - Stand (figure 1).

- (a) Attach pivot arm extension to pivot base.
- (b) Ensure stop pin in pivot arm extension is vertical.
- (c) Slide pivot arm extension through tripod base (the MCD may be positioned between the legs or on top).

NOTE

Do not overtighten the wing nut; the plastic threads strip easily.

- (d) Tighten wing nut (lower) to secure extension at desired height.
- (e) Attach at least three leg segments evenly spaced to tripod base.
- (f) Attach additional leg segments to attain required height.
- (g) Using appropriate tool, remove protrusion nub at center end of MCD support tray.

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- (h) Run the two plastic ties through the two holes below MCD support tray; loosely connect each tie to its end. The MCD may also be attached by any method that securely attaches it to support tray.
- (i) Place MCD on support tray; tighten the two plastic ties or securely attach support tray.

NOTE

Do not overtighten the wing nut; the plastic threads strip easily.

- (j) Loosen pivot base wing nut (upper nut); position pivot base/MCD to desired angle. Tighten wing nut securely to maintain selected angle.

(3) Employment - deflagration.

NOTE

The MCD may need the stand, sandbag, or other material to raise it to proper attack point.

- (a) Position MCD approximately 6 inches (152 millimeters) and at a 90-degree angle to target so EFP will strike target approximately midsection of target as shown in figure 5.
- (b) Prime MCD in accordance with the 60-series manual on general information on EOD disposal procedures.
- (c) Initiate MCD.

(4) Employment - Baseplate removal (Mk 82 and Mk 83 bombs).

NOTE

The MCD may need the stand, sandbag, or other material to raise it to the proper attack point.

- (a) Position MCD approximately 6 inches (152 millimeters) and at a 60-degree angle so EFP will strike target approximately 16 inches (406 millimeters) from base of bomb as shown in figure 6.
- (b) Prime MCD in accordance with 60-series manual on general information on EOD disposal procedures.
- (c) Initiate MCD.

6. RESULTS. The MCD is reported in a percentage reached in each category. The top number is the results in each category (by percentage); the middle number is the number of tests and the results, and the bottom number is the percentage of the yield of the filler for each category. EXAMPLE test 1: the first number is the percentage of success, next are the results over the number; in this case, 24 bombs resulted in a Category C of the 24 bombs tested, and next the average percentage of HE contribution of the target. The Baldrick testing gives percentage in each category.

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- Table 2. Mk 84, Tritonal.
- Table 3. BLU-109/B, Tritonal.
- Table 4. M-117, Tritonal.
- Table 5. Mk 82, H6.
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- Table 10. Mk 83, H6.
- Table 11. Mk 82, Tritonal.
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- Table 13. Mk 13 1,000-LB Bomb (U.K.) RDX/Wax/Al.
- Table 14. Mk 20-1,000-LB Bomb (U.K.) Torpex 9.
- Table 15. OFAB 250-270 (Russian) - Filler Unknown.
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- Table 17. BETAB 500-LB (Russian) - Filler Unknown.
- Table 18. BLU 97, Cyclotol.
- Table 19. Baseplate Removal, Mk 82, H6.
- Table 20. Baseplate Removal, Mk 83, H6.

Table 1. Mk 82, Tritonal

Cat A	Cat B	Cat C	Cat D	Cat E	Burn	Amount of C-4
			100% (24/24) 2%			4 oz

Table 1

Table 2. Mk 84, Tritonal

Cat A	Cat B	Cat C	Cat D	Cat E	Burn	Amount of C-4
		82 % (9/11) 2%		18% 2/11 89%		4 oz

Table 2

Table 3. BLU-109/B, Tritonal

Cat A	Cat B	Cat C	Cat D	Cat E	Burn	Amount of C-4
		100% 10/10 11%				4 oz
		100% 3/3 11%				6 oz

