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Short-Range Ammunition—A Possible Anti-Hijacking Device

International hijacking of commercial airplanes has become rather commonplace, and armed robbery aboard buses in the United States has recently occurred with some frequency. This type of violence poses unquestionable problems to law enforcement. In the event of a shoot-out with police or security guards, the possibility of injury to bystanders is a great problem. A high-powered round may miss a target and strike an unsuspecting person a considerable distance away, or it may richochet and veer off in an unpredictable direction. Furthermore, a round may pass through the intended target and continue on to injure an uninvolved party, or the skin of a commercial aircraft could be perforated by the gunfire, thereby upsetting pressure conditions in the cabin and possibly causing a crash.

The need for a projectile which would not pass through a body nor ricochet was recognized by Mainhardt and Baehl Associates (MBA), San Ramon, Calif., who designed .38 Special/.357 caliber ammunition, marketed under the trade name Short-Stop®, with a collapsible projectile which was intended to cause considerable injury at relatively short ranges without ever passing through the body and without risk of ricochet. Also, the projectile was designed to lose its energy quickly over a short distance, approximately 100 ft (30 m). In a commercial airliner, the projectile would not pass through the multilayered skin of the aircraft.

In addition to its deployment in hijacking situations, the ammunition would be ideal in situations such as industrial security, law enforcement patrol, crowds, or any congested or enclosed areas. Short-range ammunition became available to law enforcement agencies in 1972.

Users of such ammunition would want to know its effectiveness in immobilizing an individual and also its accuracy in typical situations which occur in law enforcement work. The purpose of this study was to investigate the wounding capacity of short-range ammunition. In addition, the danger of firing such a round inside a passenger aircraft, as is sometimes necessary in hijacking situations, was evaluated.

Description of Ammunition

A short-range round consists of a .38 Special/.357 caliber cartridge with a red-colored plastic cap (Fig. 1). A collapsed projectile rests inside the cap and is composed of a

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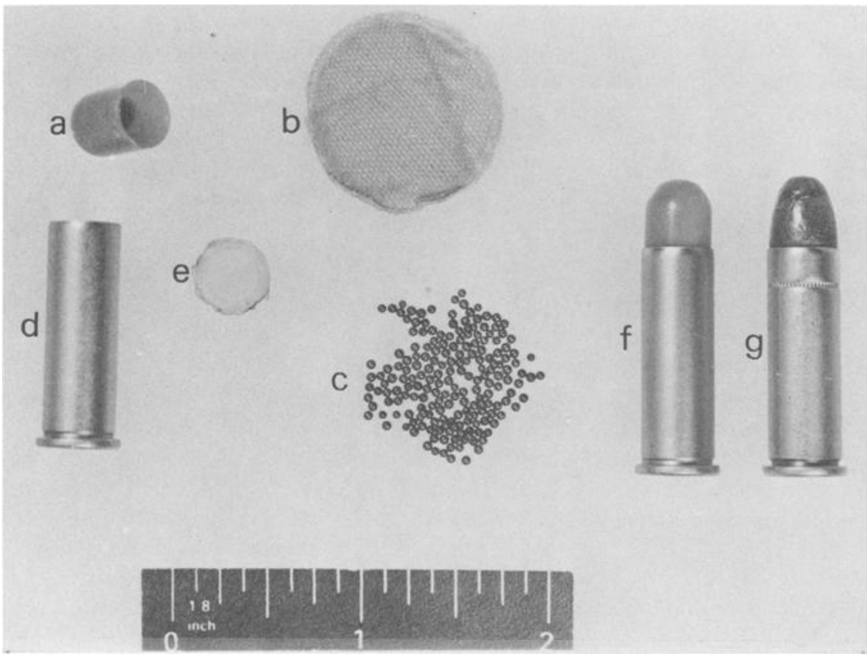

FIG. 1—*Components of short-range ammunition:* (a) *plastic cap;* (b) *circular mesh pillow-like projectile;* (c) *lead shot pellets contained in the mesh pillow;* (d) *cartridge case; and* (e) *plastic wad. An intact round* (f) *is compared with a .38 Special round* (g). *(Items are actual size.)*

circular, pillow-like structure weighing 0.14 oz (3.9 g). The outer layers of the pillow are composed of a woven orange fabric lined by a thin inner shell of clear plastic. Within the shell are 0.12 oz (3.5 g) of pellets, each pellet being 0.04 in. (1 mm) in diameter (bird shot). A plastic wad, 0.20 in. (5 mm) in height, rests on the powder which is yellow, disk-type, and weighs 4.8 grains (0.29 g).

