Chapter 29. Supplemental Miscellaneous Notes by Chapter

After I wrote Chapter 28 in June 2012, I went for over three years without adding even one new specimen to my collection, or one new bit of information. It was very frustrating. I tracked down leads, wrote emails and letters, answered lots of Gyrojet questions (many from my web site, www.Gyrojet.net), and did everything I knew of to find new specimens and information. But apparently the well had run dry and with nothing new to research and share, my interest waned. Then last month in June 2016, I struck gold. A collector in California had acquired, among other things, a group of Gyrojets from the estate of an MBA engineer who joined MBA after separating from the Army in 1960. Because the collector had no interest in Gyrojets, I was able to acquire the lot, which is the basis for this supplemental chapter. All of the specimens are shown at actual size unless otherwise noted.

Chapter 11. .50-Caliber Gyrojets

MBA .50-caliber BMG (so-called because they often used .50 Browning Machine Gun bullet jackets as cases) Gyrojet rockets typically come in three lengths; short (2.0 inches), medium (2.3 inches), and long (2.7 inches). On page 118, Figure 11-18 shows a short rocket with a ring with crimp marks around the case. It appears to be a live round with an unsnapped primer and no holes drilled in the case, but it is a dummy.

The nearly identical rocket shown below in Figure 29-1 is also a dummy, but its primer is snapped. There is nothing inside the case, and the nozzle ports are clean, so it's not a fired round. Like the earlier round, it has a very deep cannelure at the back of the case to secure the nozzle. There is no crimped ring around the case.

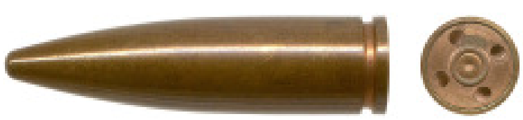


Fig. 29-1. Short .50-caliber dummy. GM case, 12.95 x 51.1mm.

Dummy .50-caliber Gyrojets sometimes have two holes drilled near the nose for a key chain, and the chain sometimes has a plastic or leather tag promoting MBA. These were often used as gifts to factory visitors or VIPs and are quite rare today. Figures on pages 114 and 115 show several of these, all with nickel-plated cases.

Other .50-caliber dummy Gyrojets have unusual nozzles, apparently formed by a "cookie cutter" from a piece of flat steel, and those examined so far have nine "nozzle ports." Figure 11-21 on page 119 shows two of these dummy nozzles, one copper plated and the other plain steel, from the Woodin Laboratory collection. The medium-length .50-caliber Gyrojet shown in Figure 29-2 has not only the key-chain holes (and a key chain) in its nose, but also a nine-port, plain steel "cookie cutter" nozzle with an unsnapped nickel primer in its base. Its shallow case cannelure is so far back, it's almost off the case. So far, it is the only dummy .50-caliber known with this configuration. The key chain master link is marked "Bead Chain."

Fig. 29-2. Medium-length .50-caliber key chain dummy. GM case, 13.0 x 58.2mm.

Long .50-caliber Gyrojets are shown on page 115 and 116 and one in particular, a dummy shown in Figure 11-11, has a case roll crimp at the back that partially blocks the ports.

The new specimen shown below in Figure 29-3 is almost identical except that there is no waterproofing foil visible in the ports and the back of the case roll crimp has been machined down so that the two ports are not blocked.

Fig. 29-3. Long .50-caliber dummy gyrojet with machined roll crimp. GM case, 12.9 x 67.7mm.

MBA designated a group of stubby, sharp-pointed .50-caliber rockets as "Kinetic Energy" or "K.E." The reason for this designation is not clear. Several variations of these Gyrojets, and a rotating-chamber machine gun designed for them, are shown and described on pages 120 and 121. An additional variation with an unusual "pagoda" point is shown on supplemental page 470 in Figure 28-65.

The dummy K.E. rocket shown below in Figure 29-4 is unusual because there are no holes drilled in its case to identify it as a dummy round, unlike each of the dummies shown in Figures 11-26 and 11-29. The rocket's case is empty, there is no waterproofing foil visible, and the primer cup is nickel-plated. Nickel primers often, but not always, indicate a dummy round. In addition, this rocket has a plain steel nozzle, not copper-plated like the other K.E. Gyrojets examined.