Table 3

Table 4. M-117, Tritonal

Cat A	Cat B	Cat C	Cat D	Cat E	Burn	Amount of C-4
		100% 1/1 0.01%				4 oz

Table 4

Table 5. Mk 82, H6

Cat A	Cat B	Cat C	Cat D	Cat E	Burn	Amount of C-4
		79% 19/24 3%	17% 4/24 44%	4% 1/24 100%		4 oz

Table 5

Table 6. Mk 83, H6

Cat A	Cat B	Cat C	Cat D	Cat E	Burn	Amount of C-4
		61% 14/23 3%	9% 2/23 32%	30% 7/23 94%		4 oz

Table 6

Table 7. Mk 84, H6

Cat A	Cat B	Cat C	Cat D	Cat E	Burn	Amount of C-4
		81.8% 18/22 2%	13.6% 3/22 24%	4.5% 1/22 100%		4 oz

Table 7

Table 8. BLU 110, PBXN-109

Cat A	Cat B	Cat C	Cat D	Cat E	Burn	Amount of C-4
					100% 18/18	4 oz

Table 8

Table 9. Mk 82, Minol

Cat A	Cat B	Cat C	Cat D	Cat E	Burn	Amount of C-4
		100% 4/4 4%				4 oz

Table 9

Table 10. Mk 83, H6

Cat A	Cat B	Cat C	Cat D	Cat E	Burn	Amount of C-4
		83.33%		16.66%		2 oz

Table 10

Table 11. Mk 82, Tritonal

Cat A	Cat B	Cat C	Cat D	Cat E	Burn	Amount of C-4
		33.33%	66.66%			8 oz*

*Used during early testing; test results demonstrated no significant performance improvements with the added explosive.

Table 11

Table 12. Mk 82, H6

Cat A	Cat B	Cat C	Cat D	Cat E	Burn	Amount of C-4
		56.25	43.75			2 oz

Table 12

Table 13. Mk 13 1,000-LB Bomb (U.K.) RDX/Wax/Al

Cat A	Cat B	Cat C	Cat D	Cat E	Burn	Amount of C-4
		33.33%	33.33%		33.33%	8 oz*

*Used during early testing; test results demonstrated no significant performance improvements with the added explosive.

Table 13

Table 14. Mk 20-1,000-LB Bomb (U.K.) Torpex 9

Cat A	Cat B	Cat C	Cat D	Cat E	Burn	Amount of C-4
		100%*				6 oz

*Limited testing - one bomb only.

Table 14

Table 15. OFAB 250-270 (Russian) - Filler Unknown

Cat A	Cat B	Cat C	Cat D	Cat E	Burn	Amount Of C-4
		80%	20%			

Table 15

Table 16. OFAB 100-120 (Russian) - Filler Unknown

Cat A	Cat B	Cat C	Cat D	Cat E	Burn	Amount of C-4
			100%*			4 oz

*Limited testing - two bombs only.

