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**TacAlert**

*Lightweight, hands-free radiation alerting & guidance system*

*A Product of Alert R&D, LLC*

***October 2017***

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**Executive Summary**

**Our Product**

TacAlert is a revolutionary new product specifically designed for law enforcement to combat the threat of radiological and nuclear terrorism. TacAlert delivers unprecedented single-user situational awareness from its lightweight, inconspicuous passive radiation alerting and locating system (patent pending[[1]](#footnote-1)). The product integrates seamlessly into the existing tactical vests already worn by officers and remains unnoticed until a threat is detected. When a threat is detected our product will use a revolutionary new hands free guidance system to guide them to the location of the threat. This system will allow the officer to keep their eyes and hands free at all times; something that is missing from current technology but crucial to officers successfully responding to potential threats.

**Our Team**

TacAlert is the intellectual property of Alert R&D, a Texas-based limited liability company with two founders who each hold 50% of the equity. The founders have a combined 55 years of radiological science and engineering experience. Holding a doctorate degree in Nuclear Engineering, Dr. Benke is a certified health physicist, entrepreneur in radiation detection and analysis, independent consultant, and FEMA‑trained emergency responder for large-scale radiological incidents. Dr. Hamby holds a doctorate degree in Health Physics, is a Professor at Oregon State University in the School of Nuclear Science and Engineering, and has 6 years of front-line experience as a patrol deputy with the county Benton County Sheriff’s Office. Both hold U.S. patents for radiation detection inventions and continue to pursue innovative advancements in detection technologies through Alert R&D.

**The Market and Industry**

The U.S. Department of Homeland Security has made impressive strides on providing front‑line defense across the country. Procurement of radiation detectors for law enforcement has been and continues to be emphasized. Our initial target market is Law Enforcement Agencies in the United States but we also hope to work with the U.S. Department of Homeland Security.

We have already made contact with multiple Law Enforcement Agencies who are excited to try the product once we have finalized development. There is a strong market for combatting terrorism not just in the United States but across the globe. Just recently the Los Angeles Police Department placed a single order for 1,800 radiation detectors for a total of $2,898,920. Previous products have been developed with a focus on more research and industry based needs, which is why many are handheld and require a user’s full attention. Our product was designed from a tactical standpoint allowing everyday on the ground law enforcement officers to continue their normal functions while also giving them the ability to quickly handle nuclear related terror threats.

**Product Status**

Development of the product is underway. The first prototype is expected by late 2018. The firm currently has a manufacturing chain in place to rapidly scale up production should large orders be placed. We are also developing a demonstration prototype which will allow us to show the product to potential clients by using infrared instead of live radioactive sources. We intend to use this as part of our marketing and sales strategy as we demonstrate our product to potential product users and purchasers.

**Financials**

We intend to offer our first product for $1,976 with the total production cost per unit of $875. Our financials include a very conservative estimate of 9,775 units sold in the first five years of operations. This will generate an estimated $19,315,400 in revenue for these first five years. Of this revenue approximately $8,553,125 will be used to cover product manufacturing cost and $7,260,390 will cover operating expenses. This leaves $4,001,885 in operating income which gives us around a 21% profit margin. Because a significantly lower unit cost is achievable in the future, handsome increases in profit margin and net income are expected as the firm grows.

Another potential source of firm growth comes from government related grants. The founders hope to utilize their collective research portfolio to apply for small business innovation grants. Through our intellectual property and user endorsements from prototypes we hope to position ourselves to be able to secure these grants and then move into large-scale procurements under the main federally funded program.

**Funding**

TacAlert currently seeks an investment of $500,000 for a 20% share in the firm’s profits, placing the current valuation at $2.5 million. As specified in our company agreement, individuals with decision-making authority must hold active positions in the company. Outside investors enjoy fractions of the profit and specify when their shares are sold back to the company. The investment solidifies the team to finalize product development and bring it to market. Specifically, TacAlert consumes this investment within two years of operations, so that by the third year operations will be fully funded through sales revenue.

**Chapter 1: The Company**

Alert R&D, LLC is a technology-based company developing a product, currently named TacAlert, for Law Enforcement Officers (LEOs) and government agents to combat the threat of radiological terrorism. Our first product is a single-user, passive radiation detecting and locating system that alerts the LEO of a potential threat. This product is built on a patented4 process of radiological source localization and threat assessment using a hands-free system to provide directional guidance.

TacAlert was founded to fill a pressing need, currently managed through less sophisticated methods. The Department of Homeland Security states “the President of the United States has described nuclear terrorism as the most immediate and extreme threat to global security.” Any type of nuclear attack would have profound negative consequences in both short and long terms; beyond the physical damage and contamination, the psychological damage to affected populations and communities could be substantial and long lasting.[[2]](#footnote-2) There are a number of ways that a terrorist organization could launch a radiological attack on the U.S. mainland. Nuclear weapon detonation is the most catastrophic. Use of conventional explosives to disperse radioactive materials, commonly referred to as a radiological dispersal device or dirty bomb, is considered the most likely threat. Other methods include sabotaging nuclear reactors, attacking shipments of nuclear and radiological materials, or commandeering radiation generating machines to irradiate unsuspecting members of the public. By empowering LEOs on patrol to track the movement of nearby radioactive material *hands free*, TacAlert substantially enhances individual abilities to disrupt the “most likely threat.”

Sparked by ingenuity and fueled by personal missions to protect our homeland from radiological terrorism, TacAlert was conceived to be the cornerstone of an innovative new business. This product is unobtrusive to the law enforcement officer and allows constant, passive threat monitoring. Being lightweight and operating inconspicuously are key selling points. Even during a radiation alarm, the officer with TacAlert does not concede any tactical advantage while being guided to the source for further investigation.

**Current Company Status (as of the 1st Quarter in 2018)**

Alert R&D, LLC is a Texas-based limited liability company formed in February 2017 by two founders who each hold 50% of the corporate equity. The current workforce includes skilled consultants in nuclear engineering, electrical engineering, tactical deployment, business administration, and finance. The company has filed a U.S. patent application[[3]](#footnote-3) for its invention and is finalizing a demonstration device and a radiological prototype. Beyond broadening their network, the founders have initiated law‑enforcement customer interviews under nondisclosure agreements and are exploring small business funding opportunities such as those with the U.S. Department of Homeland Security.

**Future Company Plans**

Alert R&D plans to expand over the next five years through initial investments, product development funding, and revenue from product sales. Initial offices will open in Corvallis, OR, to host a team of engineers and account executives to complete product development as well as initiate sales and contracts. After a stable revenue stream is established, we intend to offer expanded capabilities and additional products associated with the corporate mission and our core competencies.

**Founders**

Alert R&D, LLC is operated by two successful professionals at the pinnacle of their careers. The founders have a combined 55 years’ experience in radiological science, detection, and analysis as well as 6 years’ experience in law enforcement. Our backgrounds are directly applicable to this industry, and we are uniquely qualified to develop this product. More importantly, we are passionate about radiation detection, disappointed by the lack of innovation in commercial devices over the past 10 years, and have the resolve to do something about it.

**Dr. Roland R. Benke (co-founder)**

Dr. Roland Benke is an entrepreneur in radiation detection and analysis, independent consultant, certified health physicist, and FEMA‑trained emergency responder for large-scale radiological incidents. Dr. Benke holds a PhD in Nuclear Engineering from the University of Michigan, a Masters’ in Radiological Health Engineering, and a BS in Nuclear Engineering. Leading a team of four, he launched a technology-based startup Videnus LLC in 2015, conducted research and development at the University of Texas, and created analytical software to characterize threats of concealed radioactive materials from portable radiation detector measurements. After debuting the first product within 2 years of formation, he has shifted into promoting technological advancements for homeland security and emergency response. Dr. Benke’s novel detection techniques have generated images of radiation sources in three dimensions, and his promotional efforts resulted in project work with the Japan Atomic Energy Agency to map “hot spots” from unmanned aerial measurements of radioactive contamination on the ground surface surrounding the damaged Fukushima-Daiichi reactors. He is the lead inventor on four awarded patents and has more than 20 years of experience related to nuclear engineering, radiological health and risk analysis.

