

Physical Security R&D Tax Credits

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Introduction

The Federal R&D tax credit is an innovation incentive. It promotes both economic growth and job creation.

Any firm has the potential to qualify. The litmus is not the firm but the activity involved. That activity has to (1) be technical, (2) involve consideration of design alternatives, (3) eliminate uncertainty, and (4) result in the acquisition of new knowledge to the company.

When a company's project—be it a new or improved product, process, or software development—qualifies for the R&D tax credit, applicable employee time is the largest driver of the credit calculation.

On December 18, 2015, President Obama signed the bill making the R&D tax credit permanent. Beginning in 2016, the credit has been used to offset the Alternative Minimum Tax (AMT), and startup businesses can utilize the credit against \$250,000 per year in payroll taxes. Companies can now plan and pursue projects that are innovative but slightly risky, and utilize the R&D tax credit to help fuel their R&D efforts.

The Credit for Increasing Research Activities, or the R&D tax credit, as defined in US IRC Code, [Section 41](#), allows all of the following to be included in calculating the credit: amounts paid by the taxpayer for in-house research expenses, contract research expenses, expenses related to supplies consumed in the R&D process (tangible property other than land and property subject to depreciation), as well as certain expenses related to obtaining a patent.

The credit calculation for companies is completed on IRS Form 6765, where the credit amount can then reduce the company's tax liability, dollar-for-dollar. In instances where the business is organized as a flow-through entity, the R&D tax credit can reduce the tax liability, dollar-for-dollar, on the owner's personal tax return.

While there is no specific application to the Internal Revenue Service to obtain the R&D tax credit, contemporaneous documentation is required to be maintained by the taxpayer in the unlikely event of an audit. Our firm does a comprehensive R&D Study that includes contemporaneous documentation for each and every one of our clients, regardless of whether they are our billion dollar client or our small software start-up.

This paper draws on the many physical security projects our R&D tax credit engineers have completed, including airport security, facial recognition, law enforcement technology, retail theft protection, building security, and fire protection. Information about other physical security projects that have benefitted from the R&D tax credit is also available, including those involving [gun](#), [smart gun](#), and [cyber security](#) developments. Our firm has handled R&D tax credit projects for firms in the physical security industry, as well as for firms that are in other industries but made a significant effort to develop and improve their physical security systems for their business operations.

Physical Security at a Glance

Physical security is a highly complex, multifaceted challenge. It encompasses all of the physical measures designed to safeguard personnel; to prevent unauthorized access to equipment, installations, material, and documents; and to protect against numerous threats, such as theft and damage. The diversity of potential menaces to physical security calls for multilayered, flexible solutions that use innovative technology to keep up with ever-changing risks.

Before the pandemic, physical security had a 2020 projected growth rate of 6.5%, from \$103bn to \$110bn in [sales](#). Despite flattened sales due to [COVID 19](#), innovation within the field has continued apace. One underlying theme is that physical security technology builds off of many other current technologies, including artificial intelligence, the Cloud, drones, sensors, and improved cameras.

Protecting People: Personal Physical Security

Physical security accessories, such as Tasers, bulletproof vests, and body-worn cameras, can save lives and reduce exposure to injuries. They constitute invaluable assets for numerous professionals, particularly security personnel and police officers. The following sections discuss recent innovation trends in technology designed for personal protection.

Non-Lethal Weapons

Electroshock weapons temporally incapacitate neuromuscular transmission, disrupting voluntary muscle control through the stimulation of sensory and motor nerves. This kind of weaponry is often preferred to other less-lethal force options due to its overall

effectiveness, which presents virtually no variation relative to the subject's pain tolerance, drug use, or body size. Electroshock weapons are often divided into three categories, namely, (1) those that work through direct contact, such as stun guns and cattle prods; (2) the so-called conducted electrical weapons (CEW), which fire dart-like electrodes that deliver shocks through thin wires that remain connected to the gun; and (3) wireless long-range electroshock weapons.

