A Concept And Proposal For An Active Shooter Defense System

Purpose

The report of an "Active Shooter" initiates a sequence of time critical events starting when the first gunshot has been fired and ending when the perpetrator is finally neutralized. This sequence of events includes all of the actions necessary to locate, converge upon, engage, and finally neutralize the perpetrator. While these actions by law enforcement and first responders may only take a few minutes to complete, the shooter remains unopposed and free to continue firing. This initial time window is when virtually all of the human carnage occurs and identifies the problem this system is intended to solve.

The purpose of this paper is to present and propose a system design that will actively engage an active shooter within the first few seconds of detecting the first gunshot. Included within this system design is an active engagement component that would continuously disable the shooter's ability to point, aim, and fire His weapon in the direction of the intended target. This active engagement would continue during the time window when first responders are able to converge upon this shooter's location.

The system being proposed involves integrating a set of existing technologies into a transportable arrangement of devices that could be positioned around an open air venue or even an internal event when large crowds of people are gathered. In effect, this arrangement of devices would transform what would have been considered a "soft target" into a "hardened target" that would not only "shoot back" at a perpetrator but also minimize the human carnage the shooter was intending to create.

System Components And Technologies

An active shooter defense system must first be able to locate a shooter once He has starting firing. Secondly, the system must be able to engage the shooter in such a manner as to prevent or eliminate His ability to continue firing. The effectiveness of this system depends upon these two conditions being met within seconds of the first shot being fired. Fortunately, proven technologies and techniques already exist that can meet these criteria when properly integrated with one another.

The first essential technology to be employed in this system is a gunfire detection device. Initially developed for military applications, these are readily available and are currently being used in many law enforcement applications nationwide. Systems and companies with names such as Amberbox, Shotspotter, Boomerang, and Sentinal are all devices capable of detecting and locating the source of a gun shot at ranges of several kilometers and within a few seconds. These systems are also able to distinguish a gunshot from other sounds such as fireworks and backfiring automobiles.

The second essential technology to be employed in this system is a laser dazzling device. Like gunfire detection devices, laser dazzlers of multiple designs and power levels are commercially available from such companies as B.E. Meyers and BeamQ www.beamqus.com. These are non-lethal devices that emit a form of directed radiation that can temporarily disable a human's ability to see. Most dazzlers use a visible green laser for its ability to interact with the human eye as it is less likely to cause internal damage.

Other technology components of this system would include control software capable of integrating several of these systems to form a defensive screen around the target area. In addition, a local area graphics display (e.g. Google Earth) could assist in system positioning several systems around a venue location. Other technologies that would enable, for example, reporting a shooter's location to local authorities could be easily integrated into the system as well.

Notional Design and Functional Operation

Integrating these two technologies into a transportable system would be relatively straightforward. Once positioned and turned "ON", each system would operate in a fully automatic and autonomous manner. A notional design of what such a system might physically look like is illustrated in Figure 1.

