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Space-Age Pocket Protectors Go Mainstream

Satellite-Based Personal Locator Beacons:
Lifesaving dream or the next false alarm nightmare?

What would be the impact on public safety agencies if community members could purchase pocket-sized, wireless emergency systems to transmit calls for help to orbiting satellites with the user's identification and location—all with the simple touch of a button? This may sound like some far-off fantasy, but the potential for anyone to equip themselves with celestial panic buttons is already here. Welcome to the age of Personal Locator Beacons.

Following a nine-year pilot program in the Alaskan wilderness, the Federal Communications Commission granted nationwide use of the 406 MHz frequency for Personal Locator Beacons (PLBs) on July 1, 2003. Based upon the same technology as the Emergency Position Indicating Radio Beacon (EPIRB) and the Emergency Locator Transmitter (ELT), the PLB is designed for personal use rather than systems installed on ships or airplanes. As a false alert prevention measure, Federal law requires PLBs to have no less that two independent means for manual activation,[1] whereas both the EPIRB and ELT are designed for activation either automatically—in case of submersion or impact—or manually.

[1] Federal Communications Commission WT Docket No 99-366, p. 6.

Since PLBs have only been on the national market for about three years, it is too soon to tell the potential impact on local law enforcement agencies. During legitimate search and rescue (SAR) operations, PLBs will narrow search areas and result in quicker rescues, but will their growing popularity result in an increased number of false alerts or improper uses? If a PLB activation is indeed false or does not constitute a life-threatening emergency, who pays for police responses in towns and cities, and for wasting limited local, state and federal SAR resources? No matter how this issue unfolds, there is a good chance PLB calls for service are in the not-to-distant future for many public safety agencies across the country.

EVOLUTION OF THE PLB

The Personal Locator Beacon is one version of an instrument known as a "distress radiobeacon." The first generation of radiobeacons were the "Emergency Locator Transmitter" (ELT), designed exclusively for use aboard aircraft in the 1970's. In the event of a crash, early versions of the ELT transmitted an anonymous radio signal on the international aeronautical emergency frequency at 121.5 MHz. The rescue concept was simple: Passing planes routinely monitor the channel and would receive the warbling distress signal and notify authorities. But in the early days of the emergency radiobeacon program, without a plane overhead, the signal was not received by anyone.[2]

A subsequent version of the ELT was made available to mariners as "Emergency Position Indicating Radio Beacons" (EPIRB) which transmit radio frequency signals to specially-equipped satellites operated by the National Oceanographic & Atmospheric Administration

[2] "Safety information: EPIRBs." United States Coast Guard. June 3, 1996.

(NOAA).[3] In those early days, satellite receiver coverage was limited, the originator unknown and the ability to determine the location of the distress signal poor. The need for a comprehensive, worldwide network of satellites became apparent. As a result, Russia and the United States originally partnered on the COSPAS-SARSAT[4] System. Now there are 35 countries that are part of the Search and Rescue Satellite Consortium.

Today, when a distress radiobeacon signal is received in the United States or from one of its territories, the alert is transmitted from SARSAT satellites to one of several strategically located ground stations. The information is then passed to the United States Mission Control Center (USMCC, pictured left). The Center is staffed around-the-clock by members of the NOAA contractors.

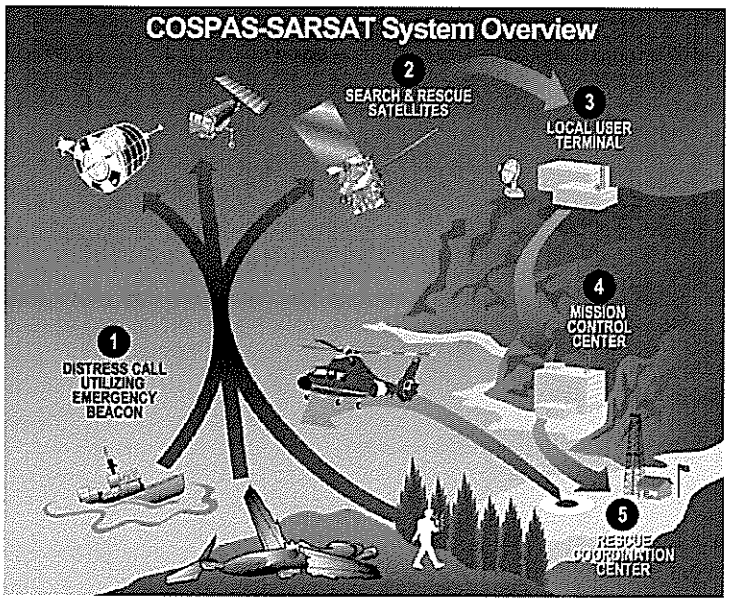
Ground station computers analyze incoming radiobeacon signals and determine the beacon's position. The information is sent to the USMCC which determines in the transmission originated over land or water. If over water, USMCC routes the call to one of 11 United States Coast Guard Rescue Coordination Centers. If land-based, the call is routed to the Air Force Rescue Coordination Center (AFRCC) at Virginia's Langley Air Force Base, which either initiates its own response or funnels the information to state search and rescue authorities—typically state police agencies or the office of emergency services. Most transactions from the Mission Control Center to rescue coordination centers are completed automatically. Each day, USMCC processes