Table 16

Table 17. BETAB 500-LB (Russian) - Filler Unknown

Cat A	Cat B	Cat C	Cat D	Cat E	Burn	Amount Of C-4
			100%			4 oz

Table 17

Table 18. BLU 97, Cyclotol

Cat A	Cat B	Cat C	Cat D	Cat E	Burn	Amount of C-4
				100%		

Table 18

Table 19. Baseplate Removal, Mk 82, H6

Cat A	Cat B	Cat C	Cat D	Cat E	Burn	Amount of C-4
		87.50%	12.5%			

Table 19

Table 20. Baseplate Removal, Mk 83, H6

Cat A	Cat B	Cat C	Cat D	Cat E	Burn	Amount of C-4
		100%				2 oz

Table 20

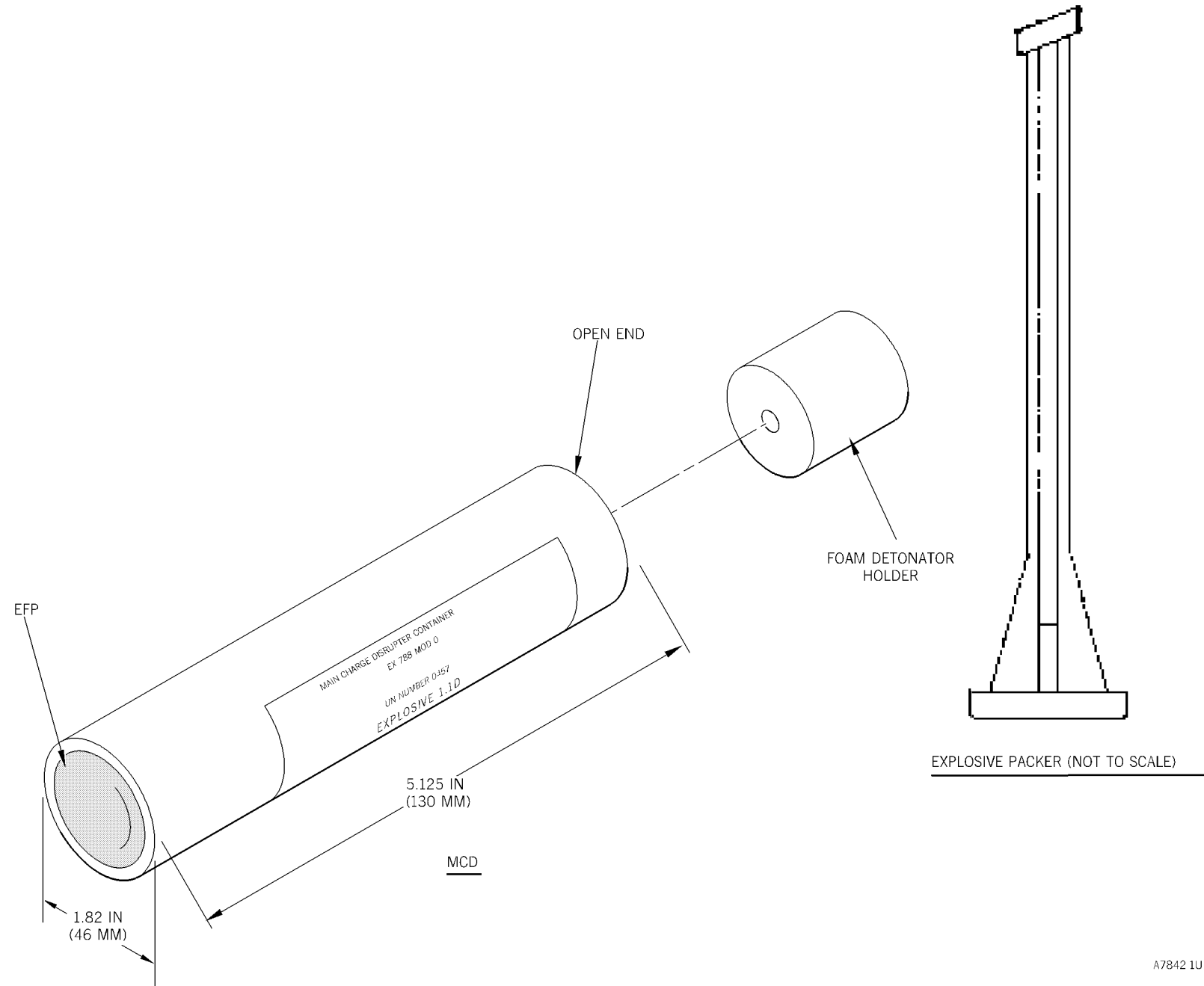
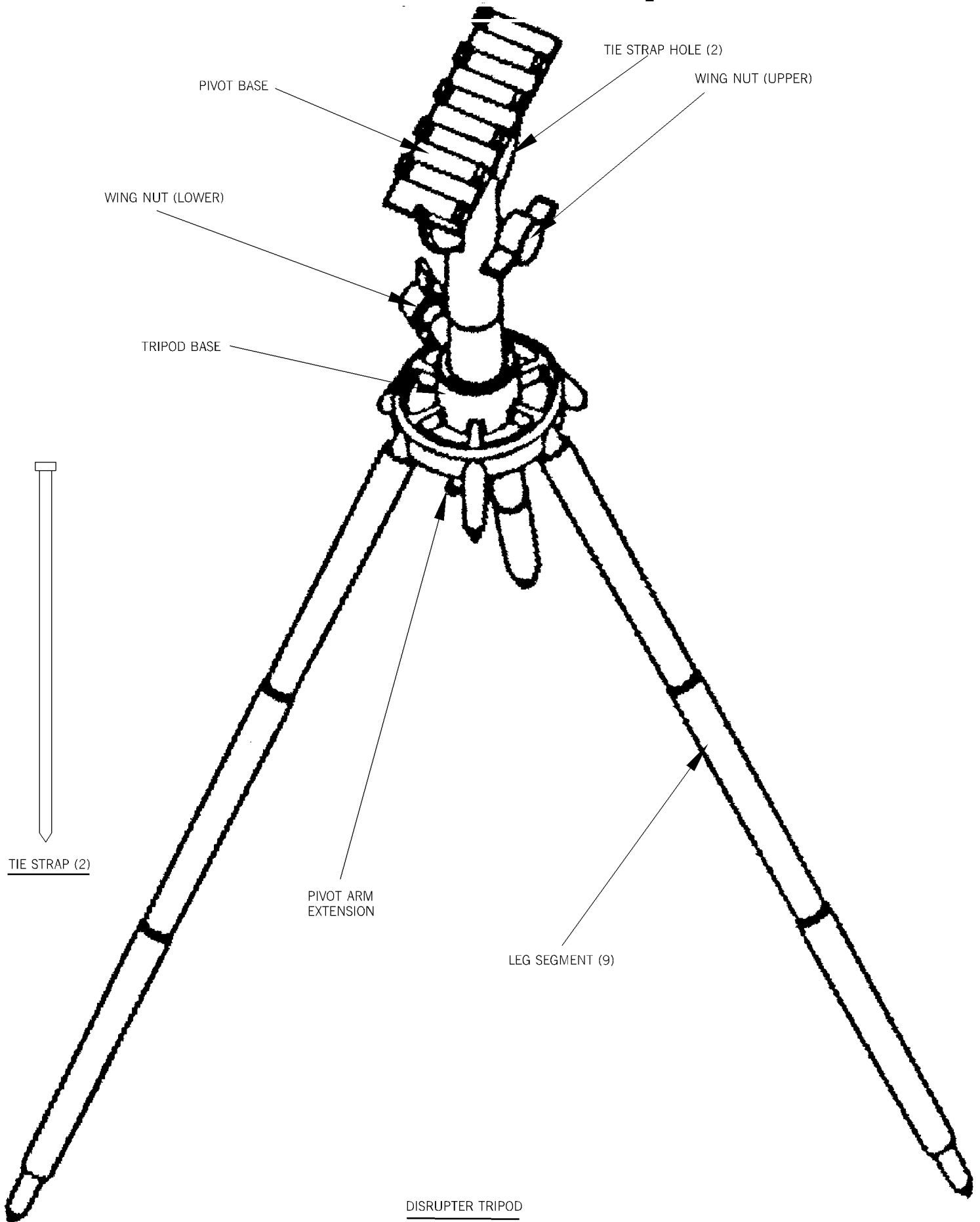
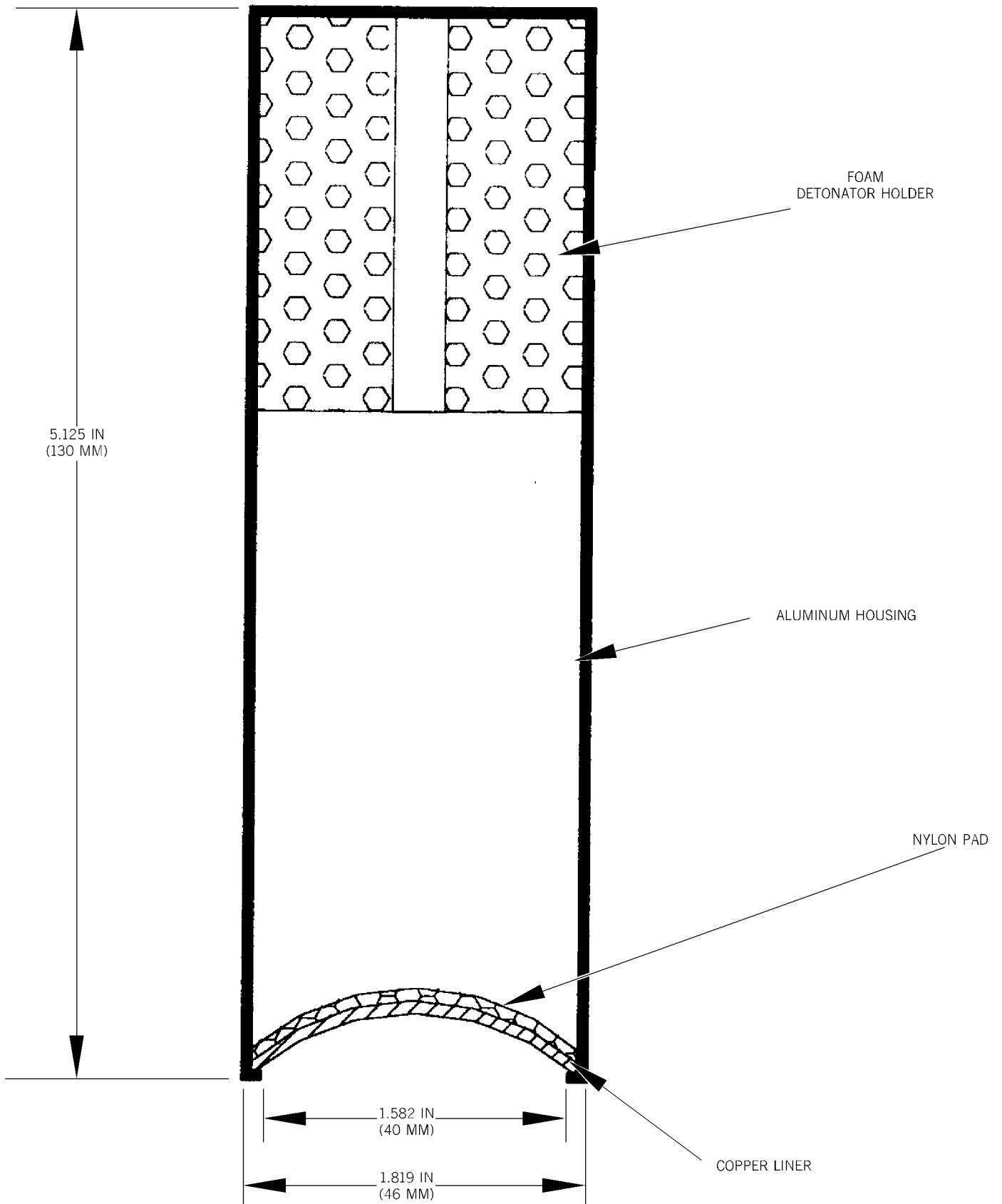
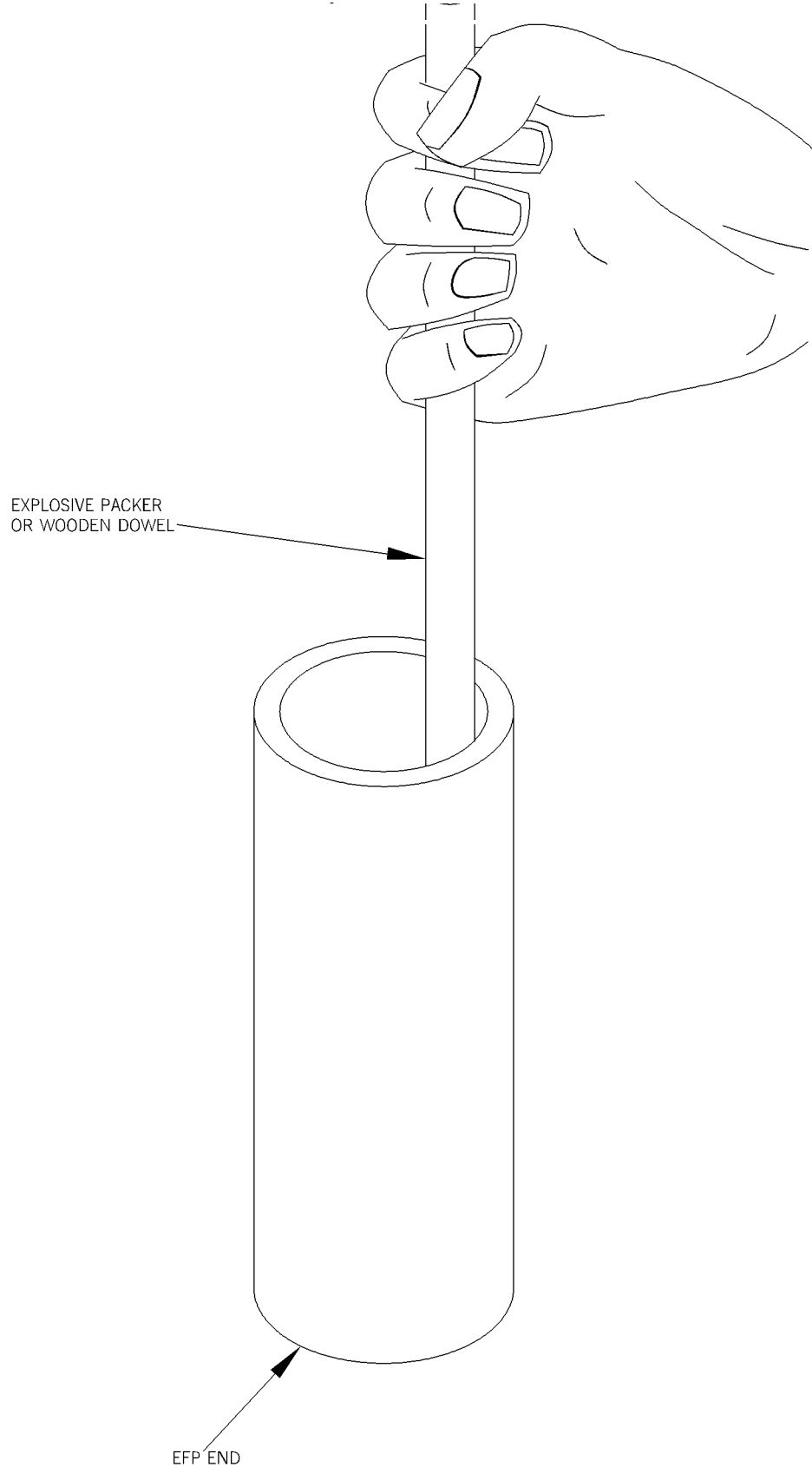


