

# Non-lethal Electromagnetic Stand-off Weapon

---

**Invocon, Inc.**

19221 IH 45 South, Suite 530  
Conroe, TX 77385

**Contact: Kevin Champaigne**

Phone: (281) 292-9903

Fax: (281) 298-1717

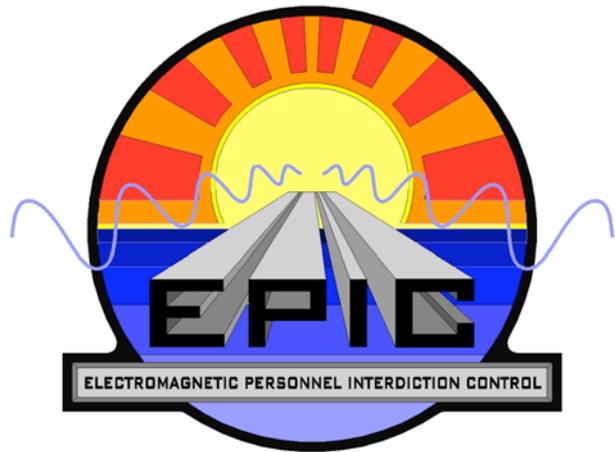
Email: [champaigne@invocon.com](mailto:champaigne@invocon.com)

Website: [www.invocon.com](http://www.invocon.com)

---

**Command: MARCOR**

**Topic: N03-163**



## PROBLEM STATEMENT

The US military has achieved the ability to target small objectives with precision that precludes widespread collateral damage. These improvements are in air to ground munitions as well as ground to ground weapons. This precise destruction of hostile military targets while allowing adjacent personnel and structures to survive with no damage has broadened the ability of political decision makers to respond with measured response force to threats of terror and hostile military actions. These responses are more politically acceptable since innocent civil casualties are kept to a minimum. The desirability of waging bloodless war to counter threats to national security is virtually limitless since both military and civil authority could determine a priori when and if the use of lethal force is necessary.

The EPIC system was developed in response to Marine Corps requirement for a non-destructive stun weapon that would render a hostile war fighter ineffective for a period of time. There is significant military interest in such a capability. In addition, the ability to remotely incapacitate a human being without permanent damage would be a landmark event in the field of civil law enforcement.

Increased interaction between friendly troops and friendly, neutral, or hostile civilian populations has become a feature of the contemporary operational landscape. This is likely to remain the case for the foreseeable future. Two factors account for this development. First, worldwide patterns of population growth and migration have resulted in increased urbanization, not only within the established industrialized states, but also in many undeveloped and developing societies.

Second, U.S. forces increasingly operate in the challenging environment known as military operations other than war. This category of operations includes such missions as humanitarian assistance, military support to civil authorities, peace operations, and

noncombatant evacuations. These operations commonly involve close and continual interaction between friendly forces and noncombatant civilians. Some military operations other than war scenarios include the presence of paramilitary forces or armed factions, which present a real but ill-defined threat. In these situations, the mission of military forces commonly has aspects that are preventive in nature.

The goal of the EPIC project is to ultimately provide military and law enforcement personnel a non-destructive, stand-off weapon that can render a human powerless to effectively resist arrest or subjugation. The initial requirements of the topic, specified by DoD SBIR solicitation topic No. N03-163, were the following:

1. Device must reduce an individual's will and/or ability to take aggressive action and resist physical restraint.
2. No physical contact between the weapon and the target.
3. Weapon must be directional and not affect the operator.
4. Reduction of mental and/or physical abilities must last for a sufficient time for restraints to be installed.
5. Device must operate through walls of conventional construction.
6. Device may not cause any permanent physiological or psychological damage to the human target.
7. No gas discharge devices may be considered.

### WHO CAN BENEFIT?

As a non-lethal weapon that affects a human's operational capabilities, EPIC will benefit both military personnel and civilian law enforcement. The impact of this new capability to incapacitate without damage cannot be understated. However, weaponry is only one facet of capabilities of EPIC concept. EPIC has the potential to affect many aspects of modern life. From flight simulators and gaming immersion systems with complete sensory environment - to vestibular and cochlear prosthesis - to treatment of inner-ear disorders - the entire range of capabilities is far reaching.

### BASELINE TECHNOLOGY

There is nothing in current arsenal that offers the same capability or effect as EPIC. The Taser is closest match to the basic purpose of the system - temporary incapacitation. However, the means of achieving this effect are quite different. To fire a Taser, the warfighter or a policeman has to be within operating distance and there can be no obstacles in the path of fire.