Though undoubtedly an important means of self-defense and law enforcement, non-lethal weapons are often subject to criticism. When it comes to technical shortcomings, the first two categories have obvious limitations of range, which is restricted to the arm's reach, in one case, and to the length of the wire, in the other. The third type, though capable of reaching more distant targets, presents higher risks of death and serious injuries, due to the speed of the projectile and the inability to control the shock after firing. Costly ammunition and an inconveniently large size are also drawbacks of long-range non-lethal weapons.

Numerous innovative companies are entering the \$8.5 billion non-lethal weaponry market with the objective of overcoming the limitations of existing technology. For instance, Digital Ally in Lenexa Kansas is working on a wirelessly controlled electronic weapon that is more compact and easier to carry than those currently available. Other proposed improvements include enhanced accuracy, reduced projectile speed, and post-firing control of the shock via radio frequency.

A more traditional player in this market, TASER International in Scottsdale, Arizona is also innovating through the development of a line of smart weapons designed to save lives and reduce injuries. With advanced firing logs, these weapons enable highly accurate reports that help understand the reasoning behind the decisions made in the field. Sensor technology registers, for instance, how long a weapon was armed and when the trigger was held. Other technical improvements incorporated into TASER's latest CEW products include dual lasers for enhanced accuracy, an audible warning to facilitate voluntary surrender, and a smart cartridge that reduces accidental discharge. More importantly, there is the possibility of a backup shot, which is a major breakthrough in a field dominated by single-shot weapons.

Bulletproof Vests

Bullet-resistant vests are designed to absorb the impact and stop or reduce penetration of firearm-fired projectiles and fragments from explosions. They work by dispersing the energy from incoming projectiles across multiple layers of material. The very strong fibers in their composition "trap" the bullet and slow it down to a full stop.

There are generally two kinds of bulletproof vests: (1) "Soft vests" are usually made of para-aramids, which are essentially plastics woven into fibers, or of Ultra-High-Molecular-Weight Polyethylene (UHMWPE), a gel-spun, multi-filament fiber also made from plastic. Though

presenting very high levels of strength-to-weight ratio, these materials remain flexible and are capable of absorbing significant amounts of energy, thus being effective against most

kinds of small-caliber ammunition. (2) “Hard vests”, on the other hand, are designed to offer protection in extreme situations involving higher-caliber threats, including rifle rounds. In addition to the fibers used in soft vests, these reinforced armors incorporate plates of ceramic, steel, or titanium. Because of the extra layers of [protection](#), hard vests are heavier and thicker than soft ones.

Despite the general distinction between hard and soft vests, more technical classifications, such as the one from the US National Institute of Justice (NIJ), refer to different ballistic levels. The choice of armor to wear should take into consideration the likely threats to be faced. Recent events involving the deaths of police officers point to an increasing use of hard vests. For instance, Texas Lt. Gov. Dan Patrick recently asserted that he would ask legislators for up to \$20 million to provide 40,000 police officers with reinforced [vests](#).

In addition to ballistic protection, a growing number of body armors offer spike and stab threat protection. Spike threats refer to sharp pointed objects, such as needles and ice picks, while stab threats take the form of edged blade attacks. Protection against both of these menaces is important to various professionals, such as prison guards, bouncers, and bodyguards.

Innovation in body armors is key for enabling enhanced protection and greater comfort. Outstanding challenges include the development of thinner, lighter, and more flexible vests that maintain high levels of ballistic protection. Improved ergonomics as well as cooling systems are also priorities, especially when targeting prolonged users in hot or humid conditions. Promising areas for body armor innovation include the field of “biomimetics”, which draws inspiration from nature (such as the scales of fish). This line of research can take advantage of 3D printing technology, which has emerged as a valuable asset in the quest of understanding how materials are formed and utilized in [nature](#).

With offices in Rogersville, Missouri, worldwide manufacturer and distributor of body armors Safeguard Armor illustrates the importance of continuous innovation. The company points to the immense potential of unusual materials, such as wood pulp, which can be used to create ballistic-resistant nanocellulose, and graphene, a sheet of single carbon atoms that can absorb considerably more energy than currently available materials.