**Dr. David M. Hamby (co-founder)**

Dr. Hamby is an internationally recognized professor with more than $8 million dollars in awarded research grants from agencies such as the National Nuclear Security Administration, the U.S. Department of Defense, the U.S. Nuclear Regulatory Commission, the National Nuclear Security Administration and NATO. Currently a Professor at Oregon State University in the School of Nuclear Science and Engineering, Dr. Hamby holds PhD and MS degrees in Health Physics from the University of North Carolina and a BS degree in Physics. He has served as a city councilman and reviewer on dozens of scientific publications including Nuclear Instruments and Methods, Journal of Statistical Computation and Simulation, Nuclear Science and Engineering, and IEEE Transactions on Nuclear Science. He holds two awarded patents for simultaneous beta and gamma spectroscopy and a skin contamination dosimeter. He also has 6 years of experience on patrol as a sheriff’s deputy in Benton County, Oregon

**Leadership**

Prior to the impending market release of the TacAlert product, the corporate structure of Alert R&D will mature and evolve to better attract additional leaders committed to the mission and corporate growth. Currently, Dr. Benke is the President of Alert R&D, Dr. Hamby is the Vice President, and James Skinner is the Secretary/Treasurer. In the near future, a new entity TacAlert LLC will be formed, with primary shares held by Alert R&D, and a Chief Executive Officer will be named to head the growth of TacAlert LLC and its leadership team.

**Chapter 2: The Product**

TacAlert enables Law Enforcement Officers on daily patrol to adjudicate radiation alarms and identify threats without compromising their own safety or tipping off suspects nearby. These capabilities are derived from a single-user, passive radiation alerting and locating system. Although other natural applications are envisioned for the future, our first product is tailored to law enforcement officers. The system is built on proven detector technology in a configuration that is lightweight and sleek enough to be integrated into the ballistic vests currently utilized by law enforcement. When a threat is detected, the hands-free system will guide the officer directly to the radiation source. **Because no other single-user system delivers this level of situational awareness, the debut of TacAlert represents a paradigm shift in how front-line personnel will respond to and resolve radiation alarms.**

**TacAlert’s Product**

**The Threat**

Recognizing the potential for massive added destruction, long-term disruption, and widespread fear and panic from a radiological terrorist attack, more large cities across the nation are equipping law enforcement and emergency responders with radiation detection equipment. The strong presence of law enforcement officers in our cities not only protects citizens but also deters crime. Assigning radiation detectors to officers deploys a preventive radiation and nuclear detection capability on our streets and in our neighborhoods.

The U.S. Department of Homeland Security is combatting the radiological threat with large government‑funded procurements of commercially available radiation detectors and deployments to large cities throughout the country, including sponsorship of research on innovative and enabling technologies[[4]](#footnote-4). To be considered for these procurements, our personal radiation detector model must comply with the applicable American National Standard.[[5]](#footnote-5) Compliance with this standard is easily achievable, and will be concluded prior to market.

TacAlert’s product is an innovative advancement designed specially to combat a radiological threat in the field. What make our product unique? *Ease of use*, *intuitive source localization* and *hands free guidance*. Time is of the essence when investigating radiation alarms, especially if the source is on the move. Until cleared, every radiation alarm represents an opportunity of detecting a potential threat and, if necessary, to intervene and neutralize that threat before the unthinkable unfolds.

**Existing Equipment**

Currently there is a range of handheld products available for detecting the presence of a radiological threat. Most of these devices are referred to as Personal Radiation Detectors (PRD) or Spectroscopic Personal Radiation Detectors (SPRD). These existing products, and the companies who provide them, are covered in detail in Chapters 2 and 3. Our analysis of the industry reveals limitations in existing products such as a difficulty to manage and use the device in a high intensity, high stress, and time-constrained situation. Additionally, the responding officer must handle the device to analyze its readout. These devices generally have audible and silent alarms, but being worn on the duty belt increases the chance that the LEO misses the alarm.

**Current Problems**

Sight, hearing, and use of their hands are abilities relied on most by law enforcement to assess a situation and detect threats, while protecting themselves during the initial encounter. Unfortunately, current detection equipment puts officers at a tactical disadvantage because operation of the radiation detector requires them to look at the device, sometimes hold the device, and monitor changing radiation levels. During an alarm, current PRDs require the officer to look at and interpret the readout of a small display and make a decision based on this information. To find a stationary source the officer must constantly check PRD indications while on the move. This additional risk is simply unacceptable because it defies the core training and operational principles ingrained into every officer, remaining aware of ones’ surroundings. A mobile source is even harder to find; current technology often does not provide enough information to find a mobile source before it is out of range. In an interdiction opportunity or terrorist situation, the officer needs to have his/her hands and eyes free as much as possible and should not be forced to analyze and interpret a changing readout[[6]](#footnote-6).

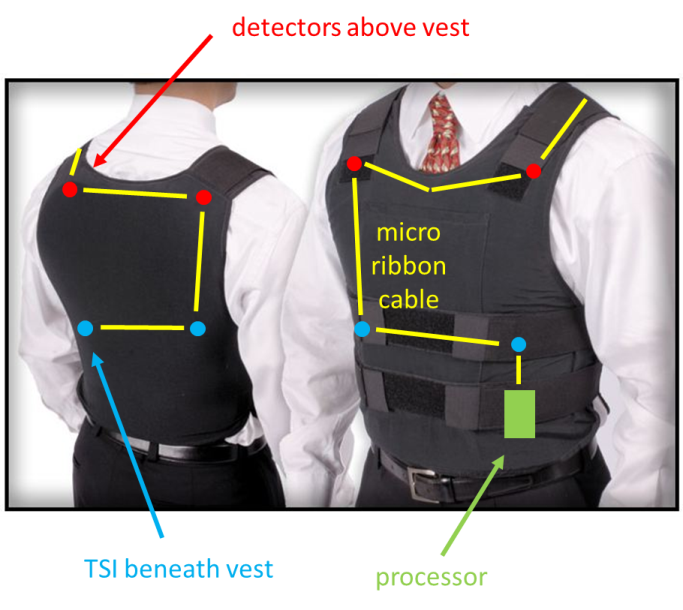
Because PRDs are very sensitive detectors, they often alarm at low levels in response to residual amounts of radionuclides in medical patients, fluctuations in naturally occurring radioactivity, or legitimate, licensed radioactive sources in transport. For each alarm, an officer must decide on the nature of the source and the next course of action. With our product, the officer will rule out non-threating alarms much more quickly and with greater ease.

**TacAlert’s Product and Solution**

TacAlert combines proven detection technology and patented innovations to solve these problems, thus filling a pressing need for a better solution. Our hands-free technology (patent pending[[7]](#footnote-7)) allows TacAlert to detect, locate, and guide the LEO directly to (or away from) the radioactive source. By knowing the location of the source, the officer can react with greater confidence when the alarm indicates a potential threat or subtle reassurance confirming elevated radiation levels associated with an alarm triggered by non-threating sources of radiation.

Ballistic vests are already standard equipment for uniformed officers, so initial TacAlert models will simply become an integral part of the equipment (Figure 2.1). Alternatively, the device functions perfectly well as a single unit worn by a plain-clothed law enforcement officer. Later software developments could allow multiple devices to be combined with GPS to enable citywide source location capabilities.

**Figure 2.1: TacAlert product design**

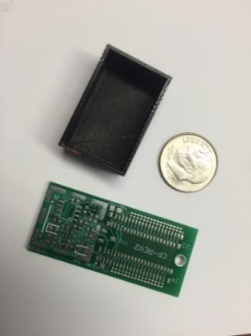


**How it Works**

The TacAlert device is simple to use. At the beginning of each shift, the officer activates the unit. On initial power-up, the unit makes a background radiation measurement and all indicators operate to show that the overall system is ready. The LEO then goes about his/her shift as normal.

When a detector (Figure 2.2) senses radiation levels above one of the proprietary set points, an alarm will occur and the officer automatically receives notification by the directional haptic system . Not having to operate or respond to the unit in any way, the officer’s line of sight and hands remain free as the system guides the officer to the source location. Alert R&D is also developing a training apparatus so that officers will become confident with the system. Our non-radiological training apparatus is a wonderful promotional tool for engaging and impressing customers because it provides realistic LEO‑system interactions in demonstrations without introducing health risks from radioactive sources.

**Figure 2.2: Radiation detector circuit board**

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**A Scenario**

An officer is on patrol in a downtown carnival. It is crowded, nice to see neighbors and fellow citizens enjoying themselves, and the officer’s job to keep it that way. The environment is challenging and loaded with distractions, loud noises, and highly variable lighting. *Under these and similar conditions, officers are simply unable to hear and see the respective audible and visual alarms from commercially available devices, worn on the duty belt or certain parts of the body, and regrettably officers also complain that vibration sensations from a belt-worn PRD are not strong enough to be completely reliable in this environment.* The temperature is cool, and a clean-cut young man passes by with a stroller. The canopy is closed, and his bundle of joy is snuggled underneath a couple baby blankets. It is a dirty bomb. The officer’s PRD alarms but those cues go unnoticed.

