Aerial Flash Bangs: A Preliminary Study

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The project was supported by Award No. 2009-DI-BX-K008, by the National Institute of Justice, Office of Justice Programs, United States Department of Justice. The opinions, finding, and conclusions or recommendations expressed in this publication are those of the author and do not necessarily reflect the views of the Department of Justice.

Table of Contents

Table of Figures

Table of Tables

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Abstract

Aerial flash bangs are derived from the concepts of bird bangs which are used to scare birds away from unwanted areas, runways in particular. The purpose of this study was to complete preliminary testing on aerial flash bangs and gain basic knowledge and applicable use of aerial flash bangs. There were several variables that were recorded and observed during testing including time delay, malfunctions and anomalies. The most prevalent observation found was that aerial flash bangs lack consistency with time delay and were difficult to aim as they performed like a glorified bottle rocket. The most significant finding was a discrepancy between the manufacturing date of the pyrotechnic inside the 12 gauge shell and the stated manufacturing date on the shell itself, leading to field usage of munitions often expired by a decade or more.

Introduction

Law enforcement agencies have been using flash bang devices for many years, and several companies have launched their own form of these devices. However, despite their application in the law enforcement sector, there is very little knowledge or literature about these munitions. Aerial flash bangs can be fired from any standard 12-gauge pump shotgun to create a bright flash and loud report. The concept for aerial flash bangs is derived from bird bangs, which are commonly used to discourage birds away from airport runways. Aerial flash bangs are primarily for outdoor use, crowd control and dispersion. When used within a confined space, disorientation and confusion can occur.

The purpose of this preliminary study was to gain an understanding of how these flash bangs function, the time delay prior to deflagration, and to document any malfunctions that may occur. These factors could present an immediate danger to the operator, “targets”, or bystanders and are of the upmost importance to research. Three different brands of aerial flash bangs were utilized for testing: Combined Tactical Systems (CTS), Defense Technology (Def Tech), and an unknown (possibly home-made or experimental) shell provided by a regional distributor.

Literature Review

Distraction devices have a history of proven effectiveness in many tactical situations. They provide tactical teams with a decided edge in surprise and intimidation to overpower and overcome subjects safely (Jones, 2000). They come in many different forms and configurations; however, the different

distractions devices have several things in common. Cardboard, rubber, or metal bodies, a bouchon or fuse assembly, black powder or flash powder- the powder usually contains an additive such as nitrocellulose, aluminum perchlorate, magnesium, or sodium to assist in burning of the payload (Jones, 2000).

Aerial flash bangs operate in a fashion similar to that of a mortar: the azimuth and elevation determine the height, distance traveled, and the point of detonation. However, these factors are all affected by wind speed and direction, as the explosives package has a very small mass which may substantially alter the trajectory. They can also be referred to as diversionary devices, stun grenades, and flash bangs which explode with a brilliant flash of light and a loud report (Bozeman, 2005).

The mixture of chemicals, when ignited, reacts exothermically to produce the effects of a flash bang making it a pyrotechnic. All pyrotechnic devices are indiscriminate and will affect anybody within the range of the discharge. Pyrotechnic devices generally contain a method of ignition, a control mechanism and a payload to convey the effect (Symons et al, 2008). Distraction devices are initiated rather than detonated due to the fact that the powder in the device is classified as a deflagration agent and characterized by progressive reaction rates and buildup pressure (Jones, 2000).

Pyrotechnic devices can be initiated using three methods. *Electrical* initiation requires the device to be primed prior to detonation with a detonator wire. *Igniferous* is a type of detonation that equates to striking a match and would be part of the manufacture of the device. *Mechanical* initiation is when the device

is hit with enough force to cause ignition. A control mechanism within a pyrotechnic can be used to alter the delay between ignition and detonation; to achieve this the burn time of the explosive train within the device is varied (Symons, 2008). Although most devices are not intended to be fragmentation producing devices, secondary objects cannot be ruled out. Secondary fragments may be such things as gravel, fuse parts, or distraction device bodies (Jones, 2000). Due to the deflagrate nature of these devices, major injuries can occur if the device detonates in close proximity to a person (Bozeman, 2005).

However, all of the extant literature is related only to traditional flash bang devices. Aerial flash bangs are more related to pyrotechnic devices similar to a bottle rocket or signal flare, and the literature is silent on these devices.