Among the most exciting recent developments in bulletproof vests are “liquid” body armors. Polish company Moratex has developed an innovative material called Shear-Thickening Fluid (STF), which constitutes a lighter and more flexible alternative to traditionally used materials. STF increases in viscosity when exposed to impact, behaving like a solid when struck with fast-moving projectiles. It is further designed to reduce indentation when hit by bullets, thereby lessening the impact felt by the wearer and reducing risks of [injury](#).

Body-Worn Cameras

Video evidence systems are designed to work not only as a deterrent mechanism but to help increase both the transparency and accountability of police officers and security personnel. Despite the ongoing proliferation of such systems, recent events have brought their effectiveness into question. In this scenario, innovation is key to enabling the necessary improvements to existing technology. The following paragraphs present recent advancements by innovative companies in the field of body-worn security cameras, whose work exemplify the kinds of efforts that could potentially qualify for federal R&D tax credits.

In October 2016, Axon, a business unit of TASER International, unveiled a new generation of police body cameras, designed to overcome the limitations of previous solutions. The innovative Axon Flex 2 automatically turns on in certain predetermined situations, such as opening a car door, unlocking a weapon, or turning on the overhead lights and siren. In addition, there is a “buffer” that starts recording up to two minutes before the officer pushes the start button. These features aim to overcome common criticisms to existing technologies that often rely on the discretion of the user to be turned on and off, leaving many unanswered [questions](#).

With offices in Huntersville, North Carolina, British security and investigations company Reveal Media has also invested in [new technologies](#) for video evidence. With award-winning design, the RS2 body camera features a front facing screen and an intuitive one-touch record function. Besides providing enhanced low light performance and clearer sound, the solution uses advanced compression technology to facilitate the upload and storage of files as well as an AES-256 encrypted memory for improved [security](#).

Safety Innovations in Logan, Utah designs highly resistant body-worn cameras that can withstand even the toughest working conditions. The company’s innovative VidMic VX integrates a radio microphone with the camera, allowing for a lighter duty gear load while keeping the equipment practical and discreet. The solution is compatible with over 200 models of commonly used radios.

Another important provider of video evidence solutions is Newark, New Jersey-based Panasonic Corporation of North America, subsidiary of Japanese Panasonic Corporation. The company has experienced a 180 percent year over year growth in its mobile evidence capture division, which includes products such as the Arbitrator 360° HD, an in-car digital video recording system that supports up to five cameras working simultaneously to generate full 360-degree views and maximize [situational awareness](#). Panasonic also produces the Arbitrator BWC, a body-worn solution that provides 130 degrees of evidence capture with GPS metadata, pre- and post-event recording, and WiFi for easy offloading. Designed to make the most of the available visual data, a unified evidence management system brings together the company’s mobile and fixed video solutions, allowing users to analyze and preserve every link in the chain of evidence.

Also a provider of law enforcement video systems, WatchGuard Video is a four-time winner of the Dallas 100 Award honoring the fastest growing, privately held businesses in

the Dallas area. Located in Allen, Texas, it has a longstanding commitment to R&D, which has resulted in 12 issued U.S. patents plus 12 additional pending patents. Innovative capabilities include the record-after-the-fact feature, which enables users to gather critical evidence with up to one-day delay, and the ultra-wide dynamic range, a solution to common problems, such as blown-out, overexposed, and underexposed images. WatchGuard's technology dramatically improves nighttime video quality through a dual-exposure mechanism that takes two separate images (a dark exposure and a light exposure) and automatically blends the two images into a single video frame.

Protecting Spaces: Perimeter Security Systems

Physical perimeter security is understood as the use of mechanical or electronic systems to protect people and assets within a facility, making intrusions less likely. It refers to the outermost layer of security and includes fences, walls, and other physical barriers as well as intrusion detection systems and electronic surveillance. The effectiveness of a perimeter security system is directly affected by its adequacy to the risks requiring protection, the sophistication of potential intruders, and the probable means of penetration. According to a 2016 report by Research and Markets, the global perimeter security market is expected to grow at an 8 percent compound annual growth rate between 2015 and 2021, reaching \$21,000 million in 2020. The study asserts that emerging technologies are among the most important drivers of growth, as "companies are majorly focusing on R&D and investments in development of new technologies in order to expand the scope of perimeter security [systems](#)."