After the cartridge is fired, the projectile begins to spin because of the rifling of the barrel. On leaving the barrel, the projectile assumes a pancake shape 1 in. (2.5 cm) in diameter. Muzzle velocity is over 1000 ft/s (305 m/s) (manufacturer's specification), and muzzle energy is 125 ft·lb (169 J). At 100 ft (30 m), the projectile velocity is 190 ft/s (58 m/s) and the energy is 6 ft·lb (8 J), approximately equivalent to the impact of a light blow from an average adult male fist.

On striking the body the "shell" of the projectile ruptures, allowing the pellets to escape in the tissue. Just as in shotgun wounds, the pellets do not exit from the body unless the shot is large, 00-buck for example, or the trajectory through the body is tangential; the pellets of short-range ammunition remain scattered along the wound tract.

Method of Assessment

To obtain adequate results of wounding capacity, a donated cadaver was used to simulate live human targets. It was important that the body not be frozen to prevent artifactual distortions during the experiment. The .38/.357 caliber short-range ammunition was fired at this target, both clothed and unclothed, at ranges from 1 to 50 ft (0.3 to 15 m).

At a range of fire of 1 ft (0.3 m), on several attempts, the missile penetrated to a depth of 3 to 4 in. (76 to 102 mm) in soft tissue in the hip, entered the pleural cavity, and passed through a thick part of the skull into the brain. With the target clothed, the missile entered the abdominal cavity.

At 3 ft (0.9 m), the projectile entered the chest cavity. The entrance wound was oval, and a superficial abrasion caused by the plastic wadding was noted on the skin surrounding the entrance wound (Fig. 2). On a separate firing with the target clothed, the missile shattered lumbar vertebrae but did not enter the spinal canal.

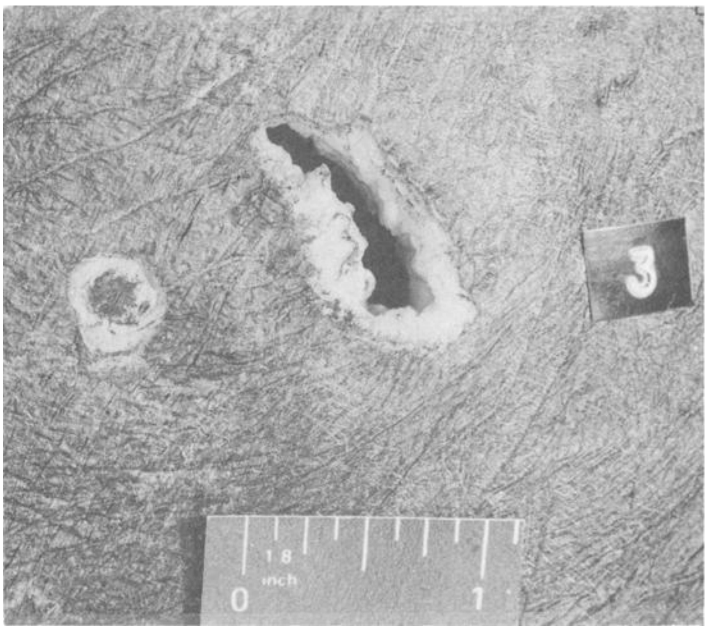

FIG. 2—*Elliptical entrance wound in skin with adjacent wadding injury at left caused by round discharged at 3 ft (0.9 m) from target.*

At 5 ft (1.5 m), with the target clothed, the missile passed through the chest wall into the pleural cavity and penetrated the lung to a depth of 5 in. (127 mm). However, at this distance the missile did not enter the thick portion of the cranium.

At 10 ft. (3 m), with the target unclothed, the chest cavity was also penetrated by the missile, whereas at 15 ft (4.6 m), with the target clothed, the missile entered the posterior abdominal wall but did not enter the abdominal cavity, although it penetrated to a depth of 2 in. (51 mm).

When the distance was increased to 25 ft (7.6 m), a wound 1 in. (25 mm) in depth was produced in the skin, whereas with the body clothed only a superficial graze occurred. At 50 ft (15 m), there was no penetration of an unclothed target; only a small abrasion was observed.

None of the projectiles nor any fragments thereof exited from any of the targets. The entrance wounds were characteristically elongated and oval in shape, presumably because the pillow-like projectile did not unfold. The edges of the entrance wounds exhibited the typical rim of abrasion. Often the projectile had exploded on impact, leaving a trail of lead pellets along the wound tract. At medium ranges, 3 to 10 ft (0.9 to 3 m), the plastic wad produced an abraded area in proximity to the entrance wound. The red plastic cap of the slug shattered on impact, and fragments of the plastic struck the target in several instances.