Thirty minutes later, her PRD alarms again as she runs to the detonation site, secures the scene, and renders aid to the wounded. She is smart, well trained, and uses the PRD to convince the arriving paramedics that it is safe enough to enter and remove the wounded (in spite of the radioactive contamination and ambient dose rates at levels one-hundred times greater than natural background—levels that she has never seen or been in before), and proceeds to usher the uninjured to areas with lower dose rates.

Was it the live music, flashing lights, or warmer clothing? Some or all of them? The federal investigators’ discussion continues, while their director is being pressured by the governor for a report on the lessons learned. The fact is an opportunity was missed that night. The investigators check the time stamps of the radiation alarms and fixate on those brief moments half an hour before the chaos when radiation levels gradually rose and then dropped. Now the officer recalls seeing the stroller from afar—he passed no more than 20 yards behind her. How could this happen in a city with thousands of radiation detectors on the street? The units are new, and the officers have been trained. How?

**The Reason & Motivation**

Public acceptance is predicated on current knowledge. There is no negligence when appropriate measures are taken. The public does not know what new capabilities and features are possible until they hit the market. In other words, nobody knows that a paradigm shift is coming with how law enforcement will be alerted to and respond to radiation alarms.

As a technology developer, we know what is possible. In fact, it is our business to know. Moreover, because we know, we are obligated to do something about it. Compelled to minimize missed opportunities on the front lines, we see the paradigm shift and are pushing hard to make it a reality, one unit at a time. “Avoid headlines; catch it at the front line.”

**Basics of Ionizing Radiation**

**Radioactivity**

Radioactivity is defined as the emission of subatomic particles (e.g., alpha, beta, neutrons) or ionizing electromagnetic radiation (e.g., X-rays, gamma rays) caused by the spontaneous transformation of atomic nuclei. The activity of a given radioactive (unstable) substance is the rate of nuclear transformation. Nuclear transformation is commonly referred to as radioactive decay due to characteristic emissions of subatomic particles and electromagnetic radiation (hence “radioactive”) as the nucleus transforms into a different element (hence “decay”)[[8]](#footnote-8).

**Radiation Dose**

Radiation dose (also called Absorbed Dose) is a basic quantity used to describe energy absorption in a given material. Dose is the mathematical ratio of total absorbed energy to the mass of material in which that energy is absorbed. The units of absorbed dose include the rad and the Gray (Gy). One gray equals one joule of energy absorbed in one kilogram of matter. One rad is 1/100th of a Gray.

**Exposure**

Exposure is a quantity that describes the charge created as electromagnetic radiation traverses air. It is measured in units of Roentgen (R) or charge per kilogram of air, C/kg. Exposure is defined only for air and only for electromagnetic radiation (gamma rays and X rays). For notational simplicity, a single term gamma rays is used hereinafter for both gamma and X rays[[9]](#footnote-9).

**Ionizing Radiation**

Radiation is said to be ionizing when it is energetic enough to ionize atoms and liberate electrons from their atomic shells. Ionizing radiation can be harmful to humans due to cellular damage and increased free radical production in the body. When the extent of damage exceeds the capacity of the body to repair itself from a high radiation dose, the loss of cellular function from unrepaired or incompletely repaired cells progresses to impaired tissue function, observable health effects, and clinical symptoms. When the received radiation dose is too small to induce these deterministic health effects, but sufficient enough to overwhelm repair mechanisms that lead to inhibited cellular growth regulation, small increases in the incidence rate (or probability) of cancer, compared to “natural” causes, are attributed to the radiation dose.

Although many other forms of radiation are around us daily, the specter of harm and fear is firmly affixed to ionizing radiation. Commonplace examples of nonionizing radiation are radio waves, microwaves, visible light, and infrared radiation. Ultraviolet radiation falls at the edge of the ionization threshold. Sunlight includes ultraviolet radiation. Due to its lower energy, ultraviolet radiation does not penetrate beyond the layers of skin, but rather deposits all of its energy in the skin. Too much unclothed exposure to sunlight leads to ultraviolet radiation burns of the skin, more commonly referred to as a sunburn. Beyond sunburns, ultraviolet radiation exposure is attributed to an increased incidence of skin cancer. Lotions applied to the outer layers of skin, called the epidermis, noticeably increase the absorption of ultraviolet radiation by the epidermal layers, thereby protecting the underlying, sensitive layers of the dermis[[10]](#footnote-10).



**Handling Nuclear Threats**

**Imminent Threat**

Considering the variety of radiation types, conventional sources, opportunities for diversion, and extent of negative impacts from malicious uses, radioactive materials emitting ionizing radiation in the form of gamma rays and X rays represent the most likely threat due to their ability to penetrate the human body and damage highly sensitive internal organs. Unfortunately, lotions and clothing provide no protection.

Although neutron exposure can also be harmful to humans, neutron emission is a known signature of and “smoking gun” for special nuclear material. Nuclear weapons are made from special nuclear material. The ominous danger from a nuclear weapon attack needs no further explanation.

For these reasons, the worldwide campaign on preventive radiological and nuclear detection concentrates on gamma rays, X rays, and neutrons[[11]](#footnote-11). Instruments in this market sector are sold for **preventive radiological and nuclear material detection**. Even under the Securing the Cities[[12]](#footnote-12) initiative, neutron detection is a specialized case. Communities receiving funds under this initiative are primarily tackling the gamma ray and X-ray detection challenge. Market forces confirm that TacAlert’s approach to enter the market without neutron detection is not only well founded, but also supported by several other new radiation detector manufacturers. After achieving market validation and growth with TacAlert, more of our attention can be devoted to neutron detection.



**Preventive Radiological and Nuclear Material Detection**

Detecting radiological and nuclear material requires sensitive instruments, especially when the location of a radioactive source is unknown and detectors are not placed next to the source. In many situations, shielding placed around radioactive materials significantly reduces radiation levels in the surrounding area compared to those from the unshielded material. With shielding, these materials can be handled (e.g., physically moved) more safely without subjecting individuals to much larger radiation doses. Because radiation levels outside the shielding containers are significantly reduced, it is also more difficult to detect the presence of shielded sources. In other words, shielding can be used to conceal the radioactive materials from detection. The mission of preventive detection is to detect and interdict unauthorized radiological and nuclear material and thereby prevent adverse consequences from their unauthorized use.

**Natural Background Radiation Complicates Threat Detection**

Natural background radiation occurs from terrestrial and cosmic sources, and the concentrations of naturally occurring radioactive material found in air, water and soil vary around the globe. Personal radiation detectors are sensitive instruments capable of registering background radiation. Because the detection signal from a radiation source diminishes with distance, personal radiation detectors strive to distinguish small signals from clandestine radiation sources apart from the variable composite signal of natural background radiation that fluctuates based on location, the time of day, and season. It is important that detectors used for preventive detection and intervention do not repeatedly trigger “false alarms” due to fluctuations in the naturally occurring background.

Trigger levels or set points of PRDs allow for fine-tuning of instrument sensitivity and alarm thresholds. It would be highly inefficient to have the LEO burdened by numerous daily alarms from natural background variations. Typical thresholds or trigger levels are set high enough to result in acceptably low rates of false alarms, but low enough to have a relatively high reliability for detecting the presence of radioactive material above background.

**Personal Radiation Detectors (PRD)**

Personal Radiation Detectors (PRDs) are small radiation-sensitive instruments with at least two alarm levels. Designed for radiation fields with very low to moderate dose rates, general‑purpose PRDs record current radiation levels, from the presence of natural background and the presence of additional radioactive sources, and provide real-time indications of absorbed dose rate for the wearer. For high and very high dose rates that might be encountered during emergencies, extended range units alleviate the inherent lack of additional information provided by an off‑scale indication from general‑purpose PRDs, and maintain functionality for preventive radiological and nuclear detection. For extremely dangerous radiation fields, personal emergency radiation detectors and monitors provide full functionality for the highest ranges of dose rates and harshest environments.

PRDs detect gamma rays, but specialized units detect both gamma rays and neutrons. Typically clipped to an individual’s belt, PRDs are used by agents in law enforcement, border protection, and homeland security. For its higher unit cost, a spectroscopic PRD (SPRD) differentiates the amount of gamma-ray energy deposited, which enables nuclide identification as well as enhances the detection, identification, and categorization of radioactive material present above natural background[[13]](#footnote-13).

**TacAlert**

Initial TacAlert models will be manufactured with scintillation detector technology. As ionizing energy is absorbed in the scintillator, a flash of light is produced that is proportional to the amount of energy absorbed. This internal light is then collected and analyzed. The TacAlert device is designed to respond to the rate at which light flashes are generated and the intensity of the flash.

The initial TacAlert models will be classified as PRDs. Because the TacAlert design is expandable, building-in enhanced operational features and crossing over into adjacent market areas, which may involve reclassifying future models, will be considered during the growth phase of the company.

