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Using the BMS Micro-Blaster for Trail Work

Bob Beckley, Project Leader

The BMS Micro-Blaster (figure 1) is a low-energy demolition device that breaks rocks using expanding gases from a cartridge containing a small explosive charge. Because the BMS Micro-Blaster does not use high explosives, it can be operated by persons who are not licensed or certified blasters.



Figure 1—The BMS Micro-Blaster shown in fully cocked position with the safety locked in place and a 25-foot lanyard attached.

No special qualifications or certifications are needed to use the Micro-Blaster. The cartridge (figure 2) resembles a rifle shell about $2\frac{1}{4}$ inches long. The explosive properties of the cartridge are similar to those of a shotgun shell.

Cartridges for the BMS Micro-Blaster are hazardous materials. All employees involved in the use, storage, and disposal of hazardous materials shall receive specialized training (FSH 6709.11, 61.11). At a minimum, this training will include general safety awareness for handling hazardous materials, and the safe handling and use of these cartridges. Talk to your purchasing agent if you wish to purchase them.



Figure 2—The BMS Micro-Blaster cartridge is about the same diameter as a .32-caliber shell but has explosive properties similar to those of a cartridge as large as a shotgun shell. The brass cap on one end of the cartridge is the primer.

Originally, the BMS Micro-Blaster was designed to open narrow passages for exploration and rescue in caves. However, it also is useful for breaking rocks that are too big to move in one piece.

Highlights...

- The BMS Micro-Blaster does not use high explosives, so it can be operated by persons who are not licensed or certified blasters.
- A hole $\frac{5}{16}$ of an inch in diameter needs to be drilled just 9 inches deep into the rock, allowing portable rotary hammer drills to do the job.
- During field tests, the BMS Micro-Blaster broke rocks up to 1,000 pounds.
- The BMS Micro-Blaster was not always effective in shaping rocks.



With support from the U.S. Department of Transportation Federal Highway Administration’s Recreational Trails Program, the Missoula Technology and Development Center (MTDC) purchased two BMS Micro-Blasters to evaluate their usefulness for trail construction and maintenance. The BMS Micro-Blaster is similar to the more familiar Boulder Buster, but the BMS Micro-Blaster works only for smaller rocks and uses a different principle to break rocks. For information on the Boulder Buster, see *Boulder Buster: Breaking Rocks Without Explosives* (9867–2840–MTDC). The BMS Micro-Blaster may be an acceptable alternative to the Boulder Buster for work with a variety of small- to medium-size rocks. The BMS Micro-Blaster also can be used to start cracks in larger rocks, making them easier to break.

Preparing the Hole

The powder cartridge needs to be placed in a $\frac{5}{16}$ -inch hole (figure 3) that is about 9 inches deep. MTDC drilled the hole with a Milwaukee rotary hammer drill with a $\frac{5}{16}$ -inch, carbide-tipped masonry bit powered by a portable Honda generator. If the hole is too shallow, the BMS Micro-Blaster could be damaged during the shot. If the hole is too deep, the firing pin might not strike the charge. Two charges can be



Figure 3—The size of the hole in the rock is important. Holes must be drilled straight using a carbide-tipped, $\frac{5}{16}$ -inch masonry bit.

placed in the hole, one on top of the other, for a four-fold increase in power. The hole should be 12 inches deep when two charges are used.

Allow the drill and bit to do the work. Applying too much pressure to the drill can cause the bit to flex, producing a crooked hole. The hole must be straight for proper placement of the BMS Micro-Blaster and the charge. Place the BMS Micro-Blaster in the hole to check its alignment and fit. If the actuator tube does not slide into the hole easily, the hole may be crooked. Drill a new hole nearby.

The hole must be cleaned thoroughly. The BMS Micro-Blaster comes with a bore brush and hand-pumped bulb cleaner (figure 4) for blowing dirt and dust from the hole. A can of compressed air also works well. Use the bore brush to remove caked dust that blowing won’t remove. Blow the hole out again after brushing. The hole must be cleaned thoroughly before the charge is placed because dirt and dust could interfere with detonation, leading to a misfire.