When it comes to physical perimeter security, there are several aspects to be considered, besides the ability to prevent intrusion. Desired aesthetics and visibility, ease of installation, and adequacy to the local weather and topography are just a few examples of important concerns. In the case of fences, for instance, installation alone can account for roughly 1/3 of the entire cost involved while a variety of naturally occurring threats, such as water intrusion, corrosion, and freezing, can significantly decrease their lifespan. Reducing costs and increasing reliability of perimeter security systems must remain a priority for companies in this industry.

Important areas for innovation in physical perimeter security include anti-cut and anti-climb mechanisms, customization against specific threats, as well as the mechanical distribution of potential impacts as a means to increase overall strength. Producer of non-metallic, non-conductive, and radar-friendly fences, AMICO Security in Birmingham, Alabama stands out for its innovative efforts, which exemplify the kinds of initiatives that would likely qualify for R&D tax benefits. The company's patent pending Amiguard system utilizes a proprietary continuous rail design that bolts together the entire length of the fence, making sure that any impact is distributed throughout the system, thereby enhancing strength and working as a unified curtain wall [barrier](#).

Innovative perimeter security solutions combine physical barriers with technology designed to detect and monitor intruders' movements. Examples of such technology include next-generation fence-mounted sensors, infrared, and integrated fiber-optic

solutions. Thermal cameras, video analytics, and intrusion detection technologies, such as microwave, seismic sensors, and radar, are also interesting allies in physical security [strategies](#).

Fence-mounted sensing technology includes various cable-type solutions that can be attached directly to fence structures in order to detect attempts of cutting, climbing, or lifting. The most common type of data used in these cases is vibration, which requires varying levels of sensitivity, according to the threats at hand. Sophisticated digital processing systems are used to analyze the collected data, assess the existence of an actual menace, and identify its nature. Smart perimeter security with sensing technology has gained ground as a crucial element of integrated security strategies, which aim for a holistic approach to security.

Examples of companies investing in this field include RBtec in Derwood, Maryland, a provider of the longest fiber-optic monitoring capabilities on the market, with up to 62 miles through a single fiber-optic cable. RBtec's RaySense illustrates the advantages of innovative fiber-optic solutions for long-range, total perimeter coverage. With no gaps between sensors, it is capable of detecting and locating within 3 meters over the entire perimeter and can be networked to provide unlimited reach. The system offers seven different levels of sensitivity that optimize performance according to the targeted infrastructure. Fiber-optic systems are also resistant to moisture and electromagnetic interference, which facilitates maintenance.

Monitoring and Surveillance

Another important aspect of physical security is video surveillance. In addition to allowing for the verification and analysis of past incidents, surveillance cameras often act as a deterrent to potential assailants. In a recent article published by IFSEC Global, Quantum's Vice President of surveillance and security solutions Wayne Arvidson pointed out that, by 2019, video surveillance will capture over [3.3 trillion hours](#) daily. The article lists five major drivers of growth in this highly dynamic market:

I. Video Analytics: analyzing video-based data can help identify useful patterns and trends. For instance, video analytics can be used for intrusion detection, going beyond traditional motion detection and intelligently distinguishing actual threats from disturbances caused by animals and weather events. When combined with advanced alarm systems, this kind of analytics enhances security while reducing the nuisance of false alarms.

II. Intelligent Cameras: recent developments in sensor technology allow cameras to be used in new and exciting ways. The fast-growing adoption of intelligent cameras embedded with sensors will require sophisticated, multi-tiered storage strategies capable of supporting an unprecedented influx of data. There will also be a growing need for enhanced capabilities, including compression, streaming, and analytics.

III. Biometrics: the use of biometric data to identify people has become increasingly complex and in turn, increasingly valuable to many industries. The integration of biometrics capabilities, such as face recognition, and video surveillance is expected to widen the scope of potential applications of video security systems.

IV. The Internet of Things: innovative strategies must be used to merge IoT sensor data with video surveillance data. The emergence of the IoT has been accompanied by an unprecedented surge in the number of connected devices, which are expected to reach at least forty billion over the next decade. The correlation of video information with input from such smart IoT devices can contribute to greater physical security. For instance, motion detectors, which are traditionally used for turning lights on and off and adjusting temperature, can now communicate with video and security systems in order to control for unauthorized [movements](#).