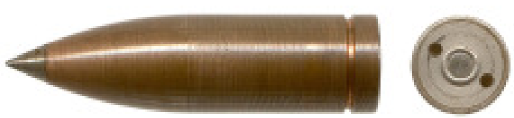


Fig. 29-4. .50-Caliber K. E. dummy, 13.0 x 50.3mm.

Chapter 12. .49-Caliber Gyrojets

Gyrojet rocket nozzles are described and shown throughout the book, with Figure 6-8(H) on page 83 showing an 8-port 13mm nozzle only. Figure 12-9(A) on page 128 shows the 8-port nozzle of a .49-caliber dummy from the Woodin Laboratory collection, and Figure 28-58 on supplemental page 468 shows an 8-port 30mm nozzle only. All of these 8-port nozzles have inconsistent distances between the ports, with the 30mm specimen being the worst. These manufacturing defects attest to the extreme difficulty MBA had in drilling equally spaced, shaped, and angled nozzle ports and why the company was so quick to go to 2-port nozzles when it discovered that two ports were more or less satisfactory.

However, early in the .49-caliber Gyrojet rocket and Model 137 pistol's development, MBA tried everything possible to increase the rocket's accuracy. Doubling the number of ports from the standard four to eight was one such attempt because the more ports there are, the less effect a slight misalignment in one will have. Drilling these eight-port nozzles, one port at a time on the "Bertha" fixture shown in Figure 6-7 on page 82, must have been very frustrating and with a high reject rate.

I wondered whether MBA ever succeeded in making 8-port nozzles suitable for firing tests, and the answer finally came with the fired and heavily corroded .49-caliber Gyrojet shown below. It is so badly corroded it's hard to tell whether it was copper plated or not since some of the rust has the same shade old copper has. But it proves that MBA did at least test fire some Gyrojet rockets with 8-port nozzles, and that makes it an interesting and important find. I'm thankful again that Robert Mainhardt never threw anything away.

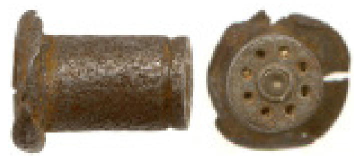


Fig. 29-5. Fired .49-caliber Gyrojet with 8-port nozzle.

Chapter 13. 13mm Gyrojet Rockets

Gyrojet rockets made from double-wall Bundy tubing are described and shown on pages 152 and 153. The rough factory partial section shown next in Figure 29-6 is interesting because it shows the two steel layers of the case defined by a thin line of corrosion between them at the rocket's nose.

A propellant grain is loaded and the inside of the back of the case has been broached (scraped) to form eight grain-retaining tabs that prevent the grain from moving back and clogging the nozzle ports when the rocket is fired. In Paul Smith's excellent section in Figure 13-17(A), the broached tabs are clearly behind the propellant grain, not in it. This would allow the slightest movement back before the grain contacted the retaining tabs, and this construction is also evident in another Bundy-tube Gyrojet case (Figure 29-6B) with grain loaded and tabs broached. However, in the newly discovered loaded case, the tabs are broached so far into the case they penetrate the grain itself (Figure 29-6C), which would prevent even the slightest movement of the grain. Remember that the grain burns only from the inside out, so the tabs would retain it throughout its burn. This case is the only example seen with grain-retaining tabs that are formed so deep that they penetrate the grain.

A.

B. C.

Fig. 29-6. (A.) Factory partial section of 13mm Bundy Tube case, actual size. (B.) “Normal” grain-retaining tabs, twice actual size. (C.) Deep-positioned tabs penetrating grain, twice actual size.

13mm wadcutter Gyrojets are covered on pages 154 and 155, and two of them have unplated cases. MBA often left steel cases that were going to be assembled into complete rockets bare, without the protective anticorrosion copper plating, if the rockets were going to be test fired with little or no delay. In other words, the cases wouldn’t have time to rust, so why take the time and spend the money to plate them?

Early wadcutter cases had a sharp edge between the straight case wall and the conical nose, and this sometimes reduced cartridge feeding reliability when the sharp edge caught on the barrel as it was being chambered. The plain steel wadcutter shown in Figure 13-19(B) on page 154 has this construction.

In order to improve feeding, a slight but distinct bevel was cut into the case at the junction of the conical nose and case wall, and most wadcutters have this bevel. The plain steel case in Figure 13-19 (E) is an example.