Figure 4—It is important to clean the hole thoroughly to prevent misfires. The BMS Micro-Blaster comes with a bore brush and hand-pumped bulb blower. A can of compressed air also works well.

Hole Diameter and Drilling

The hole’s diameter is important. If the hole is larger than $\frac{5}{16}$ inch, gas from the explosive charge will escape around the actuator tube and the rock will not break. Options for drilling the hole include:

- An electric drill with a small gas-powered generator
- A battery-powered drill (6 to 10 holes per charged battery)
- A gas-powered rotary hammer drill

Some mountaineering stores have bit holders for $\frac{5}{16}$ -inch, carbide-tipped masonry bits, allowing the bits to be used for hand drilling. These bit holders also are referred to as SDS (slotted drive shaft) bit holders. Bits tend to wobble when a hand-drilled hole is being started, making the opening of the hole larger than $\frac{5}{16}$ inch. After several inches of hand drilling, the hole should regain the proper size.

Placing the Charge

Before the charge is placed in the cleaned hole, the BMS Micro-Blaster should be cocked and its safety clip attached. The tube of the BMS Micro-Blaster should be slipped into the hole to see whether it fits properly. If the hole is sized and aligned properly, place the cartridge into the hole with the brass cap pointing up. The brass cap is the primer. If the cartridge is inserted upside down, the BMS Micro-Blaster will misfire. Once the cartridge is in place, the BMS Micro-Blaster actuator tube is slipped into the hole on top of the charge.

The BMS Micro-Blaster should always be cocked before it is slipped into the hole, especially when there is a live charge in the hole. If you cock the BMS Micro-Blaster while the tip of the actuator tube is touching the cartridge, the cartridge may fire, seriously injuring you.

A small slot on the side of the BMS Micro-Blaster will display a green stripe on the actuator tube when the BMS Micro-Blaster has been cocked. Lock the safety mechanism in place to prevent an accidental firing. Once you are comfortable that the system is cocked and the area is secure, unlock the safety mechanism. The BMS Micro-Blaster is fired (figure 5) by pulling the 25-foot lanyard from its end. An alternative CO₂-powered firing mechanism (BMS Micro-Blaster II) was not reviewed.

Transparent office tape can be used when placing the charge in the hole. After the hole has been drilled, cock the BMS Micro-Blaster and lock the safety mechanism in place. Attach the primer end of the cartridge to the end of the actuator tube with a piece of tape. Place both of them into the hole.



Figure 5—The BMS Micro-Blaster is ready to fire.

This method may reduce the need to thoroughly clean the hole and reduce the potential for misfires. Under damp conditions when the drilling dust has become wet and difficult to remove, this method of placing the charge may be more dependable than other methods.

The tight clearance between the actuator tube and the hole allow just a thin piece of tape to be used. If the tape is dislodged and drilling dust or the tape works its way between the cartridge and the firing pin, the BMS Micro-Blaster may misfire.

All BMS Micro-Blaster kits come with detailed instructions and are simple to operate.

Breaking Rock

When the charge is fired, expanding gases fracture the rock (figure 6). The rock's size, structure, and type will determine the number of holes and charges needed to break the rock into manageable pieces. During field tests conducted by MTDC, one charge was enough to break rocks weighing 100 to 250 pounds. Larger rocks required several holes and charges. Crews field testing the BMS Micro-Blaster in Alaska broke rocks that weighed up to 1,000 pounds by using multiple charges.

Harder rocks break or fracture more easily than soft rocks. The softer the rock, the more likely the rock is to absorb the energy of the blast rather than to be broken by it.



Figure 6—This rock was broken with a BMS Micro-Blaster shot using one cartridge.