Another device that, like EPIC, uses a normal physiological reaction to a radio-frequency signal is the Active Denial System. The ADS works by causing unpleasant or painful sensation in the skin when the subject enters the covered area. Naturally, the first reaction is to escape. However, the mechanism of action is quite distinct, in the sense that it needs to cover the perimeter of the area to be protected whereas EPIC could be use a targeted method. Additionally, the ADS does not incapacitate the person, thus precluding the possibility of capturing the target individual.

Another class of non-lethal weaponry includes several versions of a light-emitting device that dazzle the opponent. Lasers and explosive materials are used to achieve the goal. This kind of weapon provides relatively small area of influence and therefore cannot be applied on a large scale.

### **TECHNOLOGY DESCRIPTION**

The Electromagnetic Personnel Interdiction Control (EPIC) Phase 2 program proposes the revolutionary concept of using electromagnetic waves to interfere with the vestibular system function (sense of balance) by creating disorienting input to the brain. It is hypothesized that the resulting brain reaction will render a human inoperable for the duration of the stimulus, and possibly for a short time thereafter. The system would thereby provide an improved capability to subdue and restrain adversaries in a non-lethal manner while reducing the risk to the warfighter.

The EPIC effect is assumed to last for some period of time after the stimulus is removed, just as motion sickness does not immediately subside after the vehicle stops moving. Due to the nature of the carrier frequency, it will be effective through traditional walls, although not if the walls are shielded. Health effects for the EPIC stimulus are not known, but are anticipated to be minimal.

### **CURRENT STATE OF DEVELOPMENT**

Through the Phase II project, the feasibility of affecting the vestibular system function through electromagnetic waves will hopefully be verified. Significant effort has been focused on modeling the vestibular system physical properties in order to be able to determine the potential effect of various electromagnetic waveforms. Test circuitry capable of generating a potentially viable waveform has been produced and tested. Animal and live tissue testing to determine effectiveness is currently underway.

### **TECHNOLOGY AVAILABILITY**

Since this technology is currently at a TRL level of 2, and will only be at a TRL level 2-3 at the end of the Phase II Option in December 2007, significant funding for continued development will be needed before a system based on this technology would be ready for

field use. Similar system developments related to non-lethal weapons, such as the Active Denial System, have taken many years to develop functional prototypes, and deployable systems are just now being considered. It is likely that the EPIC system development will require similar timetables.

<b>TRL</b>	<b>Required Tests, Demos, and next steps</b>	<b>Target date</b>	<b>Estimated Funding required</b>	<b>Organizations to be involved</b>
3	Mouse vestibular response to transmitted electromagnetic wave stimulus	June 2008	\$2M	Navy, Joint Non-Lethal Weapons Directorate (JNLWD)
5	Characterization of effects on various mammal test subjects	2009	\$5M	Navy, Joint Non-Lethal Weapons Directorate (JNLWD)
7	Human Effects characterization	2011	\$10M	Navy, Joint Non-Lethal Weapons Directorate (JNLWD)

## REFERENCES

Mr. George Gibbs has been the Technical Point of Contact for the Marine Corp. for both the Phase 1 and Phase 2 EPIC programs. His contact information is as follows:

George G. Gibbs  
 Commanding General  
 MARCORSYSCOM,  
 2200 Lester Street  
 Quantico VA 22134-6050  
 703-432-3676  
 george.gibbs@usmc.mil  
 FAX # 703-432-3526

## ABOUT THE COMPANY

Founded in 1986, Invocon, Inc. is a Veteran-owned Small Business, which has developed into a leader in RF communication and data acquisition research and development. From inception, Invocon has continually introduced new innovations, ideas, and concepts to solve a myriad of technological challenges for military, government, and commercial customers.

Based in Conroe, Texas, 30 miles north of Houston, Invocon has aimed to provide high technology design and fabrication services for the U.S. Government, major corporations,

and universities. Our staff consists of professional electrical, computer, and software engineers, and skilled technicians, whose skills and creativity successfully transform ideas into working products. Invocon has laboratory facilities for the prototyping, manufacturing, and testing of electronic products. We also team with university research groups, subcontractors, consultants, and other R&D companies to solve basic research problems and to bring the ideas from the laboratory to the marketplace.

Invocon has developed a broad suite of technologies and systems for both government and commercial endeavors. Many of these systems can be directly applied to particular customer needs, or can be customized to provide an optimum solution.