V. Video Surveillance as a Service: aggregated service models will help companies automate functions and optimize their resources.

The five aspects highlighted above point to a common, underlying trend: integration. In fact, it is safe to say that integration is at the essence of physical security innovation, particularly when it comes to video surveillance and monitoring. The idea is to make the most of available technologies by allowing them to work together. Security control panels that use information from various devices, such as motion detectors, video surveillance, access readers, etc., are a great example of this overarching trend.

No-camera security systems are also a promising area, due to recent improvements in motion-detection technology. Canadian company Cognitive Systems Corp. recently announced a system capable of protecting and monitoring spaces without the use of cameras. Arguably the first smart home security system of its kind, Aura uses patented technology to monitor the disruption of wireless signals caused by movement. In addition to differentiating human and non-human motion, it sends notifications to household members in case of unauthorized movements.

A recent article in *Security Sales & Integration* magazine has pointed out that innovation in motion detection has allowed for an unprecedented level of detail, thanks to which there is practically instant response to intruders. This is made possible by the incorporation of microprocessors that “intelligently analyze the signals produced by motion to make a very fast but accurate alarm decision.” Advancements that simplify installation have also contributed to enhanced reliability, particularly when it comes to features that minimize installation errors, including integrated end-of-line (EOL) resistors and bubble levels, and lift-gate terminal [strips](#).

VI. Airports: One major application for such surveillance technology is airports. Although we have worked on airport projects throughout the country, our western Long Island office gives us birds-eye view of airport technology at three major airports namely Laganardia, Kennedy, and Newark. Improving airport technology includes airport screening, Clear's

biometric touchless optical scanning, enhanced communications systems and strategic location of fuel tank farms to minimize explosion damage.

With respect to health-related safety measures, in July of 2020, JFK's Terminal 4 became the first terminal in the United States to implement technology to monitor social [distancing](#). The technology, called CrowdVision, monitors metrics like pedestrian density, operational resources, queue times, and more. The technology enables airport employees access to real-time information that can assist them in providing a safe, socially-distanced travel experience. Conceivably, the technology can be used for other purposes, including traffic monitoring and airport security.

VII. Drones: Drones are becoming mainstream physical security assets.

A. Police Use: Often when an ongoing crime is reported in traffic congested urban areas the police response is invariably too late to capture the fleeing perpetrator. With immediate overhead drone dispatch and surveillance, the crime scene can be quickly located and pictures taken of the fleeing suspect.

B. Warehouse Use: One of our clients with numerous cavernous distribution centers was the first U.S. purchaser of [warehouse drones](#). Warehouse drones can inspect the top shelves of narrow aisle high bay warehouses and inspect for facility and product damage, lighting fixture obsolescence and conduct continuous inventory counting. Regular and accurate inventory counts are an excellent way to monitor theft and reduce stock outs.

C. Environmental Damage: Drones with infrared [capability](#) can identify emissions and septic waste runoff. Before drones it was highly difficult to identify conditions requiring environmental remediation. Pinpointing these problems can protect both drinking water and marine wildlife in harbors and waterways.

Conclusion

Recent developments in physical security technology illustrate how innovation can improve the reliability and enhance the performance of security systems. R&D tax credits are available for innovative companies engaged in protecting people, spaces, and material resources.

About the Author

Charles R. Goulding, Attorney/CPA, is President of R&D Tax Savers. Located in Syosset, New York, R&D Tax Savers is an inter-disciplinary firm at the intersection of tax and engineering. Mr. Goulding started this firm in 2005 and it has grown into a National practice with clients in industries ranging from physical security, to software development, all the way to food and beverage. Mr. Goulding spent the majority of his professional career as Vice President of tax at a multi-billion, multi-national industrial company. He enjoys reading about technology, tax and engineering advancements and spending time with his family and friends. Mr. Goulding is also the Mayor of Oyster Bay Cove, a hamlet on Long Island, New York, where he oversees two Village police departments.