**Chapter 3: Market and Industry Analysis**

TacAlert is being developed for law enforcement officers in order to combat the threat of nuclear related terrorism. Even though the company is initially targeting a specific market, the product and its underpinning of intellectual property and advanced technologies relate to three large, well‑established industries, which provide tremendous opportunities for future growth. The first is the very large nuclear and radiation industry that encompasses electrical power generation, academia, geology, the medical field and radiation detection, to name a few. The second major market is homeland security and law enforcement, both of which rely heavily on radiation detection to keep the public safe from the threats of terrorist attacks with nuclear and radiological materials[[14]](#footnote-14). The third major market that TacAlert will operate in is the software, hardware, electronics, and technology industries. Within this market, TacAlert represents wearable technology and personal guidance systems.

Our initial target market will focus primarily on the radiation detection industry. The overall radiation detection industry is shaped by 4 to 5 major competitors who generally offer a broad range of products covering additional markets. For instance, Mirion Technologies is largely involved in the nuclear industry and recently acquired Canberra Industries, a radiation detector manufacturer. Offering imaging devices for numerous different applications, FLIR is a major competitor with radiation detection representing a very small part of their product offerings. Thermo Fisher Scientific has a strong presence in the PRD market, but also offers products for applications in the life sciences, academic, research, and medical fields.

In addition to these large companies, a number of smaller companies focus on niche areas in the detection market. Many of these smaller firms focus primarily on detection related devices that fill a particular industry need. Our market analysis found that many of these firms started in academic research and often work closely with government agencies during the research and development of new products.

Overall, the industry is driven by the need for innovation, both domestically and internationally. Products enabling constant surveillance and detection of potential radiological threats are in demand. In this market, innovation is derived from academic research, internal business research and development, and government-funded grants awarded to businesses operating in the industry.



**Initial Target Market**

TacAlert offers operational benefits to law enforcement, homeland security, border security, and transportation safety. These target markets are both healthy, as evidenced by recent purchases and the urgency of escalating US Government investments, and accepting of new technologies to satisfy mounting pressure from end users for more advanced PRDs. TacAlert will initially focus on domestic markets, but growth into international markets can be expected after the product’s value to customers is established.

The law enforcement market is the entry point for TacAlert for two reasons: (1) a pressing need for increased security from terrorist and radiological threats by governmental agencies seeking and investing in the newest technology; and (2) TacAlert’s intrinsically superior mode of operation for these customers compared to existing systems that are not purpose designed.[[15]](#footnote-15)

**Initial Target Market Size**

TacAlert’s initial target market is law enforcement officers, particularly sworn officers who actively patrol and protect citizens across the United States. The market size is determined from a comprehensive report compiled by the U.S. Department of Justice. Reliable data from 2012 were used in this analysis even though the overall market size has grown since that time. Specifically, the Annual Survey of Public Employment and Payroll (ASPEP) provides a detailed overview of sworn officers by state, as reproduced in Appendix 3.1. Although other front-line agents from the U.S. Customs and Border Protection, U.S. Department of Homeland Security, the U.S. Transportation Safety Administration, and U.S. Coast Guard represent an appreciable market share, this analysis is dedicated to local law enforcement officers covered in the survey.[[16]](#footnote-16)

Based on an estimate of 625,668 sworn officers across the 50 States in 2012, Table 3.1 indicates that capturing 2% of the market equates to nearly $25 million in revenue. In other words, for every 100 officers, a department would have on average two deployable TacAlert systems. Currently, radiation detector deployment to officers has concentrated on large cities, borders and ports of entry, and communities along frequently traveled routes for nuclear and radioactive material transportation. Although jurisdictions with radiation detection equipment typically exceed 2% coverage, many others do not possess or maintain up-to-date radiation detection equipment.

**Table 3.1:** Market Size, Unit Sales and Revenue (0.5% to 2% of Market)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Officer Utilization** | 0.50% | 1.00% | 1.50% | 2.00% |
| **Total Units Sold** | 3,128 | 6,257 | 9,385 | 12,513 |
| **Total Revenue** | $6,100,263 | $12,200,526 | $18,300,789 | $24,401,052 |

In Table 3.2 we see a higher estimate of sales that extends to 12% of officers being equipped with one of our units. This would put the firm at almost $150 million in annual revenue. To determine the usage we can analyze the existing Los Angeles purchase of 1,800 units. For nearly 10,000 officers, their utilization rate stands at around 18% or 18 units for every 100 sworn officers.

**Table 3.2:** Market Size, Unit Sales and Revenue (4% to 12% of Market)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Officer Utilization** | 4.00% | 6.00% | 8.00% | 10.00% | 12.00% |
| **Total Units Sold** | 25,027 | 37,540 | 50,053 | 62,567 | 75,080 |
| **Total Revenue** | $48,802,104 | $73,203,156 | $97,604,208 | $122,005,260 | $146,406,312 |

This initial market analysis serves as input to our early sales forecasts including a high-end cap on estimated sales. Our financial estimates are significantly lower than the high-end market estimates with our estimated five years sales forecast being far less than 1% of the potential domestic market. Our potential market capture estimates are low, but we will actively pursue higher sales volumes. These estimates also do not take into account international sales or the expansion of new product lines or other product uses. For example, next stage markets could include border patrol officers or use by the military.

**Market Analysis of Radiation Detection Industry**

We conducted a detailed analysis on firms operating in the radiation detection industry. To be included in this market research, the firm either offers a personal radiation detector or has the organizational know how to develop one in the near future. This analysis found more than 70 firms that were operating in this market, and a summary of these firms is provided in Appendix 3.3. Of these firms, only 16 offered a competitive product. Chapter 4 presents an analysis of the 16 firms who offer a competitive product and their individual product lines.

**Firm Analysis**

To be considered as a current competitor, a firm must offer a personal radiation detector (PRD) or a spectroscopic personal radiation detector (SPRD) that is small and durable for use by active-duty law enforcement officers. Most firms analyzed were clearly not competitors, but approximately nineteen possess the organizational knowhow to create a PRD or SPRD. Of those organizations with capabilities to develop a competitive product, most are not high-level threats because they operate primarily in entirely different sub-industries such as medical dosimetry, electrical power production, and large-scale detector systems. Nine firms were seen as higher-level threats with a product that could be used for homeland security (Table 3.3).

**Table 3.3:** TacAlert Industry Analysis

|  |  |  |
| --- | --- | --- |
| **Competitors** | | |
| Yes | Offers Competitive Product | 9 |
| Potential | Has Technological Capability to Develop Product | 19 |
| No | Most Likely Not Competitor | 49 |

The analysis of 77 firms operating in the nuclear industry showed that they operated in multiple industries. Figure 3.1 shows the diverse range of industries of which they are part. One point of note is that detector companies were listed separately, but detectors are usually purchased for their use in specific industries, e.g, medical or research.

**Figure 3.1:** Market Analysis by Industry of Similar Firms

Of the firms analyzed, more than 60% could be considered a large company (Figure 3.2). Generally, these larger firms offered a diverse range of products with nuclear related equipment being a part of their product offerings. For instance, Toshiba is a large international company that offers a range of medical products, some of which utilize nuclear or radiation based technology. Another important part of the industry analysis is that many of these firms operate across multiple industries.

**Figure 3.2:** Estimated Size of Firms in Industry

The majority of firms analyzed operate in the detector, nuclear or medical business (Figure 3.1). A few of the firms are specialized distributors without engineering or manufacturing capability that simply sell detection products (Appendix 3.2). Some of the firms specialize in homeland security products and receive large grants, including single development grants of a few million dollars or more. Regardless, there is a high degree of overlap; for instance, a company primarily operating in the nuclear energy industry may also provide products to academic and research customers. Detector firms specializing in dosimetry, that sell products to the medical and electrical power generation industries, serve as additional examples.

**Short Term Future Market Expansion**

A number of markets not analyzed would be fairly easy for TacAlert to move into during its early stages. These markets are accessible with our current product and technological capabilities. Because innovation is a hallmark of Alert R&D, the company will be regularly assessing new market areas and tailoring existing products for new customers.

**Border Security**

Multiple types of detection systems are currently utilized to secure the U.S. borders. The U.S. Department of Homeland Security (DHS) is actively working to enhance security, and our product could be adapted to monitor borders for the surreptitious introduction of radioactive sources. Some of the firms examined already manufacture radiation detection systems for inspecting freight and vehicles, but they are large stationary devices, not intended for rapid localization and adjudication of potential threats from roaming surveillance or portable survey measurements.

**Government Grants**

Not considered as a traditional market, government grants are an incredibly important opportunity. These grants span a large number of needs across multiple industries. We will pursue grant opportunities that fit our organizational capabilities. In 2016, DHS issued multiple grants and awards to radiation detection companies. Four of these grants totaled more than $17.5 million and were awarded to companies for developing detection technologies related to specific DHS missions and applications.