Figure 1. MCD Tool.
Figure 1

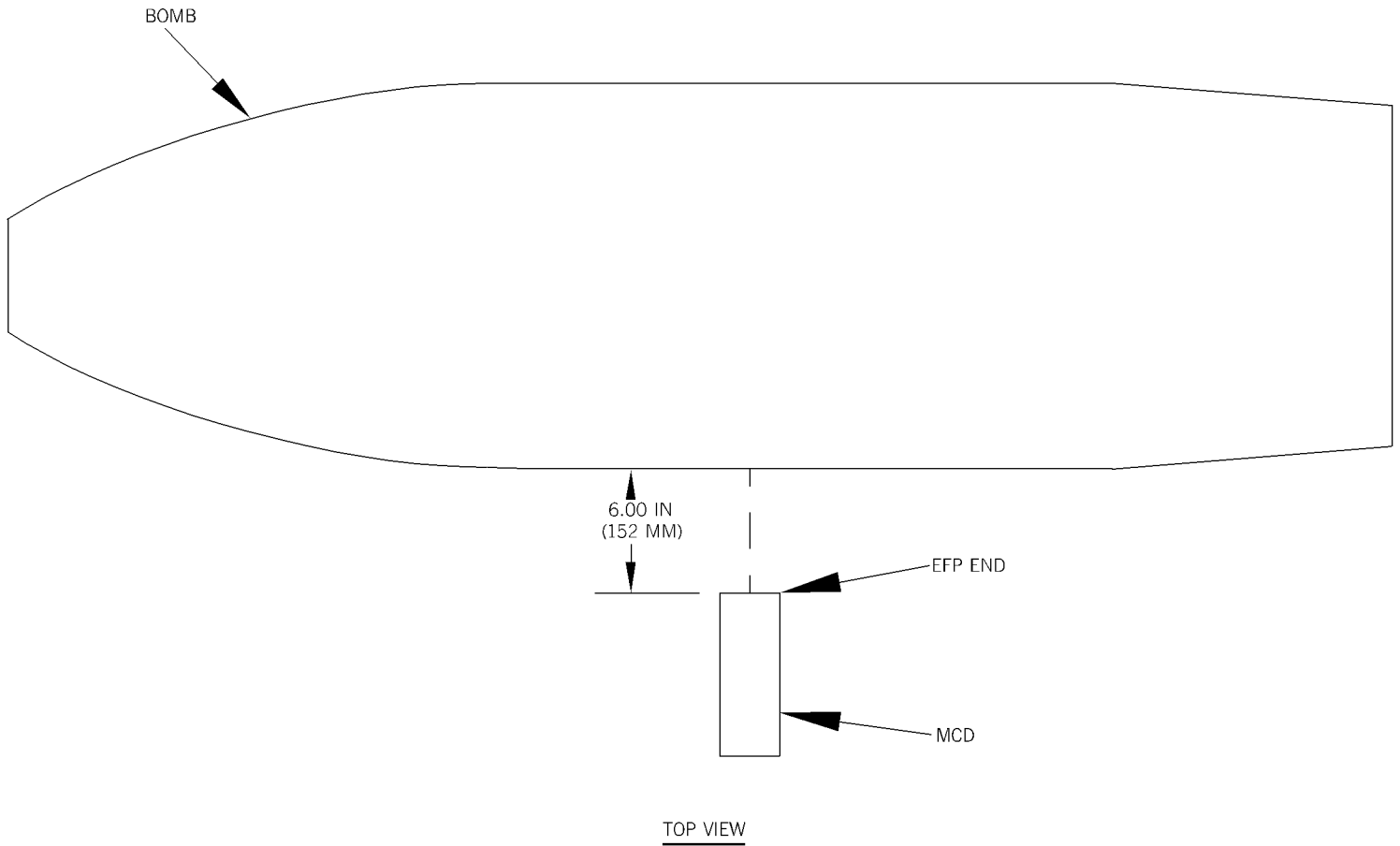




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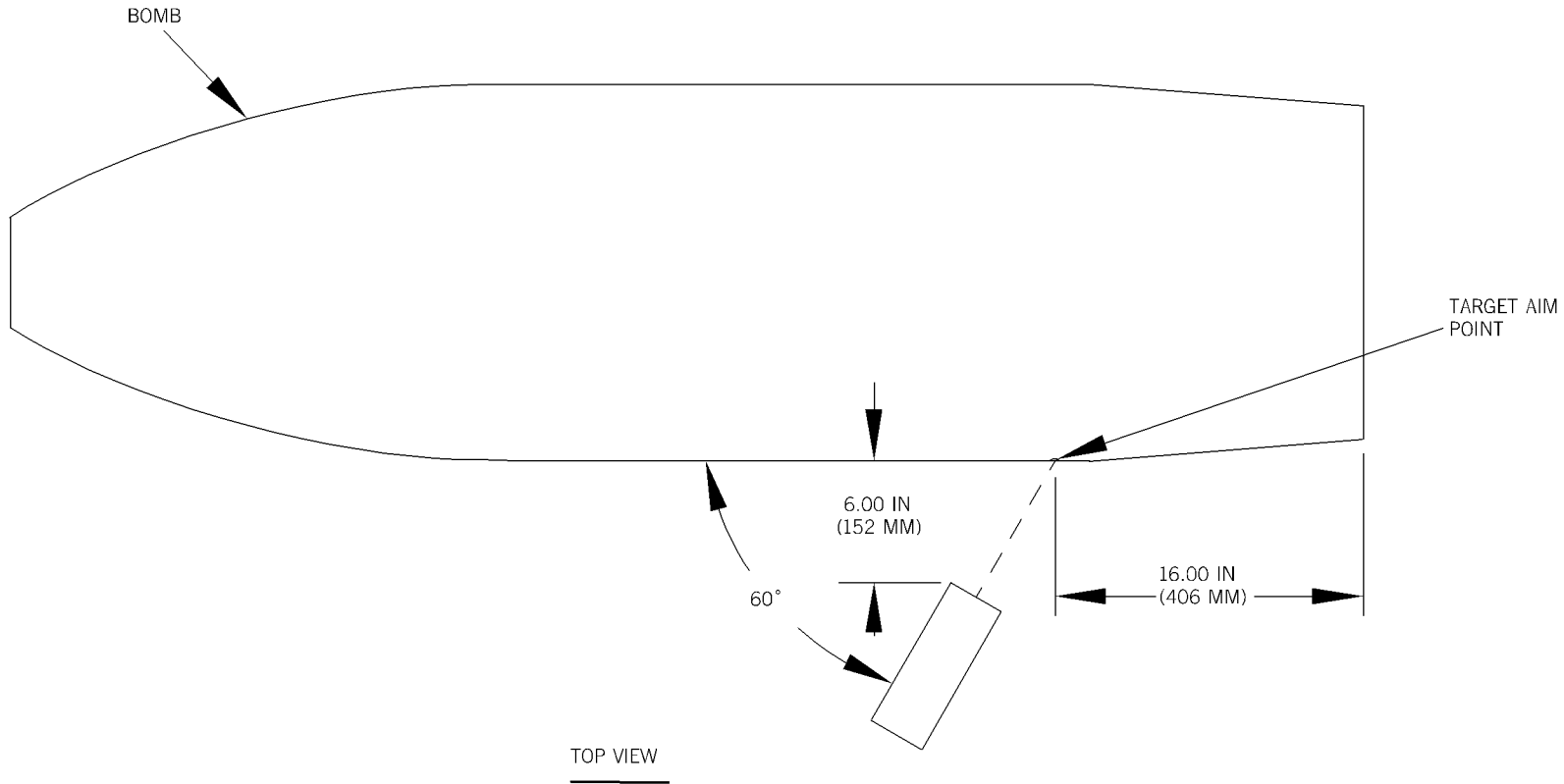
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NOTE: AIMED AT MIDDLE OF THE MUNITION.

A7842 5U

Figure 5. MCD Aimed for Deflagration.
Figure 5



NOTE: AIMED AT 16 INCHES (406 MM) FROM THE BASE.

A7842 6U

Figure 6. MCD Aimed for Baseplate Removal.
Figure 6