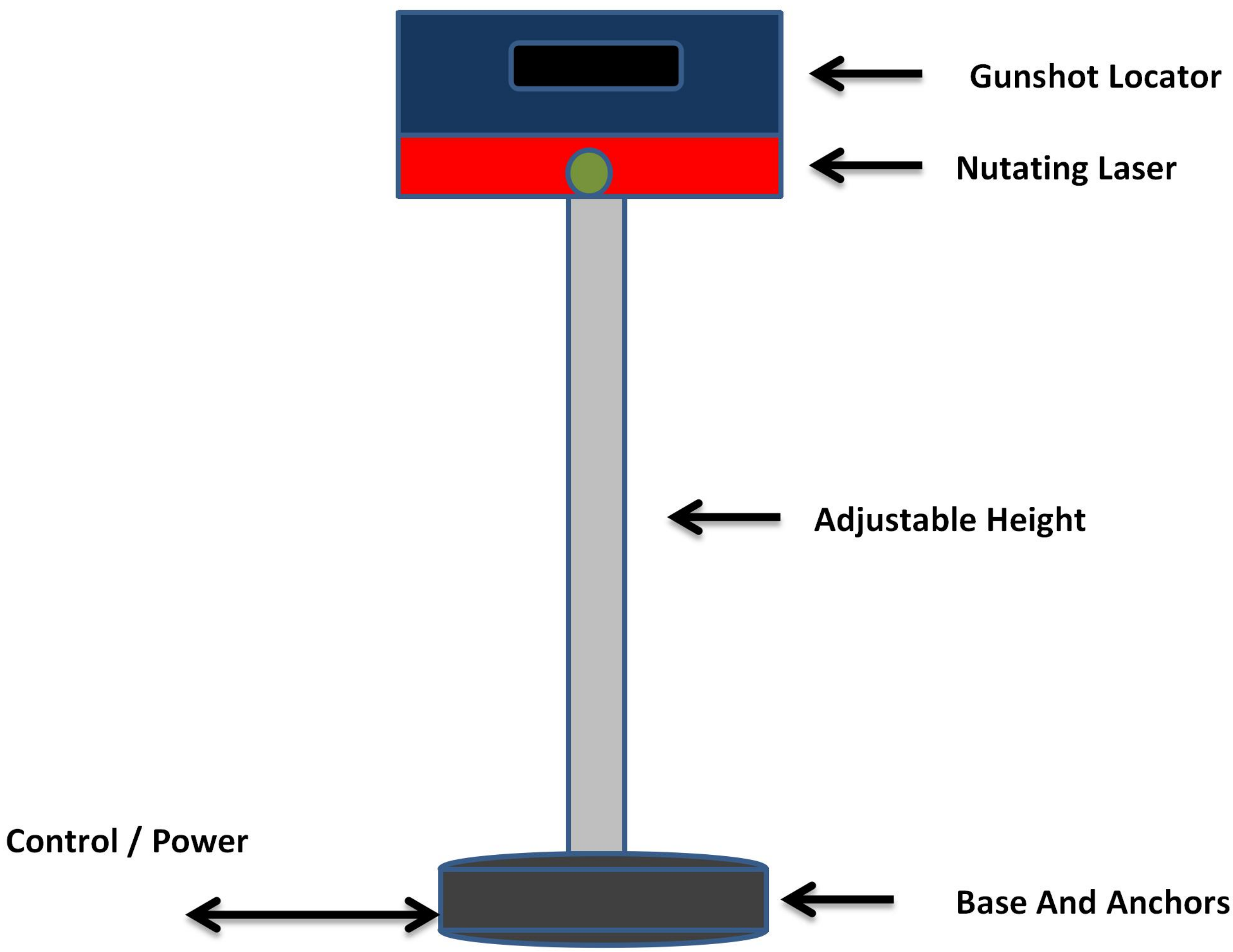

Figure 1. A Notional Active Shooter Defense Device

As Figure 1 illustrates, the gunshot locater is merged and aligned with the laser dazzler on top of an adjustable support. The entire system is secured to an anchored base with the necessary power and controller connections. Once positioned the system can be oriented and raised to a height commensurate with the locator's field of view and volume of coverage.

Figure 2 illustrates a notional positioning of multiple devices protecting an outdoor venue.