**International Markets**

Because TacAlert embodies a paradigm shift in user operation, international interest will pique after the product’s value is demonstrated in the United States. We would likely expand into Europe next and globally from there, as the firm begins hiring staff with experience in handling international contracts and sales in those locations. Beyond the current protection of the US patent application, the founders of Alert R&D will assess the need for pursuing international patents.

**Chapter 4: Competitor Analysis**

The TacAlert product is unique. No other single-user radiation detection system addresses the inherent challenges of law enforcement applications. The hands-free operation and personal guidance capabilities are new to this field and are unavailable in competitor’s products.

From a broad analysis of our competitors, sixteen firms currently offer about sixty products and models that could be selected instead of TacAlert. It is important to note that while there appear to be a large number of product lines, these products are all very similar. Most of their differences are generally associated with typical specifications for detection efficiency, durability, detection capability, user interface, and network capabilities.

**Product Analysis**

Sixty products, offered by 16 firms (Table 4.1), cover the available range of Personal Radiation Detectors, Spectroscopic Personal Radiation Detectors, or handheld radiation detectors. DHS guidelines and regulations were utilized when analyzing products. A complete summary of all products is found in Appendix 4.1.

PoliMaster, Thermo Fisher Scientific, and Mirion Technologies offer the largest range of radiation detection models. Of the sixteen firms, eight firms offer a product considered to be serious competition. Many products are very similar and offer slight variations related to factors such as gamma-ray detection sensitivity, scintillator type, durability rating, and battery life.

**Table 4.1:** Total Competitor Product Offerings

|  |  |
| --- | --- |
| **Company** | **Total Products** |
| Polimaster | 23 |
| Thermo Fisher Scientific | 10 |
| Mirion Technologies | 5 |
| Arrow Tech | 3 |
| FLIR | 3 |
| RAE Systems | 3 |
| Sensor Technology Engineering | 3 |
| Berkeley Nucleonics Corporation | 2 |
| Bubble Technology Industries, Inc. | 1 |
| Canberra | 1 |
| Environmental Instruments Canada | 1 |
| Kromek | 1 |
| Passport Systems | 1 |
| Radcomm Systems | 1 |
| Saphymo | 1 |
| Technical Associates Nuclear Instruments and Systems | 1 |

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**U.S. Department of Homeland Security Product Analysis**

The U.S. Department of Homeland Security (DHS) recently conducted their own product analysis of PRDs and SPRDs for active threat monitoring[[17]](#footnote-17). Each firm analyzed by DHS was also included in our analysis, but DHS was more restrictive, examining only eight potential firms. DHS identified twenty potential detectors currently on the market meeting basic requirements for PRDs or SPRDs (Table 4.2).

**Table 4.2:** Total Competitor Product Offerings from DHS Research Study

|  |  |  |
| --- | --- | --- |
| **Company** | **Detector Type** | **Total Products** |
| PoliMaster | PRD | 4 |
| Mirion Technologies | PRD | 1 |
| Technical Associates Nuclear Instruments and Systems | PRD | 1 |
| RAE Systems | PRD | 1 |
| Sensor Technology Engineering | PRD | 1 |
| Thermo Scientific | PRD | 3 |
| **Total PRD** | **PRD** | **11** |
| FLIR | SPRD | 1 |
| Mirion Technologies | SPRD | 1 |
| PoliMaster | SPRD | 4 |
| RadComm | SPRD | 1 |
| Thermo Scientific | SPRD | 2 |
| **Total SPRD** | **SPRD** | **9** |
| **TOTAL DETECTORS** | **PRD + SPRD** | **20** |

Because many of TacAlert’s enhancements exceed the basic operational requirements stipulated by government agencies, our competitive landscape would most likely fit the narrower field seen in Table 4.2. As previously stated, TacAlert’s hands-free operation is unique among the group and a welcomed attribute for many law enforcement officers who are already equipped with PRDs. Although TacAlert’s personal guidance system for intuitive stealth notification and localization of radiological sources has the potential to cause market disruption, this government-funded market responds more slowly compared to mainstream consumer-based markets. The slower market response has been factored into our analysis to avoid overly optimistic growth projections.

**Product Cost**

TacAlert will be sold at a competitive price. Pricing in the detector industry is subject to some level of fluctuation for large-scale contracts. Many firms do not list product prices, but instead ask the consumer to contact the firm for pricing. Utilizing data from the DHS study (Table 4.3), we found that the average cost of a PRD was $3,478 and the average cost of an SPRD was $5,237. The average for detectors of both types was $4,270.

**Table 4.3:** Average Detector Costs from DHS Study

|  |  |  |
| --- | --- | --- |
| **Detector Type** | **Average Cost** | **Total Detectors** |
| Average PRD Cost | $3,478 | 11 |
| Average SPRD Cost | $5,237 | 9 |
| **Average Detector Cost** | **$4,270** | **20** |

**Competitor Analysis Conclusion**

In conclusion, TacAlert will enter its target market in a strong position to become the device of choice for law enforcement officers. TacAlert’s intrinsically superior mode of operation will make it attractive within the law enforcement community. Beyond that incentive, TacAlert is expected to debut with fewer features compared to more mature devices. Because simplicity and ease of use are highly regarded in this particular market, fewer features will not draw the same cause for concern. Beginning before and continuing after TacAlert’s release, we will poll anticipated customers and actual end users for feedback on essential and desired features for future models.

**Chapter 5: Overall Schedule (5 year plan)**

This chapter provides a brief overview of TacAlert’s plans to bring our product to market and grow revenue. There are a number of goals we will work toward: (1) finalizing our customer ready product; (2) protecting our intellectual property; (3) securing an investment; and (4) meeting or exceeding our sales goals. Another important part of firm growth over the next five years will be the ability of leadership to build a talented and driven team of engineers, sales representatives, and business staff.

Our current sales estimates put our five year total at 9,775 units. If firm growth is achieved more rapidly, due to shifting political trends or global events that lead to an increase demand for deterrents to nuclear terrorism attacks, we would expand to accommodate the higher production and servicing volume.

The schedule shown below is a guideline dependent on many factors, but most of the major milestones will need to be met for us to achieve long-term success. In our Operations Plan (Chapter 7) we lay out our strategy for hiring and building a team. We also lay out our strategy to be able to handle scaling if the company grows above the estimated five years sales plan we lay out below.

Our overall goal is to pursue a strategy of revenue-driven expansion. The founders have already adopted a lean business model by bootstrapping the entire product development process, all hiring, contract labor, and legal & intellectual property aspects of the company. Given the formidable research backgrounds of both founders and rapid progress made to date with prototype development, government-sponsored small business projects may obviate the need for outside investments during the first 5 years of development. Additional financing might be considered if it allows us to realize other markets, new product lines, or new manufacturing enhancements, provided that those outcomes do not significantly raise long-term overhead costs.

**TacAlert Key Milestone Categories**

Major milestone types are outlined in eight major categories that are shown in Table 5.1. We go into detail about each of these categories below.

**Table 5.1:** TacAlert Key Milestones

|  |  |
| --- | --- |
| **Category Type** | **Category Code** |
| Leadership | Go |
| Staffing and Hiring | SH |
| Investment | IN |
| Product Development | PD |
| Sales Goals | SG |
| Legal and IP | IP |
| Manufacturing and Facilities | MF |
| Financial | FI |

**Leadership**

TacAlert has already begun to establish a core leadership team. We feel that the ability to bring in key leaders is what will ultimately lead to firm success. Table 5.2 lays out some of these key positions including bringing in firm vice presidents and chief executive level positions. We also have plans in order to bring in a Board of Directors.

**Staffing and Hiring**

Staffing and hiring goals will be very important to the overall success of TacAlert. For this reason we plan to focus on setting and meeting goals that will foster a highly qualified and motivated team who align with our vision. Our first key milestone will be bringing in a CEO who will oversee the execution and strategic direction of TacAlert. The next milestones will include building a team of engineers and account managers. Finally, when we expand into our first office we will also bring in business related staff to help with hiring, administration and company related activities. The manufacturing arm will require the next level of staffing.

**Investment**

Pursuit of government-sponsored research and development projects is advantageous because those investments do not dilute company equity. If TacAlert secures an outside investment, achievement of intermediate performance metrics and providing the anticipated return on investments are paramount.

**Product Development**

Product development milestones include developmental achievements (and costs) for current and future products including research and development goals and manufacturing efficiency. As a product-driven company, these goals and timelines will be crucial to firm operations and diligence will be taken to track progress. We plan to utilize technology-based products to streamline development and team interaction. This includes, for example, allowing engineering teams to operate with software they find most effective for our needs.