Simulated Aircraft Wall

To assess the safety factor involved in the discharge of this ammunition during possible airplane hijacking attempts, specifications of a large commercial passenger airliner (Boeing 727) were obtained from the manufacturer.

The wall of the aircraft is composed of four basic layers: two layers of aluminum sandwiching insulation covered by a thin plastic trim (Fig. 3). A simulated wall was

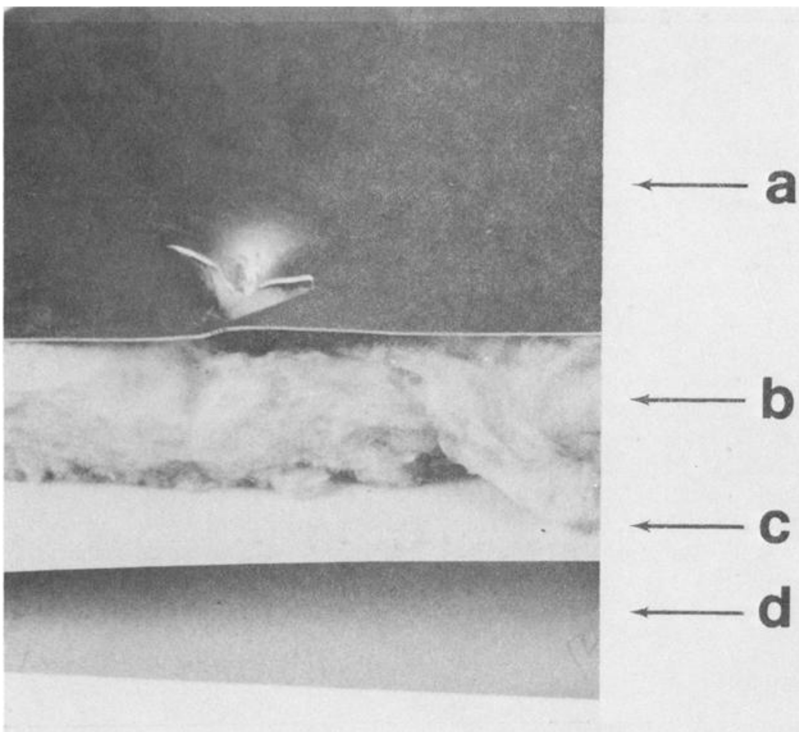

FIG. 3—*Simulated aircraft wall of Boeing 727:* (a) *inner aluminum wall;* (b) *insulation;* (c) *outer aluminum wall; and* (d) *plastic trim, which actually covers aluminum wall* a, *placed here to visualize the defect produced by the short-range round.*

constructed for test firing purposes. The outer aluminum sheet was 0.40 in. (10.2 mm) thick; the inner wall, 0.32 in. (8.1 mm) thick; and the fiberglass insulation, 2.25 in. (57.2 mm) thick and 1.5 lb/ft^3 (24 kg/m^3) in weight. The inner aluminum sheet was covered with a thin plastic trim.

The test firing was carried out at ranges of 1, 2, 3, 5, 6, and 12 ft (0.3, 0.6, 0.9, 1.5, 1.8, and 3.7 m). At ranges of 1 to 5 ft (0.3 to 1.5 m), the projectile passed through the full thickness of the simulated airplane wall, leaving a jagged hole approximately 1.5 in. (38 mm) in diameter (Fig. 4). Several rounds were fired at a distance of 6 ft (1.8 m). Thirty percent of the rounds perforated the two metal sheets. The remainder penetrated only the inner aluminum wall and dented the outer wall without perforating it. Similarly,