In Alaska, field crews were able to use the BMS Micro-Blaster to shape lips and ledges on embedded rock. Forest Service crews in Colorado were less successful. Breaking embedded rock is more difficult than breaking loose rock, because the ground may absorb the shock wave. When shaping embedded rock, it is best to break the rock to a free edge. This means starting near an edge and breaking away sections of rock. You may use the BMS Micro-Blaster in a horizontal position to remove protruding surfaces.

Flying Debris

The detonation produced little flying debris. A rubber doormat (figure 7), or a piece of carpet, could be used as a blast mat. A mat also helps hold the BMS Micro-Blaster in place during detonation and minimizes noise. Despite the advantages of a blast mat, the BMS Micro-Blaster can be used without one.



Figure 7—A rubber doormat helps contain flying rock and holds the BMS Micro-Blaster in place.

Earlier Versions of the BMS Micro-Blaster

The actuator tube in earlier versions of the BMS Micro-Blaster tended to shift, causing misfires. BMS made several design changes that improved performance and corrected those problems. Anyone who has earlier versions of the BMS Micro-Blaster may wish to contact the company to have the actuator tube modified.

BMS Micro-Blaster II

BMS has developed a new model called the BMS Micro-Blaster II. According to BMS, the BMS Micro-Blaster II can be configured to fire three cartridges using a manifold-valve assembly powered by a portable air tank. BMS says that this system has broken rocks that weighed as much as 2 tons, splitting the rock along a fairly straight line. MTDC has not evaluated this product.

Conclusions

The BMS Micro-Blaster (figure 8) works in the vertical and horizontal positions and appears to be a good tool for shaping rock walls and steps. It also works well when building trail segments and when splitting rocks (figure 9) to a size that can be handled more easily. The BMS Micro-Blaster is small and light, making it portable.



Figure 8—This BMS Micro-Blaster kit weighs less than 7 pounds.



Figure 9—Another rock broken with a BMS Micro-Blaster shot using a single cartridge. The spent cartridge is at the base of the rock.

BMS

Phone: 304-497-4311

E-mail: info@micro-blaster.com

Web site: <http://www.micro-blaster.com/>

How Much Does It Cost?

Suggested retail price of the BMS Micro-Blaster at the time of this printing was \$375. A package of 10 loads was \$15.

Hand Drilling

The SDS bit holders for hand drilling can be found at mountaineering stores. One source is Pika Mountain: <http://www.pikamtn.com/>

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About the Author

Bob Beckley received a bachelor's degree in political science from the University of Montana in 1982. He began his Forest Service career as a timber technician on the Nez Perce

National Forest. Bob was a smokejumper when he joined MTDC in 1990. He works as a project leader, public affairs specialist, and blaster.

Library Card

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Describes the use of a low-energy demolition device, the BMS Micro-Blaster, to break rocks weighing up to 1,000 pounds. Because the Micro-Blaster does not use high explosives, it can be operated by persons who are not licensed or

certified blasters. A hole $\frac{5}{16}$ of an inch in diameter needs to be drilled just 9 inches deep into the rock, allowing portable rotary hammer drills to do the job. During trail construction or maintenance, this device can be used to shape rock walls or steps or to split rocks to a size that can be handled more easily.

Keywords: rock breaking, rock drilling, rocks, trail tools

You can order a copy of this tech tip and other trails documents using the order form on the Federal Highway Administration's Web site at:

<http://www.fhwa.dot.gov/environment/rectrails/trailpub.htm>

For additional technical information about the BMS Micro-Blaster, contact Bob Beckley at MTDC.

Phone: 406-329-3996

Fax: 406-329-3719

E-mail: rbeckley@fs.fed.us

Electronic copies of MTDC's documents are available on the Internet at:

<http://www.fs.fed.us/eng/t-d.php>

Forest Service and Bureau of Land Management employees can search a more complete collection of MTDC's documents, videos, and CDs on their internal computer network at:

<http://fsweb.mtdc wo.fs.fed.us/search>



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