The wadcutter Gyrojet shown next in Figure 29-7 is the first plain steel specimen seen with the beveled case in a complete cartridge, which might be a purpose-made dummy or a fired round. Frankly, it’s hard to tell because the rocket is undamaged and the nozzle ports are clean, appearing unfired. However, the waterproofing foil has been perforated beneath each port. There are a few longitudinal, not spiral, scratches on the case. It probably doesn’t matter because the thing that makes this particular rocket a variation is the fact that it is the only known complete *plain-steel-case* wadcutter with a bevel. Copper-plated specimens with bevels are fairly common among Gyrojets.

Fig. 29-7. 13mm wadcutter Gyrojet with beveled plain steel case, 12.9 x 35.2mm.

Zinc plated 13mm Gyrojet presentation dummies are explained on page 163 and shown in Figure 13-35. By ‘presentation,” we mean that these particular dummies were intended for use in the 10-round walnut discs with Goddard medallions in cased Gyrojet pistol sets, or were for presentation to factory visitors or VIPs. They are not functional dummies meant to be cycled through Gyrojet firearms. The cartridge shown below is a variation of those. It is different because its nose shows the prominent “teat” at its tip caused by the open-end resizing die used in the manufacture of this case. As the case was squeezed and pushed forward, some metal was upset and protruded through the open end of the die. This is the only known zinc (or possibly tin) plated dummy of its type with this characteristic.

In addition, the top of the primer cup has been cleanly ground off, exposing the boxer three-prong primer anvil, the only Gyrojet dummy of any caliber or type seen thus far with that feature. Finally, the rocket has a band of excellent-condition plating that extends 0.43 inch up from the base, while the remainder of the case has plating that is more worn. The 0.43-inch band width does not correspond with the 0.82-inch depth of the holes in the cased set walnut disc, so the reason for it is unknown.

Fig. 29-8. 13mm Zinc (or tin)-plated presentation Gyrojet dummy with exposed primer anvil, 12.9 x 35.8mm..

A group of long-case 13mm Gyrojet rockets is shown in Figure 13-34 on page 162. These long-case rounds could hold more propellant, thereby increasing velocity and energy at the target. However, because of their length, they had to be fired from carbines not based on the pistol—they wouldn't fit in the grip magazine—or in other weapons like the shotgun with barrel inserts shown in Figure 13-33 on page 162, or the modified Topper shown in Figure 14-51 on page 198. Long-case rockets are rare and most seen are dummies, like the new-find rocket shown below in Figure 29-9. It is a beautiful specimen with a bright nickel-plated case, a turned-steel nozzle, and two ports. There is no waterproofing foil visible at the bottom of the ports.

It also has no nozzle-securing case cannelure, unlike every other complete long-case Gyrojet seen. But the nozzle seems quite secure, held in place by some type of adhesive. The nickel primer has not been struck.

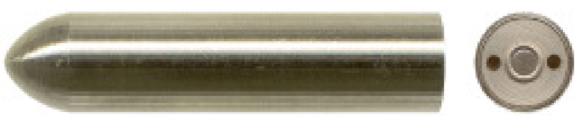


Fig. 29-9. 13mm nickel-plated long-case dummy with 2-port steel nozzle, 12.9 x 58.5mm.

Chapter 15. 13mm Gyrojet Flares

An unusual 2.75-inch-long 13mm Gyrojet flare from the Woodin Laboratory collection is shown on page 207 in Figure 15-14(G). The Woodin flare has a 2-port nozzle that is copper plated, with an unstruck primer.

The similar newly-found specimen shown in Figure 29-10 has a 4-port plain steel nozzle with a struck primer. It is an unknown mystery round because, unlike a pyrotechnic flare, the plain aluminum case contains loose metallic objects that rattle when shaken and strongly attract a magnet all the way from the top of the steel motor section up to the case's conical tip.

Fig. 29-10. 13mm Dummy "flare" with metal pieces inside, 12.9 x 70.8 mm.

