

Infrared Beacon Analysis: Applications for Law Enforcement

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Introduction

Law enforcement officers working in various nighttime and daytime conditions often encounter a significant number of safety issues. Officers frequently become involved in foot chases/pursuits and may become difficult to locate, particularly if they have been incapacitated. Specialized units such as SWAT and K9 are at increased risk as target identification may be difficult, leading to the potential for friendly fire incidents.

A problem faced by law enforcement agencies is the tracking of their officers once they leave their motor vehicles. Frequently, officers in the heat of the moment exit their vehicles in pursuit of a suspect without communicating an updated location to dispatch or other officers. An officer in a foot pursuit could travel more than one half of a mile away from their vehicle before the first back up unit arrives. Consequently, if the officer is incapacitated, they are difficult to locate, particularly in nighttime or low-level light conditions.

This current study details the uses of, and seeks to evaluate, existing IR and strobe technology that an officer could potentially incorporate into his duty uniform. The study attempts to discern whether this technology would make the officer identifiable at a substantial distance. Ultimately the researchers seek to determine whether or not IR beacons can be used as a low cost, easily implemented solution for tracking officers engaged in foot pursuits, perimeter searches, in urban and rural environments.

Materials and methods

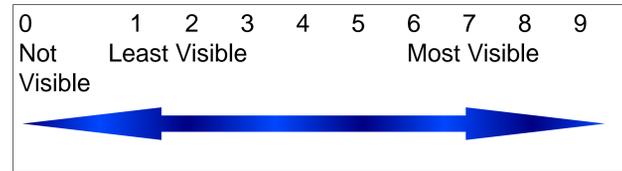
Funded by a National Institute of Justice grant, eight research assistants from FGCU were trained in the operation of a PVS-14 night vision scope and the scoring of each infrared beacon on a nine-point visibility scale. Training of personnel lasted seven weeks for a total of forty hours.

Each beacon was tested in a variety of environmental conditions and observed from ground-based and aerial platforms. The goal was to identify the operational limits of each infrared strobe and determine the feasibility for use by patrol officers, police canines, and SWAT teams.

Table 1: Infrared Beacons Tested

Make	Model	Length	Cost	Battery
Cejay	Athena	2.6"	\$99	CR123
Cejay	Glo-wand	6.0"	\$ 7	#675
Cejay	Glo-wand	2.8"	\$12	#675
Cyalume	Glowstick	6.0"	\$ 4	n/a
Phoenix	Firefly	1.5"	\$20	9 volt
Glotoob	IR	2.8"	\$32	A23
MS2000	Rescue	4.5"	\$95	AA
Powerflare	PF200	4.3"	\$110	CR123
Surefire	HL	2.2"	\$99	CR123A
Tektite	IR300	9.3"	\$83	C cell
Tektite	IR200	7.2"	\$74	C cell
Tektite	Marklite	5.7"	\$50	AA
Adv Light	VIP	2.7"	\$108	DL123A

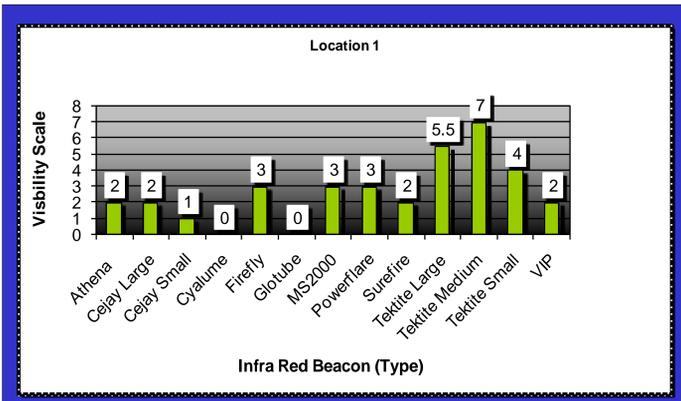
Fig. 1 Relative Visibility Scale



After each infrared beacon was scored in a range of different environments, aerial observation was carried out with the cooperation of the Orange County Sheriff's Office Aviation Unit. Infrared beacons were placed in a densely wooded area and viewed from the helicopter in orbit at 750 feet.



Each beacon was scored on the nine-point visibility scale created and validated for this project. As shown below, the majority of the beacons were visible in heavy brush, while in a stationary position. Consequently, this technology would significantly aid in the recovery of a lost or injured law enforcement officer.



It was believed that moving targets might produce higher visibility scores. This theory was tested in dense palmettos at distances ranging from 100-300 yards. Scores indicate that each beacon's score rose substantially, suggesting that even the least performing beacons would still have utility in moving target scenarios.

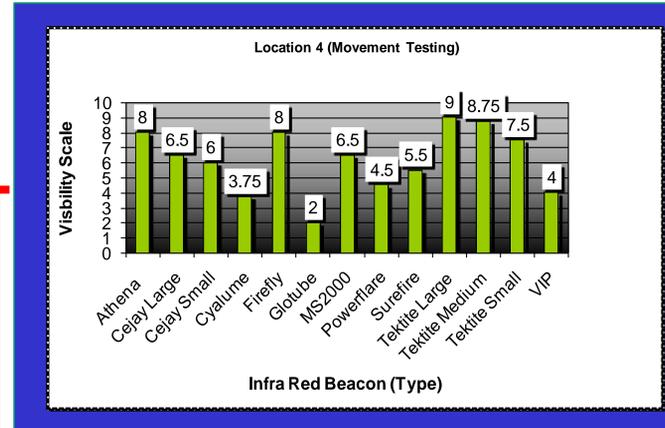


Fig. 2 Moving beacons have substantially higher scores due to elevation and tendency to catch the attention of the viewer.



During the course of testing, it was determined that there were no K9 harnesses designed to attach an infrared beacon. As a result, the National Institute of Justice allowed the researchers to subcontract with a manufacturer in Hungary to produce such a harness. It was decided that the best performing beacons (Athena, Firefly, & Tektites) would each have a harness designed specifically for them. The new beacon harness hybrid was tested utilizing a trained dog with significant success. Performance scores for each were significantly higher and provided substantially more protection to the beacon. As many of the beacons utilize a plastic frame, this finding is of considerable value for repeated deployments in the field.



Conclusions

This project evaluated a range of infrared beacons currently in the law enforcement marketplace. The findings suggest that this technology has substantial application for tracking law enforcement officers involved in foot pursuits as well as for monitoring police canines that are operating off-lead. While the visibility of the beacons was increased by motion, a large number were detectable while stationary and on the ground. Consequently, these beacons would certainly aid in the discovery of an injured officer that was unable to respond or novel uses such as a marker to identify evidence for later recovery. The utility for a K9 tracking team to be able to drop a low cost marker whenever evidence is located cannot be underestimated. Forensic evidence is easily destroyed and creates substantial problems for officers pursuing a suspect. Markers of this type are invisible to anyone without a night observation device and would insure that these items of evidentiary value would be collected by the proper trained personnel.



Additionally, their visibility from a helicopter would allow the direction of assets on the ground. Canines and officers could be deployed in a manner that increases the likelihood of success and minimizes the potential for friendly fire shooting scenarios. As most air units are equipped with thermal imaging systems, suspects not wearing an infrared beacon are quickly discerned from the law enforcement officers.

Finally, the cost of implementation is well within the budgetary limits of even the smallest law enforcement agency. Technology transfer programs provide night vision technology to agencies at little or no cost and the individual beacon cost is less than the cost of an expandable baton. Given the multiple functions of this technology, implementation of infrared beacons in actual field deployments is the next logical step in determining feasibility for nationwide implementation.

Funding and Appreciation

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