**Sales Goals**

The ability to create relationships with future customers and secure both small and large contracts will be crucial to our success as a company. Reasonable-to-aggressive sales goals will ensure that we are doing everything possible to increase revenue. Initial missionary sales contacts will be of extreme importance. We will create sales teams of two employees each, one who specializes in sales and one who is expert in tactical gear and law enforcement. TacAlert plans to nourish a sales strategy built on relationships and trust, and will always put the customer first. A long-term goal is turning initial customers into repeat customers. Our sales goals will include rewarding account executives for meeting those goals and for establishing long-term customer relationships.

**Legal and IP**

In light of its multiple end uses, legal and intellectual property milestones are essential to the protection of TacAlert. By securing patents and employing commonsense approaches to protect against the reverse engineering of our products, our entry into this highly specialized market will leave large barriers for our competitors to overcome before offering a compatible product. If we decide to pursue international markets, international patents could provide an additional competitive advantage. We except that international patents and overseas sales could result in higher costs, so we intend to keep our initial focus on the domestic market. The added challenge of penetrating into international markets might create an option for licensing the intellectual property to companies who are more established in those specific markets.

**Manufacturing and Facilities**

One of TacAlert’s first goals is to secure office space. In the near term, we plan to open an office in Corvallis, OR, ultimately collocated with manufacturing. Later the firm may establish a manufacturing location in Austin, TX, and overseas location to assist with European sales. The five-year plan, however, focuses on US operations.

**Financial**

Financial goals will be used to track and encourage growth, analyze performance and insure the ability to meet short-term financial needs. Many of these will be tracked and measured utilizing traditional accounting methods and financial ratios. A few important areas we are already using include firm revenue, operating margin and net profit margin. We will also use current industry standards to benchmark our performance. Our current two largest goals include creating and growing revenue and operating efficiently. These goals are significant for firm growth, in that if we do not meet financial goals, other goals will slip in the schedule.

**TacAlert Key Milestone**

TacAlert has a number of milestones that are key to our success. Milestones (Table 5.2) are based on projected sales and are distributed according to the year and fiscal quarter in which we anticipate their occurrence. These milestones build upon each other and, given sales beyond expectation, it is possible this timeline becomes condensed to a shorter duration. It is our goal to grow as quickly as possible, but to do so in a fiscally responsible manner.

**Table 5.2:** TacAlert Five Year Schedule

|  |  |  |  |
| --- | --- | --- | --- |
| **Year and Units Sold** | **Task** | **Category** | **Quarter** |
|
|  | | | |
| Year 1 2018 | Company formation (Pres & ExVP) | LE | 1 |
| Bring on Firm Leadership (4) | LE | 1 |
| Begin developing Business Plan | IN | 1 |
| Begin interviewing customers | PD | 2 |
| Hire CAD engineer (1) | SH | 2 |
| Hire electrical engineer (1) | SH | 2 |
| Hire manufacturing engineer (1) | SH | 2 |
| Hire design engineer (1) | SH | 2 |
| File patent application | IP | 3 |
| Complete first product IR demo | PD | 3 |
| Complete business plan first draft | IN | 3 |
| Hire VP of Engineering (1) | LE | 3 |
| Hire VP of Marketing (1) | LE | 3 |
| Reconcile business plan and financial figures | IN | 4 |
|  | | | |
| Year 2 2019 (100 units sold) | Begin work on radiation detectors | PD | 1 |
| Send whitepaper to DHS S&T | IN | 2 |
| Finalize professional grade IR demo | PD | 2 |
| Establish Corvallis office | MF | 2 |
| Apply for Homeland Security funding | IN | 3 |
| Finalize radiation prototype | PD | 3 |
| Show DHS compliance w National standards | PD | 3 |
| Hire Sales Account Manager (Team 1) | SG | 4 |
| Hire Technical Sales Specialist (Team 1) | SG | 4 |
| IR Demo and Radiation Prototype to agencies | SG | 4 |
| Fabricate and field test loaner models | PD | 4 |
|  | | | |
| Year 3 2020 (1,250 units sold) | Apply for $500,000 in Angel funding | IN | 1 |
| Establish Corvallis manufacturing site | MF | 1 |
| Hire FT Electrical Engineer (1) | SH | 1 |
| Hire FT Account Executive (1) | SH | 1 |
| Product refinement for production | PD | 2 |
| Deliver first products | SG | 2 |
| Hire Sale Account Manager (Team 2) | SH | 3 |
| Hire Technical Sales Specialist (Team 2) | SH | 3 |
| Deliver small orders | FI | 4 |
|  | | | |
| Year 4 2021 (2,750 units sold) | Hire Electrical Engineer (1) | SH | 1 |
| Hire FT Electrical Engineer (1) | SH | 1 |
| Hire FT Account Executive (1) | SH | 1 |
| Hire FT Administrative Assistant (1) | SH | 1 |
| Hire Interns | SH | 1 |
| Hire Sales Account Manager (Team 3) | SH | 3 |
| Hire Technical Sales Specialist (Team 3) | SH | 3 |
| Hire Administrative Assistant (1) | SH | 3 |
| Large-scale field testing | PD | 4 |
| Deliver medium orders | SG | 4 |
|  | | | |
| Year 5 2022 (5,675 units sold) | New generation model development | PD | 1 |
| Hire FT Nuclear Engineer (1) | SH | 1 |
| Hire FT Electrical Engineer (3) | SH | 1 |
| Hire FT Software Engineer (3) | SH | 1 |
| Hire FT Account Executive (3) | SH | 1 |
| Hire Administrative Assistant (1) | SH | 1 |
| Hire Business/Accountant (1) | SH | 1 |
| Hire Web and Graphic Designer (1) | SH | 1 |
| Hire Office Manager (1) | SH | 1 |
| Hire Human Resources (1) | SH | 1 |
| Establish Board of Directors | LE | 3 |
| Deliver large orders | SG | 4 |
|  |  |  |  |
| Categories: LE – Leadership; SH -- Staffing and Hiring; IN – Investment; PD -- Product Development; SG -- Sales Goals; IP – Legal and IP; MF – Manufacturing and Facilities; FI – Financial; FA -- Facilities | | | |
|

**Chapter 6: Management and Human Resources**

TacAlert recognizes that our firm’s success is tied directly to the strength of the founders and the leadership team. We will operate in a technology sector that relies on highly educated employees, often with years of specialized experience. TacAlert expects, therefore, to pay higher than average salaries and work to create an environment that makes it possible to attract and retain top talent.

One of the ways we plan to do this is through creating a company culture that centers on empowering employees and rewarding innovation. We plan to offer competitive pay, generous benefits, and an engaging and positive work environment. Technology companies generally have smaller and higher paid staff, but still generate high profit margins through the value of the intellectual property they create.

In the early stages of the firm, we may not be able to offer salaries as high as when revenue begins to grow. To compensate for this we plan to offer equity, stock or profit shares to early employees. As the company grows, we intend to offer stock options to increase employee loyalty.

**Firm Staffing**

TacAlert will employ a number of different employee types that are needed to manage and operate a technology-based firm. The company core will rely on the engineers needed to design, build and implement new products. We anticipate hiring several types of engineers, but see electrical and nuclear engineers as critical to our success. As the firm grows, we anticipate additional hiring in the areas of software, industrial, design, and manufacture engineering.

**Employee Levels**

TacAlert will hire employees within three general tiers (Table 6.1). This will include entry, mid, and senior-level employees. These categories are based primarily on years of applicable experience and/or technical degree level. Hiring-level guidelines are used to provide salary recommendations and to assign levels of responsibility.

**Table 6.1:** TacAlert Hiring Levels

|  |  |  |  |
| --- | --- | --- | --- |
| **Level** | **Category** | **Relevant**  **Experience** | **Degree**  **Level** |
| 1 | Entry | 0 to 3 years | BS |
| 2 | Mid | 3 to 8 years | MS |
| 3 | Senior | >8 years | PhD |

**Employee Types**

To cover major company functions, TacAlert will initially employ personnel in one of six categories: (1) Leadership; (2) Engineering; (3) Production; (4) Finance; (5) Marketing and Sales; and (6) Administration. In the early years, most employees will be hired as contract labor. This option provides an effective way to accomplish work. We currently retain highly skilled individuals including an engineering team (e.g., electrical, CAD, design) for product development. We envision utilizing contract labor when appropriate, especially for tasks that may not require a full-time employee, e.g., graphic work, product design, website development or the design of new products. Eventually, these tasks will be brought in-house.