Chapter 17. Large-Caliber Gyrojets
25mm Gyrojets

A 25mm MBA Model 501-1 chaff flare is described and shown on page 237, Figure 17-17. The newly acquired specimen in Figure 29-11 is a dummy version of the 501 (-1 or -2). The new specimen has an open-point plastic nose with a 5mm hole in the center so that the pyrotechnic delay fuze bulkhead, held in place by the case cannelure, can be seen. The stainless case has two 5mm holes, and the plain steel nozzle has four clockwise ports with alternating red and green colors

Fig. 29-11. Dummy 25mm Model 501 chaff flare with two case holes, hole in nose, struck dummy nickel primer, and alternating red and green at the bottom of the ports. 25.5 x 151.5mm (OAL).

at their bottoms, *a feature not seen in any other live or dummy Gyrojet of any caliber*. The reason for the colors is not known, but Mainhardt did sometimes add color to rockets for a more interesting appearance. See the red plastic noses in Figures 28-77 on supplemental page 476 and 28-82(E) on supplemental page 478.

The next newly-acquired dummy rocket doesn't match any other 25mm rocket configuration in the book, but it appears to be either a dummy 25mm Model 8400 "Gyrosignal," as shown in Figure 17-18 on page 238, or an SRU-29P chaff signal, as shown in Figure 28-82(B) on supplemental page 478. This identification is based solely on the case cannelure location and nozzle configuration. Both of the other rockets have hemispherical round-nose, friction-fit plastic noses with skirts that slip over reduced-diameter steps in the outside of the case mouths. This plastic nose has a pointed ogive, like those shown in Figure 17-20(B) and (C) on page 239, and it slips off and on the stainless case easily because of a crack in its skirt. It may be an incorrect replacement. The primer is snapped.

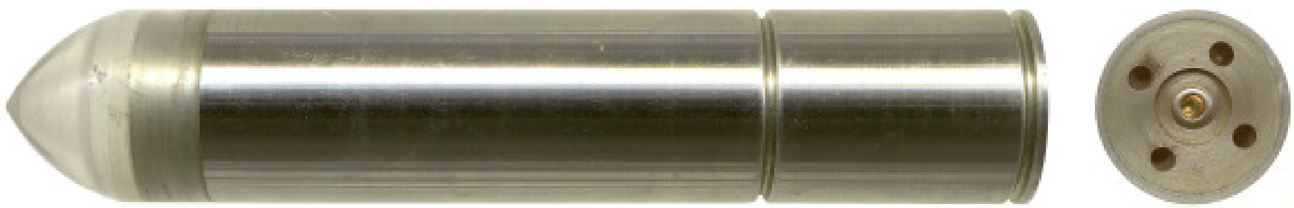


Fig. 29-12. Dummy 25mm Model 8400 "Gyrosignal" or SRU-29P chaff signal. Round-nose, slipover plastic point possibly replaced with one having a pointed ogive. 25.4 x 140mm (OAL).

The final 25mm dummy, shown below in Figure 29-13 has a stainless case much longer than any other 25mm rocket in the book, and its exact identification is unknown. It has a short motor section, as indicated by its case cannelure being only 27mm up from its base, like the two rockets shown in Figure 17-20 (A) and (B) on page 239, both with 2-port nozzles like this specimen has. Two other rockets with short motor sections are shown in Figure 28-82(C) and (D) on supplemental page 478. The rocket in Fig. 28-82-(C) has a round slipover plastic nose that has a diameter larger than the case mouth diameter, as this rocket does.

Finally, two other short-motor rockets are shown in Figure 28-85 on supplemental page 479. Whatever this rocket actually is, there probably were at least four more just like it because it has the number 5 inked on its case wall. Its primer appears to be lightly snapped.

Fig. 29-13. Dummy 25mm rocket with long stainless case and round-nose, slipover nose. 25.5 x 165.4mm (OAL).

30mm Gyrojets

Live MBA 30mm rockets are rare, and the one that was part of the group of Gyrojets just acquired is the only live specimen of its type I've seen. Fortunately, its solid aluminum nose and fuze are inert. A dummy made from a fired case is shown in Figure 17-36(E) on page 249.

The rocket was made from standard, off-the-shelf, 1.25-inch-diameter stainless steel tubing, and remnants of the manufacturer's green identification lettering are barely visible. The inert fuze is held in place by a squeeze crimp at the case mouth. The rocket has a steel 4-port nozzle with a light plating of something that appears to be zinc chromate. Shiny waterproofing foil is clearly seen at the bottom of the clockwise ports. The small copper primer has a red waterproofing seal.

Unlike any other MBA rocket seen, there is black writing in small letters around the circumference of the base just above the nozzle cannelure. Unfortunately, most of the letters have been rubbed off by the case being handled, but the first of them, **MBA**, are clearly legible.