Methodology

In an attempt to try and gain a better understanding of how the delay function of each flash bang performed, researchers disassembled and examined the inner workings of each device. The Combined Tactical Systems (CTS) Bird bang was comprised of six parts. Once removed from the shell, the inner mechanism of the flash bang consist of gun powder, a fuse mechanism, flash powder, a plastic cylinder and a bottom lid (believed to be wadding) that is wrapped in orange paper. The timing of the explosive charge is regulated by the length of the fuse segment. The Unknown brand is comprised of a thin red shell, gun powder, spacer, bird banger (Pyro-Knallpatrone, which resembles an M-80 firecracker), and sealed with a card board wadding. DefTec contained the same

bird banger (Pyro-Knallpatrone) as the unknown brand, and were designed in a similar fashion.

Figure 1 illustrates the different mechanisms in each shell casing. The photo on the left is the Unknown brand showing the gun powder, the pyro device and its capping mechanism. The photo on the right illustrates the shell as a whole, broken down into its pieces. The mechanism on the left is placed inside the orange explosive and topped with a cap, then placed inside the shell with the gun powder.

Figure 1. Shell Casings and Contents

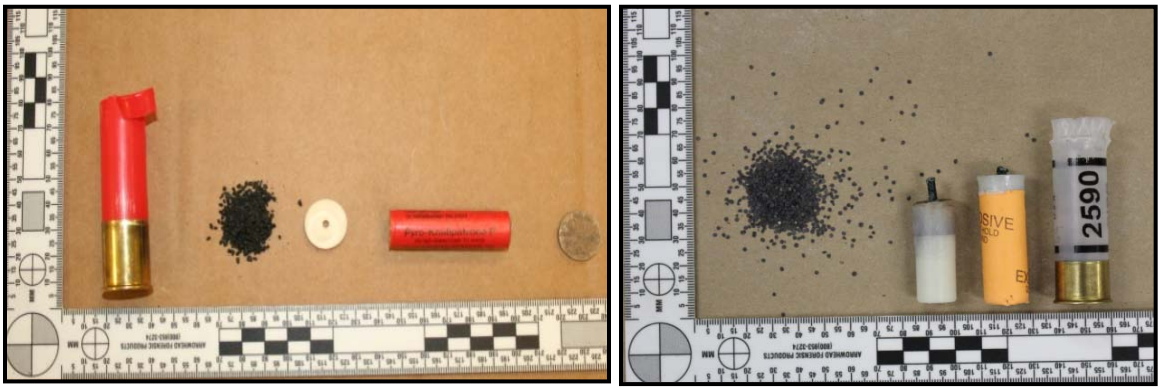
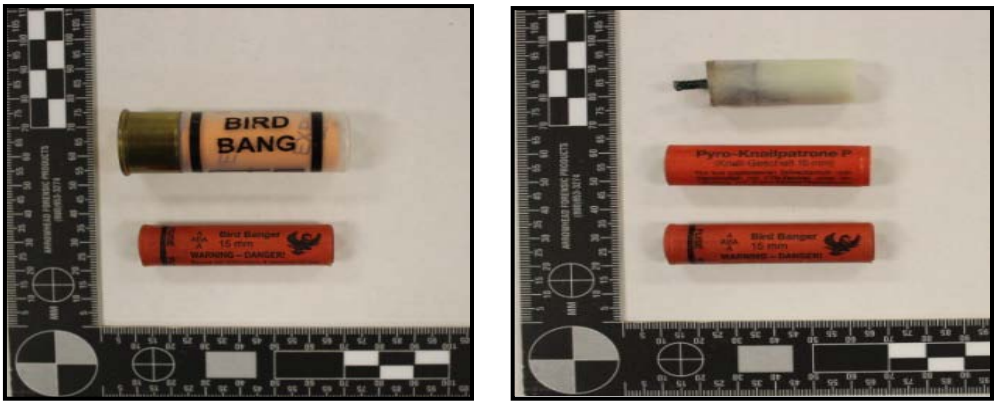


Figure 2 shows photos of the ABA Bird Bangers that are used for wildlife and environmental use. The gun used is a Scare-Away Launcher Model RJ 1, measuring 4 inches in size. The Bird Bangers also resemble an M-80 firecracker. To fire the launcher, a primer which is 6mm in size is placed in an angled chamber at the rear of the launcher. The operator then cocks the hammer back and pulls the trigger causing the hammer to strike the primer and launch the banger.