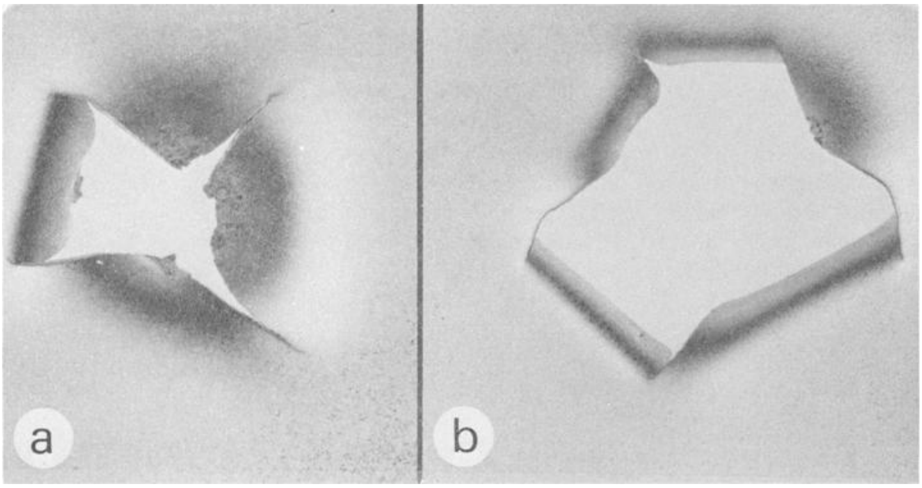

FIG. 4—(a) *Defect produced in simulated inner aluminum wall from short-range round fired at a range of 3 ft (0.9 m)*; (b) *defect produced in simulated outer aluminum wall from same shot as* a *(actual size)*.

at 12 ft (3.7 m) the projectile passed through only the inner aluminum wall, denting the outer wall without perforating it.

Test firing was continued on a simulated, Plexiglas®, aircraft window. The windows in the commercial airliner are triple layered and 0.46, 0.22, and 0.08 in. (11.7, 5.6, and 2.0 mm) thick, respectively. The exact three-layered structure was not duplicated by the single Plexiglas® sheet at our disposal. The test material used in these experiments was as thick as the combined thicknesses of the commercial aircraft window, that is, 0.75 in. (19.1 mm). At 6 ft (1.8 m), the projectile created an irregular hole 1.75 in. (44.5 mm) in diameter in the 0.75-in. (19.1-mm) Plexiglas® window.

Observations

1. During test firing on cadavers, the projectile never exited from the body, regardless of range of fire, supporting the manufacturer's claim of this safety factor.
2. The ammunition was reasonably accurate at ranges of 50 ft (15 m), that is, it was capable of hitting a 3-ft (0.9-m) square target at this distance.
3. At ranges up to 15 ft (4.6 m) with a clothed person, evidence of substantial injury was noted. However, at ranges of 25 ft (7.6 m) only superficial wounds were noted.
4. With an unclothed cadaver, significant wounding was produced at distances of 25 ft (7.6 m), but not at 50 ft (15 m).
5. At ranges up to 10 ft (3 m), the ammunition produced wounds likely to be fatal in real situations.
6. At ranges up to and including 6 ft (1.8 m), the ammunition perforated the full thickness of a simulated wall of a large commercial airliner. At the same distance the ammunition produced a 0.75-in. (19.1-mm) hole in a Plexiglas® window of the same thickness as that used in commercial airplanes.
7. The ammunition produced characteristically elliptical abraded entrance wounds probably caused by the lack of unfolding of the projectile at the ranges tested.

Conclusions

The manufacturers of short-range ammunition have developed a round which has the safety advantage of not passing through a human target, thereby avoiding possible injury to bystanders. This ammunition has an effective wounding capacity at ranges up to 10 ft (3 m); however, the effectiveness of this ammunition at distances greater than 25 ft (7.6 m) diminished markedly. For this reason, law enforcement personnel may be skeptical regarding its standard use on the street.

At close range, up to 6 ft (1.8 m), the danger exists in airplanes that the aircraft wall may be perforated. However, the ammunition seems to be well suited for specialized use in congested or enclosed areas.

In consideration of the above risk factors, short-range ammunition exhibits sufficient advantages to warrant serious consideration for use as an alternate to regular ammunition in anti-hijacking situations.

Short-range ammunition is currently being used by certain units of the U.S. Air Force. However, specific information regarding the extent of deployment of this type of ammunition by law enforcement agencies is not currently available.

Summary

Short-range ammunition was developed for use by law enforcement personnel in congested, enclosed areas and primarily as a hijacking deterrent in commercial airliners. This ammunition was expected to reduce the risk of injury to innocent bystanders and prevent damage to the aircraft walls.

Experimentally, short-range ammunition is effective in its wounding capacity at close ranges, and it does not exit from the body. Due to the particular structure of the projectile, injuries due to ricochet are averted. At ranges of 6 ft (1.8 m), the risk of damage to the full thickness of an aircraft wall does exist.

Short-range ammunition deserves serious consideration as an alternative to regular ammunition for use in specialized, close-quartered situations, such as hijacking.

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