**Leadership**

Drs. Benke and Hamby will operate as two key leaders of the firm and plan to be hands-on with all aspects of the growing company. Dr. Benke is currently President of Alert R&D, and Dr. Hamby is currently Vice President. As the firm grows, more leadership positions will be established. A likely progression will be the formation of a manufacturing-based firm that handles production and sales. This new company would require the hiring of a CEO, upper-management, and the transfer of several employees from Alert R&D.

**Engineering**

Engineers will make up the core of the research and development endeavors. The initial product, TacAlert, is being developed primarily by individuals holding nuclear engineering, electrical engineering, physics, and health physics degrees. These individuals are employed as contract labor through Alert R&D. These engineers will likely remain core to our product development. As the firm expands, we anticipate needing design, manufacturing, and industrial engineers. We see software as a potentially promising growth area; this would require establishing a core software team. As teams grow, we anticipate establishing engineering leadership positions to help manage and run the day-to-day development activities.

**Production**

In the early stages of production, TacAlert will require one mid-level manufacturing engineer and three entry-level manufacturing specialists. Orders in Years 2 and 3 should be manageable with that level of staffing. However, in Years 4 and 5, we will likely require additionally four-to-six specialists.

**Finance**

At the end of 2017, Alert R&D added a finance manager (James A. Skinner) with an equity stake. Within the Alert R&D structure, Mr. Skinner has taken on the roles of Secretary and Treasurer. Mr. Skinner will handle all financial matters, including accounts payable and receivable, monthly payroll, end-of-year tax preparation, etc. As the company grows, we will add staff to assist Mr. Skinner.

**Marketing and Sales**

At the beginning of 2018, Alert R&D added a volunteer marketing consultant (Dan Brown, PhD). Dr. Brown is a retired professor of Marketing at Oregon State University, with more than 30 years experience in marketing, business, and branding. Our business manager (David Vasquez, MS, MBA) will work under the direction of Dr. Brown with primary responsibility in the early stages focused on business development. As the company grows, we will add staff to assist Dr. Brown. We envision the hiring of a Director of Sales in mid- to late-Year 2. Thereafter, sales teams will be constructed of a Sales Account Managers and a Technical Sales Specialists.

Our Sales Account Managers will be the driving force behind product sales. These managers will work with Technical Sales Specialists to make up our sales team, a team specializing in mid-level technology sales with a high-level of technical understanding and tactical attentiveness specific to law enforcement officers. These sales teams will foster long-term relationships with clients, providing initial instruction/certification to onsite training officers. This is important since local government and law enforcement agencies may make incremental purchases over a number of years. We hope to create a product that becomes an industry standard, after which account managers will focus on product awareness and marketing.

We do not anticipate a particular degree for this field, but will likely require at least a bachelor’s degree; employees will need to understand the technical nature of our products. We also will look for individuals we feel can build relationships, since we do not feel a high pressure sales approach would help our company achieve and sustain long-term growth. Our goal will always be to meet customer needs, providing them with superior products. Sales teams may also interact with other partners, such as ballistic vest manufacturers and vendors.

**Administration**

The administrative staff fall into a broad category encompassing those individuals who handle other business related aspects of the firm. The first employees brought into this role will be responsible for handling incoming calls, scheduling meetings, responding to emails and all other aspects of the day-to-day running of a business. It is possible that the first person brought into this role may be given a high degree of responsibility and they will be compensated to match the level of demands that will be placed upon the position. As the company grows this may split into more traditional business categories such as human resources, information technology, etc.

**Employee Benefits:**

Once established with a reliable revenue stream, we anticipate being able to offer all employees a comprehensive medical, dental and vision plan. The additional cost of these benefits is estimated into the overall budget through each employee’s compensation package. The firm will explore offering other benefits such as retirement options, tuition reimbursement, fitness memberships, and other perquisites as the budget allows.

**Employee Stock and Equity:**

TacAlert plans to offer stock options to firm employees. We are considering offering equity to key new employees that are brought in to fill leadership roles. If employees were offered equity, we would offer a plan of vested equity over time. In the early start of the firm, we plan to do this to help compensate for lower salaries until revenue allows us to offer competitive pay and benefits packages. Even when the firm is profitable, we will look at offering stock to all employees as a way to increase individual employee commitment to the firm.

**Chapter 7: Operations Plan**

TacAlert operations will be similar to other radiation detection manufacturing firms that engage in R&D, manufacturing and mid-level technology sales. We will have a core engineering team that will maintain and develop products and a business team that will handle marketing and sales operations. Currently, both founders and a small team of engineers operating through contract labor are conducting product development. Additionally, the two founders and three contract employees, a marketing professor, an MBA and a finance manager, are handling business development operations.

We anticipate substantial changes in our operations over the next five years. These changes include hiring employees, establishing an administrative office, a manufacturing facility, and introducing our first product to the domestic market. It is also possible that we will have operations taking place internationally either through manufacturing or product sales. Taking our product from idea to production, we are making steady progress on prototype development with engineering consultants, intellectual property protection from a patent application filed with the U.S. Patent Office, and initiating relationships with potential customers.

Even though operations will be changing, we anticipate certain components to remain relatively stable. These include having a strong R&D product team, strong business operations, and knowledgeable account executives driving sales. Changes will come about through the accomplishment of these tasks and the scale at which we operate. New challenges will present themselves as the company grows, but we are confident that these challenges can be overcome with the right management team. Our operations plan describes some of the details of how operations will be conducted.

**TacAlert Operations**

Our operations will have two major components including R&D of new products and the execution of day-to-day business and manufacturing operations. While there will be some layers of separation between these tasks, we anticipate the firm running as a cohesive group where all employees are encouraged to pursue our vision.

Our overall operations will be driven by the research and development of new technologies. We have already established organizational knowhow related to hardware, software and radiation detection. This has allowed for the development of the TacAlert product, which combines these technological components in the form of a wearable electronic device.

The other major area will include the business components of leadership, marketing, sales, and accounting. While the functions of each of these areas will be different, we plan to have them highly integrated as an organizational whole. One example of how this will work is that account executives will work closely with engineers to be certain that customer needs are incorporated into product changes. Our leadership will be hands-on making sure the company is working together to support the overall company vision.

**Research and Development**

Research and development constitutes the core of what Alert R&D does as a firm. Our current research environment is being developed with the expertise of our founders and the product development engineers. Product development relies on software, hardware, electronics, and radiation detection equipment. We anticipate our research area being similar to the research labs found at major universities. Generally, this consists of a lab setting with access to needed radiation detection instrumentation and electronics analysis equipment. We will provide computer workstations with the specialized software needed by the different development teams. Our budgets take into account the funds required to purchase or license the specialized software and technical equipment. Alert R&D intends to provide the needed space once an office is located. As the firm grows, the number of labs used will grow correspondingly and labs that are more specialized will be incorporated.

**Business Operations**

Currently, the founders and three contract employees are handling all of the business operations of TacAlert. As the firm grows, we intend to bring in two initial types of business employees. The first will be Sales Account Managers teamed with Technical Sales Specialists who will work with clients to promote sales. The second will be an administrative assistant who will handle many of the office operations and potentially other areas of the business. As the firm continues to develop, we will bring in employees who are more specialized to fill specific business needs. This will include employees for marketing, human resources, accounting and management.

**Office Space**

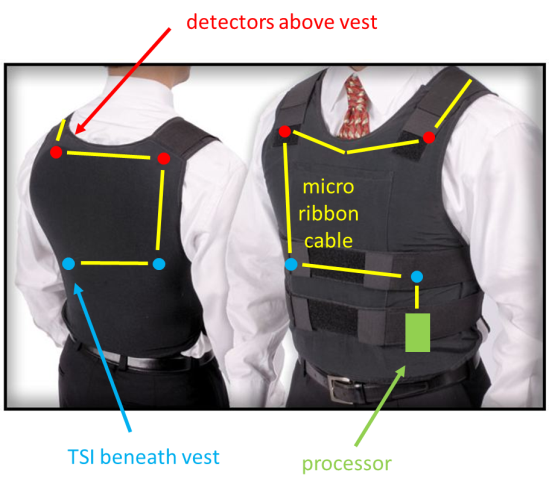
Currently, Alert R&D does not have an office space during the prototype development stage. In the second year of operation, we plan to rent a small office from which the founders, contract workers and any other employees will operate. At this stage, we will still be focusing on efficiency and keeping costs as low as possible. Receipt of a government-sponsored development grant or investor funding, will allow the firm to operate out of an office with research and development space where engineers can design, build and test current and future products.

Once the firm is generating sales and has full-time staff, we anticipate needing space that will allow for R&D, business operations, and manufacturing. This will include a work station for all employees, meeting space and a break room. Another important area of the office will be the research area where employees will be able to build and design new products. It is possible that the engineering team will work from the research area of the office. Alert R&D will do everything possible to provide a positive work environment and intends to model our workspace after technology firms that create a desirable environment to attract top talent.