Figure 2. ABA Bird Bangers

Illustrated in *Figure 3* are photos of the CTS Bird Bang used as an aerial device and the ABA Bird Banger used for scaring birds. The photo on the right shows that inside the CTS brand is the white plastic tube with an igniter, followed by the Unknown brand which is almost identical to the actual Bird Banger, except it is encased in a 12 gauge shot gun shell.

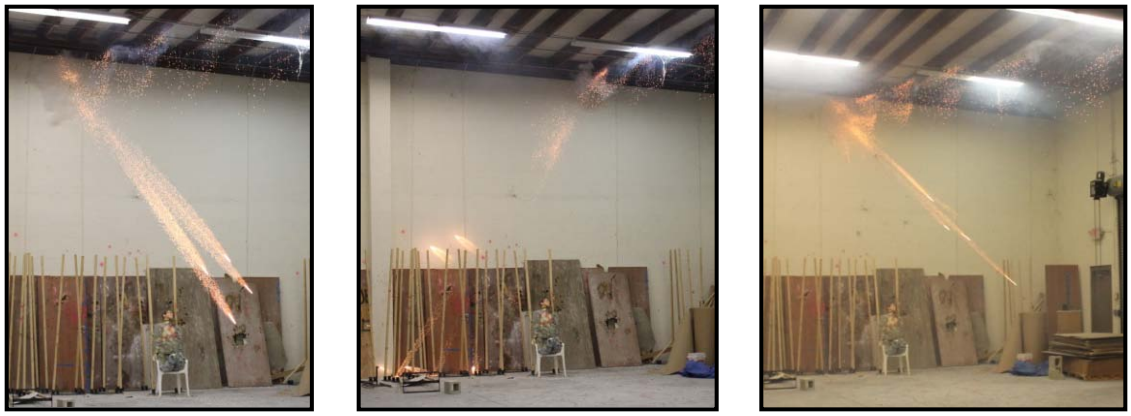
Figure 3. Contents of Bird Bang Munitions



The Bird Bangers have an estimated time delay of 1-1.5 seconds. When the ABA brand was fired, it spiraled unpredictably through the air prior leaving a

trail of sparks to detonation. Upon detonation, the round resembled that of a typical fireworks display. The next set of illustrations *(Figure 4)* show how the Bird Bangers performed. They burst from the flash powder inside the tube, and then followed with a trail of sparks.