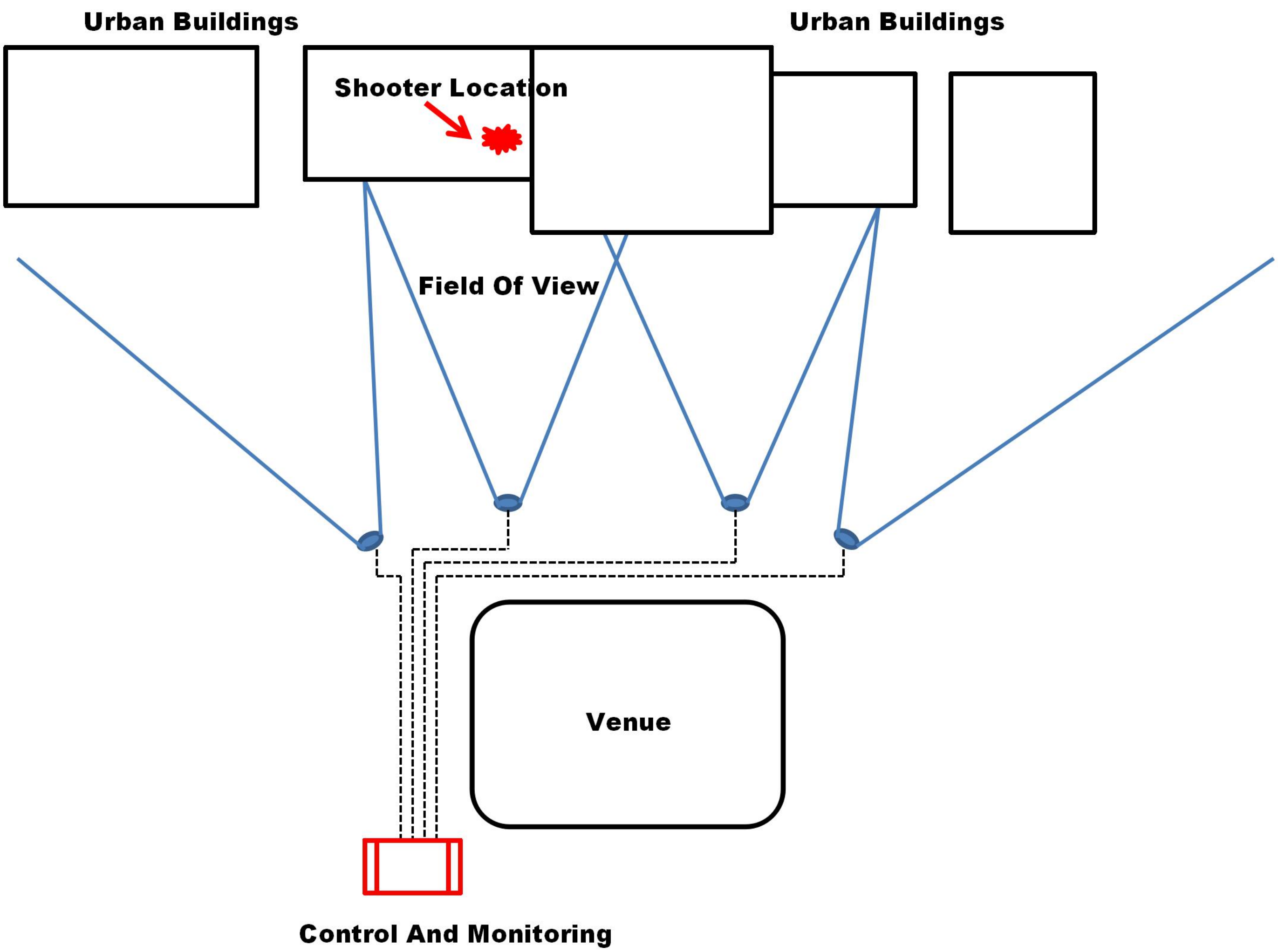

Figure 2. Arrangement Of Multiple Defensive Systems

In this example, the arrangement of several defense systems would provide overlapping coverage of an urban development consisting of multiple buildings. Given an active shooter is positioned in one of these buildings and begins to fire a weapon into the outdoor venue, one or more of these systems will be in a position to detect the gunshot and provide a ***general*** location of the shooter's location.

It is important to note that a gunshot detection device requires only a few seconds to detect and determine the general direction from where a gunshot originated. Several more seconds are typically required, in addition to several more rounds being fired, for a gunshot detection device to provide a ***precise*** location of the active shooter's position. For this application, only a ***general*** location of the shooter's location is required.

Given the gunshot detection device can provide a coarse line of bearing and elevation to the source of gunfire. As the line of bearing and elevation are displayed on a controller's graphics overlay, the intersection with a physical structure may also become evident, providing a coarse estimate of range to the shooter. Given these coarse estimates of bearing, elevation, and range to the shooter, the control processor would calculate an "Area Of Uncertainty", similar to a circular error probable (CEP), that will declare, with confidence, a 90% probability the shooter is located somewhere within that area.

Figure 3. Illustrates the sequence of device operation that will occur within these first few seconds of detecting gunfire and determining this Area Of Uncertainty.