Although its exact use is unknown, the rocket's configuration and small percussion primer point to use as a ballistic test round for the series of H.E. anti-armor rockets fired from over-the-shoulder launchers as shown in Figures 17-22 on page 240, Figure 17-24 on page 241, and Figure 17-25 on page 242.

Fig. 29-14. MBA 30mm live rocket with inert fuze. 31.8 x 185.5mm (OAL).

37mm Gyrojets

Until now, large-caliber MBA rockets have been seen in just four sizes; 20mm, 25mm, 30mm, and 40mm.The final rocket of the group is a unique (so far) *37mm* specimen, shown next in Figure 29-15, with some very unusual characteristics. It is a purpose-made dummy made entirely of aluminum, including its 4-port nozzle with blind-drilled, clockwise ports. Drill chatter marks are seen at the bottom of each port. A machined piece of brass rod placed in the center of the nozzle simulates an Olin BWP electric primer. The nozzle appears to be threaded and screwed into place because there is an obvious joint between it and the case, and because there are four stab crimps in the joint to secure it. The three cannelures are cut, not rolled, into the case. The front end of the rocket appears to be solid, with circular machine marks in the "top bulkhead" and no visible joint between it and the 2.24mm-thick case wall. (Normal large-caliber stainless case walls are 1.25mm thick.) The rocket is topped with a red-painted piece of cardboard held in place by friction and easily removed. Unfortunately, I have no idea what live rocket this dummy simulates, if any.

Fig. 29-15. MBA 37mm aluminum dummy rocket. 37.0 x 215.3mm.

Chapter 18. 40mm Gunpowder-Powered Less-Lethal

MBA's first production 40mm Stun-Guns were made of injection-molded Lexan, which soon proved to be too weak. Figure 29-16 below, an MBA photo, shows a first-production Stun-Gun with its handle extension. It has a rifled aluminum bore liner. Another photo from a different angle shows that the molded markings at the rear of the breech are:

MBASSOCIATES
SAN RAMON, CALIF.
MARK 70 MODEL 0
PATENTS PENDING
U.S. AND FOREIGN
MADE IN U.S.A.

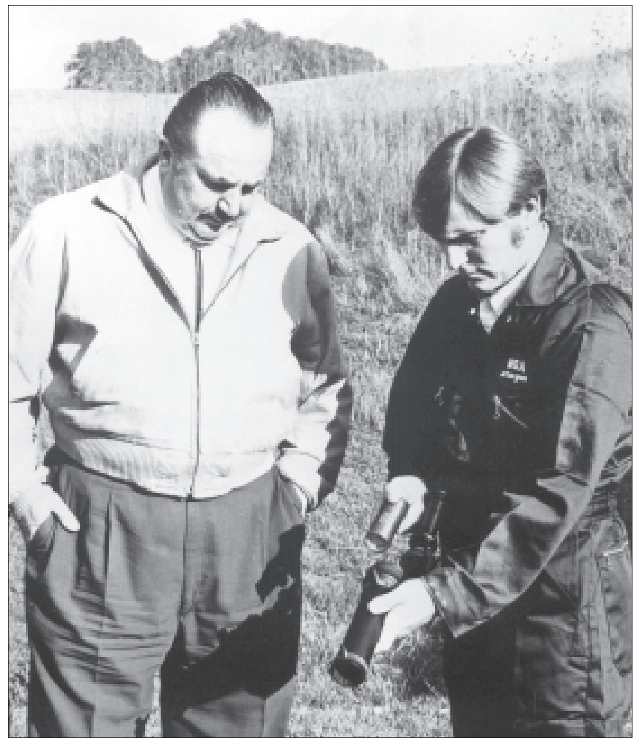
As mentioned earlier, the Mark 70 designation relates to the year the Stun-Gun was developed. When this Lexan Stun-Gun failed, it was replaced by the all-metal Mark 70 shown in Figures 18-29 on page 269 and 27-51 on supplemental page 442. These were, in turn, replaced by the aluminum Mark 70 Stun-Guns shown in Figure 18-33 on page 271.

Fig. 29-16. First production MBA 40mm Lexan Stun-Gun. MBA photo, reduced.