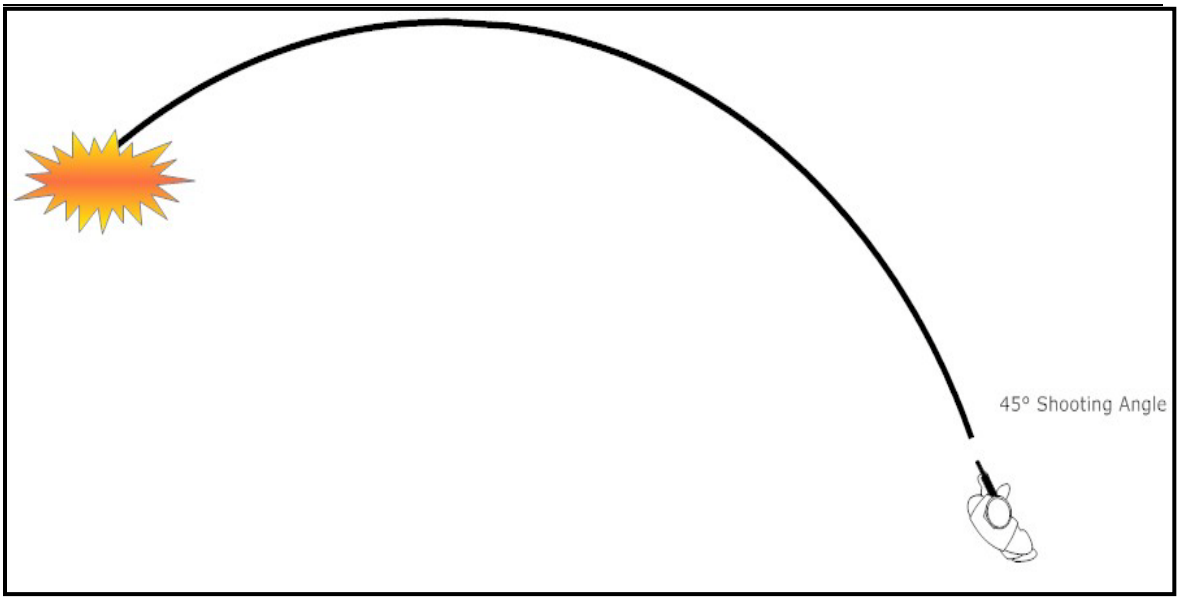
Figure 4. Bird Bangers in Flight



Data Collection

Testing of aerial flash bangs consisted of testing three brands CTS, DefTec, and an unknown (experimental/homemade) model. The three brands were tested independently of each other, using twenty rounds of each brand of ammunition. Time delay, (the amount of time from the flash bang being fired to the time it deflagrated), was recorded for each shot. Different barrel lengths (20in, 18in, 14in) were used in testing to determine if length affected time delay. Observations and malfunctions were recorded for each shot as qualitative measurements. The firearm was cleaned every five shots, between brands and after each malfunction. Shots were fired at a 45° angle, which is the standard launching position (see Figure 5.).

Figure 5. Standard Firing Angle



Findings

Time delay was the primary quantitative variable that was obtainable during this study. The average time delay for CTS was 3.55 seconds, which fell in the overall time range of 3-5 seconds, which was the longest time delay between brands. DefTec had an average time delay of 3.15 with a time range of 2-4 seconds. The Unknown brand fell within a range of 2-3 seconds, averaging 2.15 seconds, and was the shortest time delay (as shown in Table 1.)

Table 1. Time Delay

Brand	CTS	Unknown	DefTec
Average Time Delay	3.55 Seconds	2.15 Seconds	3.15 Seconds
Time Range	3-5 Seconds	2-3 Seconds	2-4 Seconds

It was determined that barrel length had no bearing on time delay and did not appear where the charge detonated. Rounds that blew up in the firearm were documented as malfunctions; however, an additional round was fired so that there were twenty rounds of each brand of ammunition to record time delay.

Malfunctions

Several malfunctions were documented throughout the study. It was also determined during the study that aerial flash bang munitions are “dirty” ammunition, which leaves a significant amount of residue in the firearm requiring extensive cleaning time. The firearm had to be field stripped and cleaned after every five shots and between brands to keep results fair and the weapon functioning properly.

The most common malfunction that occurred with all three brands was shell stove piping, which occurs when a round is not ejected properly after being fired. This is an unusual and rarely seen malfunction for a pump shotgun. *Figure 6* shows photographs of this malfunction. The left photo shows the unknown brand and the photo on the right is CTS, both illustrating the occurrence of shell stove piping. In each case, the shell failed to extract from the breach and temporarily disabled the weapon. Our study was not able to determine the cause of these malfunctions.

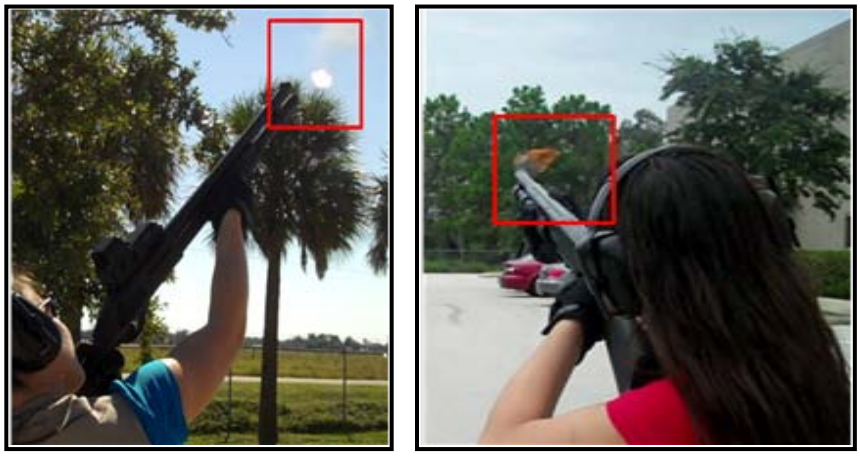
Figure 6. Stove Pipe Malfunction

Debris blowback occurs when material and particles from the munitions and adversely affect the shooter and surrounding bystanders. This was a reoccurring issue between all of the brands and for the shooter. Debris blowback was caused from the rounds exploding in the gun or directly outside the barrel of the gun upon being fired. Debris blowback can lead to injury to the shooter and bystanders. Affecting both visions and breathing capabilities, it can render the shooter, fellow officers or bystanders vulnerable. The following photo series illustrate the consequence of wadding that is stuck in the shell that caused the round to explode in the gun.