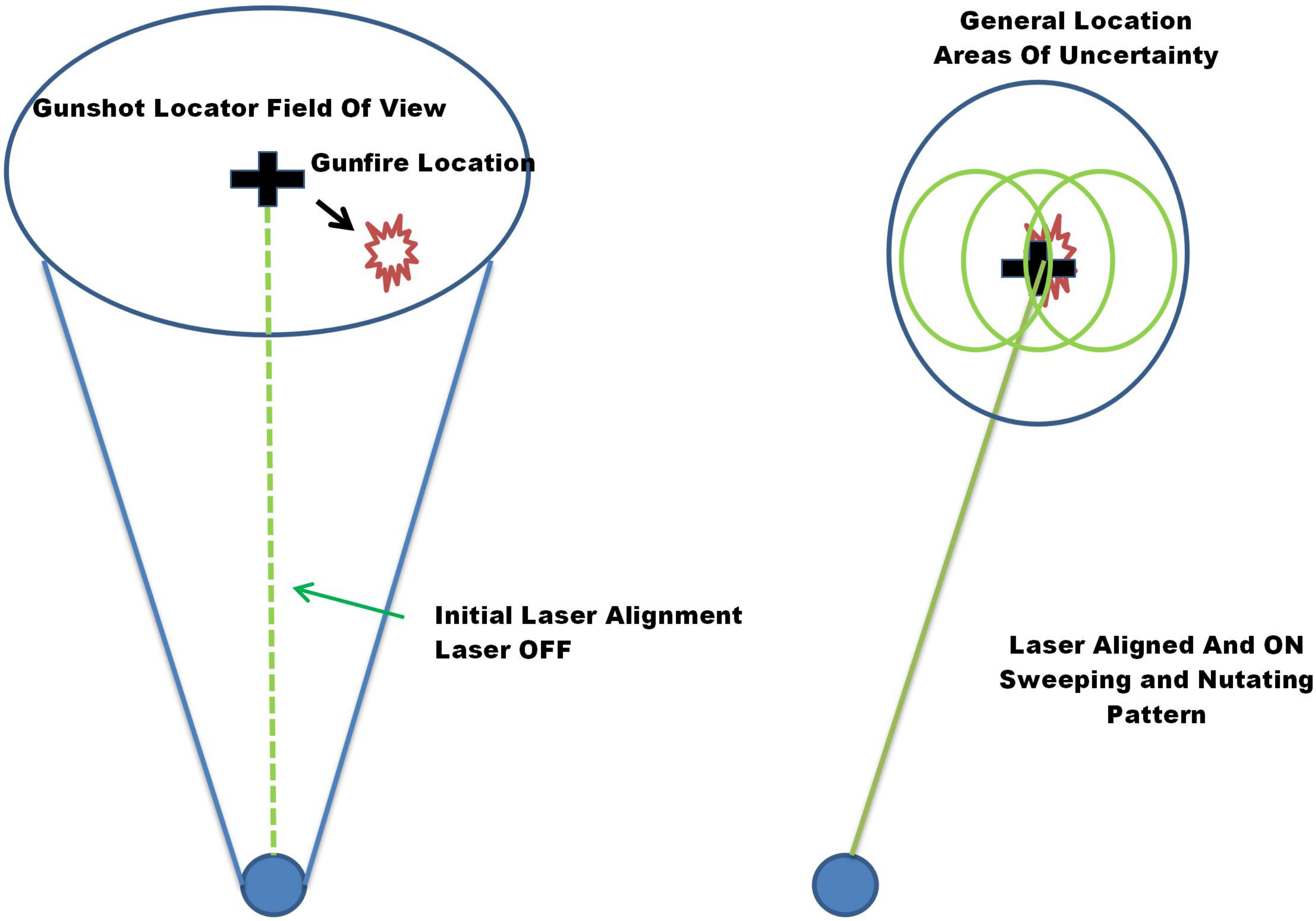

Figure 3. Laser Dazzler Activation

Once the Area of Uncertainty is calculated, the controller will select which system is in a position that most closely parallels the line of bearing to the active shooter. The selected system will slew the laser dazzler to the Area of Uncertainty, turn ON, and begin radiating a nutating and sweeping pattern of laser energy adjusted to envelop the Area of Uncertainty. As the laser dazzler covers the Area Of

Uncertainty, so also will the active shooter be exposed to the dazzling effects of the laser radiation.

The laser dazzler selected for this device would most probably be a high powered, tightly collimated, visible, green laser. By rapidly nutating and sweeping the laser within the Area of Uncertainty, the laser beam would impinge upon the shooter's eyes at an unpredictable and aperiodic rate. The effect on the shooter would be similar to experiencing both a sense of "flash blindness" and "flicker vertigo". The desired effect on the shooter from employing a laser dazzler in this manner would be to both impair the shooter's ability to visibly see His intended target and to induce a sense of disorientation. The combination of effects from the laser pattern will prevent an active shooter's ability to point, aim, and subsequently continue to fire upon a crowded venue until law enforcement is able to arrive at the shooter's location.

Summary

Regardless of motivation, the goal of an active shooter is to create as much human death and injury as possible before law enforcement is able to arrive at the shooter's location. Unfortunately, the time between when the first shots are fired by the active shooter and when law enforcement does arrive at the shooter's location is when virtually all of the carnage typically occurs.

The design concept for this Active Shooter Defense System is intended to so disrupt or completely eliminate an active shooter's ability to ***continue*** firing into a crowded venue during this critical time period. Unfortunately, once an active shooter has successfully gained a position to fire, nothing can prevent Him from firing the first few rounds into the venue. However, this defensive system will transform the "soft target" into a "hardened target" within seconds after the first shots are fired. It enables "firing back" at the active shooter in such a manner as to prevent the human carnage that is now occurring worldwide and with increasing regularity.

Central to the design and construction of this device is the existence of proven technologies, already built, deployed and tested. The proposal to design construct this system and falls more within the realm of a technology ***integration*** concept and, as such, would enable rapid the prototyping, construction, testing, and fielding of a complete Active Shooter Defense System in a short amount of time and at minimal cost.