[3] http://www.sarsat.noaa.gov/satellites1.html

[4] Acronym for "Cosmicheskaya Systyema Poiska Aariynyich Sudov—Search And Rescue Satellite-Aided Tracking." The Russian term roughly translates into, "Space system for the search of vessels in distress."

some 250-400 radiobeacon alerts. About 85 percent of all alerts are referred to the Coast Guard; the remaining 15 percent are processed by the Air Force.

Due to technological limitations in the 1980's, COSPAS-SARSAT was upgraded from 121.5 MHz to 406 MHz, the new frequency reserved exclusively for emergency beacons worldwide. Second-generation devices transmit a 15-digit alpha-numeric identifier code on this higher frequency and a warbling homing signal on the lower channel. But arguably the biggest boon to efficient search and rescue operations is the embedding of location information into the newest radiobeacon signals using data gleaned from the nation's network of 29 satellites collectively known as the Global Position System (GPS).



"Before the 406 MHz beacon and embedded GPS data was made available to us, search and rescue crews were faced with potential search areas of over 1,000 square miles," says Allan Knox, AFRCC Search and Rescue Program Manager. "With GPS information, search areas are reduced to 1/100th of a square mile, or about seven acres. That is a huge difference and makes for rescue operations that are timed with a watch instead of a calendar." As the slogan goes, *COSPAS-SARSAT takes the 'search' out of search and rescue.*

LIVES SAVED

It is not hard to imagine why the COSPAS-SARSAT System has been so successful saving lives around the world. There are plenty of regions where radio waves don't reach a listening ear and cellular networks are nonexistent. In those places, a PLB could very well mean the difference between life and death. Modern distress radiobeacons have no equal when it comes to making a last-ditch call for help from remote outposts.

According to the NOAA Web site, distress radiobeacons have saved 18,500 people worldwide (5,204 in the United States alone) since its 1982 inception. In 2005, 222 U.S. lives were saved using the COSPAS-SARSAT System.[5] During the nine-year Alaska PLB pilot program, over 300 lives were saved; 54 in 2001 alone. The striking success of this program led to approval for PLBs to be used throughout the United States.[6]

Widely used by civil aviators and required aboard all U.S. fishing vessels and on ships over 300 gross tons, there are some 340,000 second-generation ELTs and EPIRBs in use worldwide with nearly half of those registered in the United States alone. Some 700,000 first-generation beacons are estimated to still be in use internationally but due to technological advancements, these 121.5 MHz-based devices will no longer be supported by COSPAS-SARSAT after February 1, 2009.[7] These successes have led many to believe that PLBs would be as dramatically useful to

[5] International COSPAS-SARSAT Web site, http://www.cospas-sarsat.org/Beacons/121Bcns.htm.

[6] "Search and rescue satellite-aided rescue." NOAA Satellite and Information Service. July 2005.

[7] "Technology Update: Personal Locater Beacons (PLD) come online in July 2003." OutdoorEd.com. 2003.

individuals and not just occupants and passengers aboard planes and ships. In legalizing PLB use nationwide, the Federal Communications Commission wrote:

> We believe that these rule changes (in adopting PLBs) will further the public interest by facilitating the use of radio spectrum to increase the safety of the general public in life-threatening conditions in remote environments after all other means of notifying search and rescue responders have been used.[8]

Thinking back to the early days of cellular telephones and the 9-1-1 system, this technological relationship has largely been a positive one. But what if cell phones were only capable of communicating a one-way request for help with the user's identifying information and current location? Discerning this effect is to foresee the potential impact of the PLB on public safety.