Figure 7. Chambered Munition Detonation

There were also incidents where a fireball or flame was discharged from the barrel of the shotgun several seconds after the weapon had been fired (Figure 8). The flame was thought to be a buildup of gases and unburned gun powered that was released after the round is fired. Due to the lack of literature on the subject matter it is unclear if this is a typical occurrence with this kind of ammunition or a malfunction. However, these discharged often preceded occurrences where a shell would explode prematurely in the weapon.

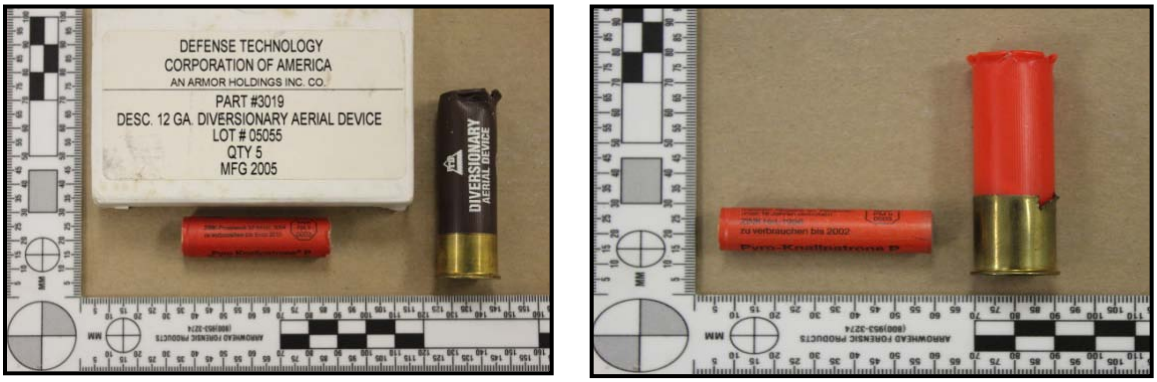
Figure 8. Flame Discharge



Issues in Manufacturing

Munitions were closely examined by disassembling them into their component parts, where questions related to manufacturing date were discovered. For example, the unknown brand's12 gauge casing stated that the manufacturing date on the pyrotechnic round was 1996; the expiration date on the shell was 2002 giving a shelf life of six years. These were received for testing in 2010, making that 14 years later, more than doubling its stated shelf life. To put in to perspective, it was manufactured during President Clinton's term, expired during President Bush's term and was shipped and fired for testing during President Obama's term, making it through three different presidential administrations.

Figure 9. Date Stamping



Defense Technology (DefTec) contained the same bird banger (Pyro-Knallpatrone) as the unknown brand flash bangs. Their brands pyrotechnic was manufactured in 2004 with an expiration date of 2010 (however, the box that it was shipped in visibly showed a manufacturing date of 2005). This added an extra year on to its shelf life, making the purchaser believe that it is good through

2011. It is assumed that the device inside the shotgun shell has a six year shelf life based on the stated manufacturing date that is on the box, but once encased the shelf life is changed again.

Conclusion

The purpose of this study was to obtain basic knowledge and an operational understanding of 12 gauge aerial flash bangs. It was found that aerial flash bangs lack consistency with time delay and was difficult to aim as they performed in a fashion similar to a bottle rocket. There were no manufacturer specification sheets to verify time delay times. It was discovered that two of the brands of the aerial flash bangs were comprised of an actual bird banger, Pyro-Knallpatrone, which resembles the M-80 firecracker.

There were a number of malfunctions observed during testing including a number of incidents of pieces of the ammunition becoming lodged in the barrel of the firearm. Debris blowback occurred resulting in fragments of ammunition and other foreign material to blowback in to the face of the shooter and bystanders. Stove piping or failure to extract the round also occurred during testing and was witnessed with all three brands tested. Fire balls or flames were recorded when observed leaving the barrel of the firearm. The flame anomaly is suspected to be a buildup of gases being released from the firearm after the round is fired. Finally, the most significant finding of this study was the identification of potential discrepancies in the expiration dates of these products. One manufacturer inserted submunitions into their product that were manufactured over fifteen

years ago yet were for sale in the law enforcement marketplace. Consequently, once the submunition is sealed within the shell, it is impossible to verify the manufacturing and expiration dates. As this is has been a preliminary pilot study and this law enforcement equipment that has not been fully evaluated, further testing of this weapon system is warranted.

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