Mainhardt did everything possible to increase publicity for MBA's products, including hosting media people at the factory for hands-on demonstrations of MBA products; in this case, less-lethal devices. When the book was in work, I looked for a reason to include the following group of MBA photos, but in the end they were left out because of space required. Then, with the group of newly-acquired items including a new MBA sewn patch, I decided to include the photos in this supplemental chapter because they provide a look at what was probably a fairly routine event at MBA when Mainhardt, shown at the left in Figure 29-17(A), hosted the unknown visitor in the center of the photo, with Stun-Gun inventor Robert C. Mawhinney (decked out in a new MBA Stun-Gun jump suit) on the right.

In photo (A), the visiting shooter is holding a new, shiny 40mm Prowler-Fouler with his right thumb about to release the cocking knob to fire it. In (B), Mawhinney demonstrates the loading procedure for a 40mm Stun-Gun equipped with rubber sights. In (C), the visitor is firing a dull aluminum Stun-Gun, apparently knocking down one of the life-size man targets placed 100 feet away. In (D), Mawhinney demonstrates the correct stance for firing a Stun-Gun with a wood stock, and in (E), Mawhinney demonstrates an experimental Stun-Gun with an open breech. In this experimental,

A.



B.

C.

D.

Fig. 29-17. MBA Less-Lethal firing demonstration, ca 1971.

E.

the Stun-Bag cartridge's internal pressure is contained in the aluminum cartridge case itself, with a large portion of the case unsupported by the breech wall. Note the open gap at the top of the breech for loading and unloading. The cartridge is secured by two spring clips.

When I first saw these photos, I wondered if I would ever find one of the unique 102 x 60mm MBA Stun-Gun patches Mawhinney has on his jump suit, and sure enough, there was one in the newly-acquired group of MBA items, shown below in Figure 29-18.

Fig. 29-18. MBA Stun-Gun cloth patch. Reduced

Chapter 20. 12-Gauge Less-Lethal

MBA's Stinger-Stik allowed the use of less-lethal 12-gauge shotshells with special collars around their bases (to prevent the use of regular shotshells) to be fired in a device that doubled as a billy. Several different variations of these are shown in Figures 20-1 on page 279, Figure 20-2 on page 280, and Fig. 27-53 on supplemental page 442. The photo of the Stinger-Stik shown below in Figure 29-19 has not been seen before, and it is puzzling. The Stinger-Stik shown is not the standard production version, yet it has these markings molded in its breech: **Stinger-Stik, MBAssociates, San Ramon, Calif.**, as if it were a production model. It is shown with a standard Stinger-12 shotshell with aluminum collar and a 1-inch Stun-Bag.

Fig. 29-19. Experimental 12-gauge Stinger-Stik. MBA photo, reduced.

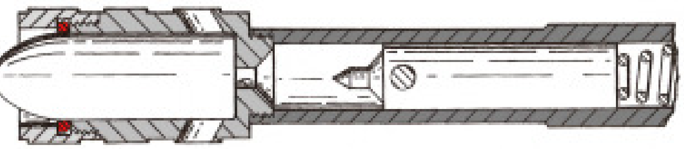
Chapter 24. Miscellaneous MBA Ordnance

An interesting 13mm Penguin brand "Pen-Gun" flare gun adapter developed by MBA is described and shown in Figure 15-24 on page 212. Unfortunately, I missed the significance of MBA patent 3,717,069 of February 20, 1973, and the importance of MBA's concept for a small, light, covert weapon. In fact, the *primary* purpose of the adapter was to convert the pen-gun into a covert *weapon* to fire a 13mm Gyrojet. Flare-launching was only a secondary purpose because MBA already had a compact 13mm flare launcher, the Model 207 (see Figure 15-25 and 26 on page 213), which was protected by MBA patent 3,717,068. The two patents are consecutively numbered and both were granted on the same date. The two patent applications were filed just seven days apart in 1970.

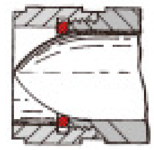
Patent 3,717,069 has five drawings; three show Gyrojet rockets, one shows an alternate means to hold down the rocket until it builds up enough pressure for normal firing, and just one relates to a pyrotechnic flare. See Figure 29-20 in the right column.