PREDICTING THE IMPACT

Distress radiobeacon alerts may soon creep their way from obscurity into America's police vernacular, but as of now, law enforcement's awareness of wireless emergency device response protocols is limited at best. If your agency receives a PLB activation tomorrow, will you be prepared? Do you have policies in place to deal with this call type? Is your agency properly equipped to respond? And, most importantly, will your staff believe that an incoming call from the United States Coast Guard or Air Force is actually a legitimate request for service that must be handled immediately?

The potential public safety impact of PLBs is difficult to forecast. According to AFRCC, there have been 63 non-military PLB activations (six of which have been legitimate distress alerts) in nearly three years since the PLB program went nationwide in 2003. This low number of alerts

[8] Federal Communications Commission WT Docket No 99-366, p. 1.

may be short-lived as PLB popularity grows among the general public who realize that a one time investment has the potential of saving lives.

Declining Prices, Increasing Popularity. The pocket-sized PLB was designed with the backcountry enthusiast in mind, such as hikers, hunters and fishermen, and for people that work

or live in the wilderness. Clearly, the intended market did not include urbanites or casual users. The first PLB delivered to the national market in 2003 cost nearly $1,000. At that price, a PLB would only be considered by the serious outdoor adventurer. Now, the potential for PLBs to creep into society's mainstream is real. With growing market competition, demand and availability, the 2003 unit costing a thousand dollars now retails for $469 with integrated GPS,[9] dispelling one assumption that high costs due to technical requirements would keep the number of users low.[10] Other PLBs can be found on eBay with a starting bid of $199.[11] Declining prices may be directly responsible for the recent increase in PLB registrations.

According to NOAA Corps Lieutenant Jeffrey Shoup, Operations Support Officer at USMCC, registrations of PLBs are on the rise and there is no sign of a sales slump on the horizon. "We typically average 300 PLB registrations per month during the winter and 600 per month during the summer. Our busiest month thus far was March 2006 when 813 PLB were registered with

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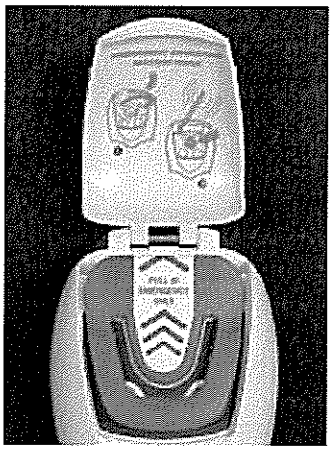
[9] McMurdo Pains Wessex Fastfind Plus 406 PLB EPIRB with Internal GPS. Landfall Navigation. April 26, 2006.

[10] Federal Communications Commission WT Docket No 99-366, p. 6.

[11] "SATFIND-406 MHz Personal Locator Beacon GPS Hunting." eBay online auction. August 22, 2005.

NOAA either online, via fax or by mail." Eventually, PLBs may soon outpace registrations for EPIRBs and ELTs combined, sparking a shift in the focus of radiobeacon uses from protecting things—specifically aircraft and vessels—to safeguarding individuals of all types, not just aviators and mariners.



Change in Intended Uses. When the Federal Communications Commission (FCC) amended Part 95 of the Commission's Rules to authorize the use of Personal Locator Beacons on the international earth-to-space emergency rescue frequency in 2002, the Commission's intentions were clear. "The 406 MHz PLB is primarily intended to provide a distress and alerting capacity for use by the general public in life-threatening situations in a remote environment after all other means of notifying SAR responders (e.g., telephone, radio) have been exhausted."[12] That said, there is nothing to prevent PLB users from activating their radiobeacon in an urban environment or for less than a life-threatening condition; a possibility that NOAA acknowledges.

"What is to stop a person from having a flat tire and then using the PLB to seek help?" asks the NOAA Web site.[13] The posted answer:

> Unfortunately, nothing. If a person feels that they are in distress, there is nothing to prevent them from activating their PLB. However, the users should be aware that the individuals responding to their distress alert will be a dedicated rescue response and not an auto mechanic. As such, the user should rely on an emergency roadside assistance

[12] Federal Communications Commission WT Docket No 99-366, p. 11.

[13] http://www.sarsat.noaa.gov/new.html

service to provide them the correct response. As well, the user should be aware that he/she is wasting valuable rescue resources that may also be pulling the team away from a legitimate distress.

So what is wrong with putting a PLB in the hands of everyone? "Plenty," says Matt Scharper, Law Enforcement Branch Deputy Chief with the California Governor's Office of Emergency Services (OES). "People get into trouble when they exceed their ability to be self-sufficient. In a way, PLBs work against our basic survival instinct; it makes people feels invincible. They think they can persevere in the face of extreme danger because help is only a button-click away. PLBs can give weekend warriors a false sense of security because public safety agencies are not always capable of an immediate search and rescue response."

"PLBs are an awesome tool to assist in the rescue of persons in the wilderness when they are faced with a true, dire emergency," says Scharper. "Unfortunately, the way PLBs are marketed, there is a chance they will be embraced as a 'yuppie 9-1-1- tool' and undermine what the devices were designed for." According to Scharper, some companies market the devices as getting a three-minute search and rescue response. "It is impossible to get that kind of a response from any kind of radiobeacon." Scharper adds, "PLBs were designed with a very small segment of the population in mind. Flooding the market with PLBs means more false alarms and false alarms could be the undoing of this new emergency rescue system."

False Alarms. False alarms have plagued nearly every type of system that generates an alarm to which a response is expected, and it looks like PLBs may not be much different than the police experience with EPIRBs, ELTs and conventional electronic security systems.

First-generation analog radiobeacons have had horrific false alarm problems, so much so that first-alert rescue launches are impractical. Of the hundreds of beacon alerts received by the USMCC each day, only one in eight originate from an emergency radio beacon. The rest are generated by radio frequency interference generated by such things as pizza ovens, radar installations and automated teller machines. All told, the aged 121.5 MHz system has a 99.9 percent false alarm rate.[14]

Radiobeacons transmitting at 406 MHz offer a much better operating platform by eliminating radio frequency interference and enabling GPS coordinate transmission. On average, 15-20 beacon alerts are handled each day. Seventy percent of these newer beacons are properly registered and 65 percent of the alerts are cleared with a simple telephone call confirming the alert was accidental.[15] But even with these technological innovations, the ratio of false alerts to legitimate rescue requests is staggering. According to NOAA's Shoup, airplane-based beacons currently have a 99 percent false alert rate while the marine-based counterparts have false alert rate of 95 percent.

During the Alaska pilot program, state OES coordinators like Scharper were excited because of the extremely low incidents of false alerts. Unfortunately, the information gleaned during this trial is proving to be not a good indicator of PLB false alerts for the rest of the country. Since 2003, NOAA reports the PLB false alert rate at 76 percent.

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[14] "SARSAT 101" presentation. NOAA Satellite and Information Service. August 23, 2001.

[15] "Search Planning." U.S. Coast Guard Addendum to the United States National SAR Supplement. February 6, 2004.

Any discussion of false alarms must be *déjà vu* for most law enforcement personnel. Statistics show that 10 to 30 percent of all law enforcement calls for service are security alarm related and that 95 to 99 percent of these calls are false.[16] While security alarms are effective in preventing crime, they also waste public resources. On some fronts, the security industry and government are working together to address the issue of false alarms. On others, some municipalities have made unilateral moves against alarm responses altogether by adopting non-response policies to unverified security alarm activations.

Change in Cost Recovery Efforts. A strict interpretation of public policy dictates that a public safety response to a false alarm—no matter the origin—is a private good. It could be argued that even a legitimate response to a PLB would also be considered a private good. Utilizing this stringent analysis, all responses to such devices, regardless of the ultimate disposition, would be considered a private good and all related expenses associated with a public safety response would be paid for by the user and not the community-at-large.

Instituting such a stringent cost recovery program would hold users accountable for their own actions. Unfortunately, such a procedure might also achieve the unintended consequence of users failing to use the devices as designed because of potential financial implications.

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[16] Cunningham, William, and Taylor, Todd. 1985. "The Hallcrest Report: Private Security and Police in America," p. 282. Boston: Butterworth-Heinemann; Daughtry, Sylvester. 1993. "False Alarm Reduction: A Priority for Law Enforcement." Police Chief, February; and, Spivey, Katherine, and Cobb, Renee. 1997. "False Alarms: Public Safety/Private Sector Working to Solve the Problem." Police Chief, June.

Drs. Simon Hakim and Erwin A. Blackstone, professors of economics at Temple University, opined on the private good created when police respond to false alarms:

> When police respond to a false alarm activation, a private service is provided to the alarm owner. Nobody else in the community gains any benefit from the response. In economic terms, a response to false alarms carry no good attributes for the public. The patrol officer abandons other duties to provide this private service. If alarm owners do not pay the full cost for this private service, then non-false activations of alarms subsidize activators of alarms.[17]

CONSIDERATIONS FOR POLICE MANAGERS

It is difficult to put futures-based concerns at the forefront of police executives' minds when they are busy dealing with the problems of the here and now. Truthfully, Personal Locator Beacons happen to be such an issue for the majority of United States law enforcement agencies. Police agencies nationally, however, are struggling with call volumes and the impact of false alarms on their ability to devote patrol time to those who truly need their services. PLB's may emerge as the next arena where this struggle may be fought; managers should anticipate the possible impact and plan today. While real-world experience with personal locator beacons is extremely limited at present, there are strong operational correlations between distress radiobeacons of all types and conventional security systems. Clearly, the potential impact on local law enforcement agencies is significant if PLBs are widely adopted by the American public.