Several times during our conversations, Mainhardt mentioned to me that he had designed a simple and cheap covert Gyrojet weapon to be used like the WWII OSS FP-45 Liberator and CIA Vietnam-era DEER gun. (These are described and shown on page 190.) Both were single-shot, pistol-caliber weapons designed to kill an enemy soldier at close range, which would allow the shooter take the enemy's weapons for his own use. As mentioned earlier on page 190, these small pistols had significant muzzle blast and recoil. A small weapon firing a Gyrojet has neither.

I had assumed that Mainhardt was talking about the series of "Indigenous" pistols described and shown on pages 191 and 192. But these pistols are flimsy and weak. They require the use of experimental pull-wire-fuzed rockets as ammunition or two-hand use to fire them, or both. They are clearly impractical and probably not something Mainhardt would brag about, even though they were submitted for the CIA's consideration. But his converted pen-gun makes perfect sense. Since the pen-gun part of the weapon was in production and available in unlimited quantities at little cost, all MBA had to do was machine the top 2-piece rocket-holding device from aluminum and screw it onto the shortened pen-gun.



A.



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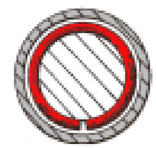
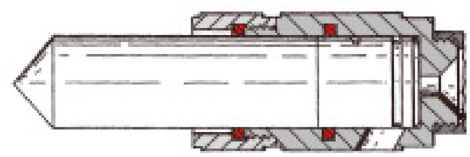


C.



D.

Fig. 29-20. 13mm Gyrojet rocket-firing adapter. (A.) Patent drawing of adapter mounted on shortened pen-gun launcher. (B). Patent drawing showing rubber O-ring (red) securing a round of 13mm Gyrojet rocket ammunition. (C.) Patent drawing of alternate split metal O-ring. (D.) Patent drawing of a different adapter (not yet examined) with two rubber O-rings (red) to hold down a straight-walled 13mm pyrotechnic flare or wadcutter rocket.

The rubber O-rings, colored red, were to hold down the Gyrojet rocket until enough internal pressure built up for a normal launch. Note that in (B), the O-ring is positioned slightly ahead of where the rocket's ogive begins, which requires the rocket to compress it as it moves forward. In use, the top part of the adapter would be unscrewed, the Gyrojet rocket would be loaded in the bottom part, and the top would then be screwed down with the O-ring snug against the rocket's ogive. The alternate split metal O-ring in (C) does the same thing. The different adapter in (D) is for the straight-wall flare. Since the flare has no ogive to squeeze the O-rings, two are used to increase hold down force. This would also allow firing the straight wall wadcutter Gyrojet rocket. It is not clear why the adapter in (D) has just one exhaust hole while the other has two. Both are angled forward in the drawings, but the specimens examined have the holes straight out, not angled. Forward-facing exhaust holes would increase what little recoil there is, while straight holes would allow two to be drilled in one operation.

The "new" adapter, shown in Figure 29-21 below, is anodized black, unlike the jungle green specimen shown in Figure 15-24(A) on page 212. After it was installed on its pen-gun, it was heavily staked in place so it cannot be unscrewed by hand or by a clockwise-spiraling Gyrojet being fired. The two parts are a permanent unit, and this one has been fired multiple times. There is no serial number or other marking, which is not surprising considering its intended covert use.

I have found no reference in any MBA literature to the device, which is much smaller and lighter than the FP-45 Liberator or DEER gun. It has little or no recoil, and it is nearly silent when fired. It is easily concealed in a shirt or pants pocket. Its firing mechanism is safe, strong, simple, reliable, and cheap. I am thankful that this one was in the group of newly acquired items and caused me to take a second look and dig a little deeper to correct my oversight six years ago.

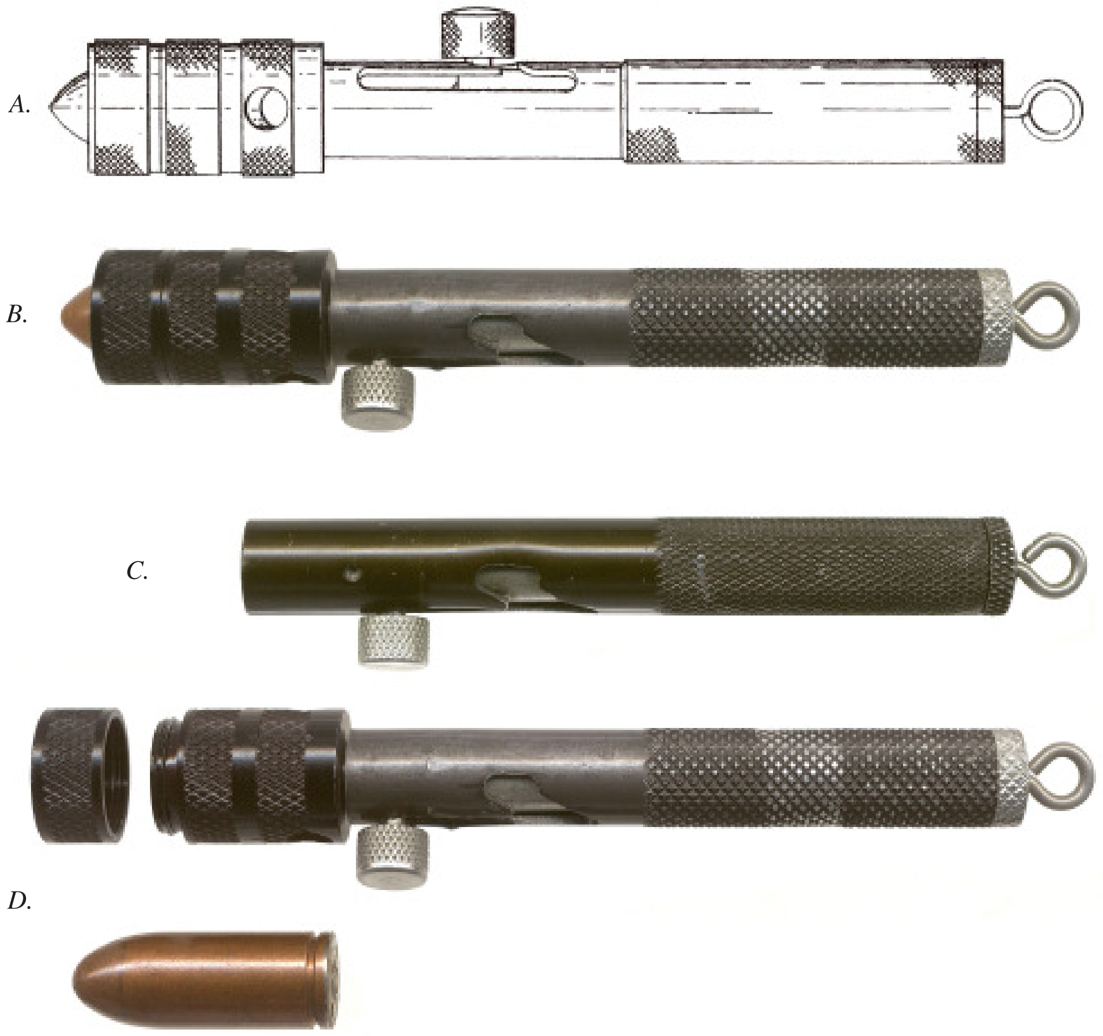


Fig. 29-21. Covert 13mm Gyrojet rocket-firing weapon. (A.) Patent 3,717,069 drawing. (B.) Device with 13mm Gyrojet loaded. (C.) Standard-length Penguin Pen-Gun, for comparison. (D) Device with front cap off and 13mm Gyrojet rocket. Actual size.

Shaped charge liners in high explosive rocket warheads focus high explosive energy into a small beam to penetrate armor. They must be machined to extremely close tolerances, sometimes to 300 millionths of an inch. As described and shown in Figures 17-26 and 17-27 on page 242, MBA developed a machine that would simultaneously turn the inside and outer surfaces of copper shaped charge liners to these very close tolerances.

The liners were made in various sizes for ARROW, TOW, LAW, DRAGON, and VIPER warheads, and probably others. The group of four, shown below in Figure 29-22, were included in the newly-acquired group of MBA items. The hole in liner (A) is for a wire running from the front fuze of the H.E. projectile back to the H.E. initiator. The square-cut notch in (C) performs a similar purpose. When installed in a warhead, the large open ends of the liners point forward, toward the target.

Fig. 29-22. Solid copper high explosive shaped charge liners made by MBA. (A.) 95.3mm diameter at large end, including flange. (B.) 66mm diameter. (C.) 66mm diameter. (D.) 25.2mm diameter.

— End of Supplemental Chapter 29 —