Failure to properly prepare for this new type of call for service may result in embarrassment to local agencies at best, or injuries sustained or lives lost at worst. Fortunately, there are resources emerging of assistance to organizations planning for their future. For example, the U.S.

[17] Hakim, Simon, and Blackstone, Erwin. 1996. "Keeping A Watchful Eye On the Cost of Response to False Alarms." Security Dealer, p. 104. August.

Department of Defense produced a six-minute training tape on Personal Locator Beacons for state SAR coordinators and first responders in an effort to combat this potential issue.[18] No doubt, others will follow suit.

Certainly, PLBs will save lives, but how profound will be the issues of false alarms and improper use or abuse? At what price does government support programs such as these if an overwhelming amount of resources are wasted chasing calls that are fictitious in nature or do not report true emergencies, or should individual PLB users shoulder the response costs? Under federal law, knowingly and willfully transmitting a hoax distress call via a PLB is a felony and is punishable by prison, a $250,000 fine, and restitution to the rescue agency for all costs incurred responding to the distress,[19] but what about that flat tire call? The definition of an "emergency" currently lies in the mind of each individual PLB user unless state or national mandates are established as to when PLBs can be utilized without sanction or local false alarm ordinances are expanded to included emergency wireless devices.

When conventional security systems fist came in vogue in the 1950's, law enforcement embraced this revolutionary crime prevention tool, going so far as to offer alarm system monitoring at many police headquarters. As the years went by, alarm response demands outstripped available resources and the false alarm problem never improved. Now the police revolt against security alarm calls is in full swing; cost-recovery efforts and verified response ordinances are sweeping the nation. Does this foreshadow the future of PLBs, or can astute

[18] To request a copy of the VHS training tape, "Personal Locator Beacon," please e-mail Mr. Knox using an official agency e-mail account at Allan.Knox@langley.af.mil.

[19] Ibid. See 14 United States Code 88.

management of the technology create a win-win for the police and those in need? Only time, and good planning, will tell.

CONCLUSION

History may very well repeat itself as local law enforcement come to realize that Personal Locator Beacons may be the next major false alarm problem. The question is: What will be the result? Are non-response ordinances, false alarm billing, verified response procedures, private search and rescue providers or insurance policies for the PLB user on the horizon?

Statistics show that when an alarm rings—no matter what the origin—the overwhelming likelihood is that it will be false. The response by publicly-funded police officers to false alarms is contrary to accepted public policy since no one but the alarm owner reaps any benefit from the response. The community-at-large should not be expected to pay for the false alarms of a few. False alarm fines, fees, and penalties rightfully hold those persons accountable for wasting governmental resources no matter what the origin.

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Tom Chronister is a 23-year veteran of the Oxnard (CA) Police Department. He currently serves as a commander in the Field Services Bureau and is a member of California's P.O.S.T. Law Enforcement Command College Class 39. This article was completed in partial fulfillment of the curriculum required of all Command College students. For more information, see http://www.post.ca.gov/training/cc/default.asp.

IMAGE REFERENCES

1. Page 2: International COSPAS-SARSAT logo available at http://www.sarsat.noaa.gov/cospas_sarsat.html .

2. Page 3: Photograph of the United States Mission Control Center. For high resolution version, go to http://www.noaanews.noaa.gov/stories/images/sarsat-mcc.jpg. Please credit "NOAA."

3. Page 4: COSPAS-SARSAT System Overview graphic available online at http://www.noaanews.noaa.gov/stories/images/sarsart-highres.jpg. Please credit "NOAA."

4. Page 7: Photograph of a closed Personal Locator Beacon. For a high resolution version, go to http://www.noaanews.noaa.gov/stories/images/personalbeacon-closed.jpg . Please credit "NOAA."

5. Page 8: Photograph of an open Personal Locator Beacon. For high resolution version, go to http://www.noaanews.noaa.gov/stories/images/personalbeacon-open.jpg. Please credit "NOAA."