**Product Manufacturing Details**

The TacAlert product is a wearable device that integrates seamlessly with the current ballistic vests worn by law enforcement officers. As depicted in the image below, the product will have a number of interconnected components. Each component will require different manufacturing and design processes.

The product will have four miniature radiation detectors positioned on the upper torso of the ballistic vest. Four haptic notifiers are placed in similar locations, but underneath the ballistic vest, and in contact with the torso. Finally, the processing unit will slide into a pouch attached to the carrier (Figure 7.1).

****

**Figure 7.1:** Product Manufacturing Design

**Detectors (4)**

Each unit will have four distinct radiation detectors indicated by the red dots (Figure 7.1). Each detector is comprised of a printed circuit board (PCB) and a scintillation crystal. The board itself is created in two steps, PCB fabrication and PCB assembly. Alert R&D electrical engineers will create the PCB design, and then will use external manufacturing firms to fabricate and assemble the PCBs. Alert R&D is utilizing a firm in Portland, Oregon, that has PCB fabrication and assembly capabilities. As the boards are finished, they will be sent back to our assembly area. The next step is finalizing each detector with the scintillation crystal. This final manufacturing step for the detectors would be done at our manufacturing locations. With increased sales levels, we may look to outsource all aspects of detector assembly so that a finalized detector unit is delivered.

**Control Unit and Guidance System Wiring Harness**

The next major component is the processor, shown as a green box in Figure 7.1. The PCB for this unit will go through the same fabrication and assembly process as described above. At lower sales levels, Alert R&D plans to manufacture the plastic case by outsourcing it to a 3D printing firm and at higher levels potentially contract with a large-scale producer. The harness that holds the detectors and guidance system into the vest is the final component. In early years, we will manufacture of the wiring harnesses in house, with potential outsourcing as sales grow. Once all the components arrive, we will assemble them at our local manufacturing facility. At higher sales volumes, we will assess the efficacy of outsourcing the various components of product manufacturing.

**Operating Expenses**

Alert R&D has prepared financials estimating the cost of operations over the next five years. We anticipate our highest fixed cost to be associated with labor. Office rent, R&D, legal and travel will also major expenditures. Figure 7.2 is an estimation of where revenue will be expensed, but we anticipate this changing greatly depending on revenue levels and duration of operations. One example of how we see this shifting is that as the company matures we would expect that less would be required for legal fees.

**Figure 7.2:** Average Expenditures as a Function of Total Budget

**Labor and Staffing**

We anticipate our highest expenditure going towards labor. As discussed in Chapter 6, we will hiring a team of individuals to develop our products and operate our business. We recognize the importance of interpersonal relationships in team building and plan to compensate employees with above-average salaries as compared to other firms working in similar industries with similar job functions. We will be operating in a very specialized field where a small number of scientists and engineers are able to generate intellectual property that can be translated to a valuable revenue stream. Even with higher salaries, we will be able to operate with high net profit margins.

In establishing our operations, we created a baseline for salaries (Appendix 7.1) that allows us to gauge compensation levels for employees. In all future financials showing an employee’s salary, this number includes their base salary plus benefits. In our operation plans where we compensate employees below industry standards we intend to offer these employees stock, or in the case of leadership roles, we may offer equity. In the early days, operational expenses will focus on employees that are in leadership roles, even though in this case these employees will be doing the hands-on work of a regular employee. An example would be the Chief Marketing Officer; this individual will be actively engaged in sales and the hands-on product marketing tasks in the first couple years of operation.

Alert R&D currently uses highly skilled engineers who work on a contract basis. We intend to continue utilizing contract labor until revenue allows for office space and the ability to bring in full-time employees. And, even though we discuss using contract labor, these are engineers that the founders know well and are highly specialized and trained in the areas in which they are contracted. For instance, one current contract worker is a retired Professor of Marketing in the School of Business at Oregon State University.

Additional employee costs (Table 7.1) will cover all expenditures related to providing employees the equipment and space they need to be successful. There are two main types of employee costs including one-time costs and recurring costs. One-time costs relate to providing office space and a computer workstation. Recurring costs include, for example, a business phone and a budget to cover any software or supplies the employees may need. Employee benefits are not included in these estimates.

**Table 7.1:** Estimated Annual Operational Costs per Employee

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Individual Employee Costs** | | | | |
| **One Time** | |  | **Recurring** | |
| **Item** | **Cost** |  | Office Supplies | $400 |
| Desk | $500 |  | Phone | $600 |
| Office Chair | $200 |  |  |  |
| Computer & Printer | $2,000 |  |  |  |
| MS Office Suite | $250 |  |  |  |
| Software License | $100 |  |  |  |
| **Total** | **$3,050** |  | **Total** | **$1000** |

**Office Space and Utilities**

Rent and utilities will include office rent, electricity, water, sewer, internet, natural gas and communications, where appropriate. At lower levels of funding, Alert R&D will operate out of a single office rental space. Below, we estimate rental costs for a staff of up to 20 people (Table 7.2). A budget of approximately $600 per month at a minimum is required to cover utilities; this number obviously will increase as the company grows. Rental costs will change as the firm grows. In the first year, and at lower funding/sales levels, the company will operate without a formal office. However, our goal is to establish our first office space in year two of firm operations.

**Table 7.2:** Estimated Monthly Rental Costs as a Function of Office Size

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Company Size** | **Square Feet** | **Range Low** | **Range High** | **Average** |
| 0 to 3 | 750 | $1,125 | $3,750 | $2,438 |
| 3 to 10 | 1500 | $2,250 | $7,500 | $4,875 |
| 10 to 15 | 2250 | $3,375 | $11,250 | $7,313 |
| 15 to 20 | 3000 | $4,500 | $15,000 | $9,750 |

We intend to allow for $200 per month for utilities while we operate out of a small office during our second year of funding. During our third year, we plan to allocate $600 to cover utilities. As the firm grows this number will rise accordingly.

**Office Supplies**

We will allocate a budget to cover office supplies that is related to total number of employees and revenue. The items will include all necessary components that an office uses in day-to-day business. This budget may include paper, pens, pencils, printers, break-room food, office decorations, etc.

**R & D**

Research and development expenses will include items directly related to the development of new technology. This will cover expenditures related to applicable detection equipment, electronics, cabling, software/hardware, ballistic vest carriers, and any other materials and supplies that might be required during product development.

**Legal**

The company is committed to protect its intellectual property with patents, trademarks, and copyrights. The TacAlert technology is protected by a patent application filed in October 2017. Without external funding, the founders engaged patent counsel in the development, finalization, and filing of the patent application. As the firm grows, we expect to incur other near-term legal expenses related to human resources, operations, reorganization, intellectual property enforcement, new IP protection, etc.

**Travel**

The travel budget covers all company related travel expenditures. One major component of the travel budget will be to cover domestic travel to meet with potential clients. Since we foresee the potential for large contracts, it will be imperative to speak with potential clients face-to-face and give them a hands-on demonstration of how easily the technology works.

**Table 7.3:** Average Trip Expenses for Three-Day Trip

|  |  |
| --- | --- |
| **Business Trip Cost** | |
| **Item** | **Cost** |
| Food Per Diem | $250 |
| Hotel (2 rooms) | $450 |
| Rental Car | $300 |
| Airfare | $1,000 |
| Miscellaneous | $100 |
| **Total Cost** | **$2,100** |

Alert R&D sees most trips including two travelers. Sales teams will always include a Sales Account Manager and a Technical Sales Specialist. One member of a sales team might attend some events, whereas other trips may require more than two employees. In order to put together financials, we will assume two travelers and use a budget of $2,100 per trip.

**Chapter 8: Marketing and Sales Strategy**

TacAlert employs a number of strategies to effectively market and sell our initial product and future product lines. Our first product targets front‑line law enforcement personnel, operating within the United States, with a sales and marketing strategy tailored to this audience. Future growth areas include expanding to government agencies, to the military, and possibly to international markets.

Keep in mind that the firm will consider separate ventures into the much larger consumer market with adjustment to our wearable directional guidance technology for syncing with smart phones, navigation, or gaming systems. However, we built our initial marketing and sales strategy for the first target audience.

**Product Demonstration**

We plan to employ a range of sales tactics, including utilizing a hands-on product demonstration to prospective customers. It is important for customers to see and feel the equipment as it operates. Currently, our competitors loan detector equipment to prospective customers to remove uncertainties prior to purchasing decisions. We will achieve our initial sales volume with in-person visits at customer sites that involve side-by-side comparisons and field demonstrations so that the transformational impact of our intuitive feedback system can be realized firsthand by end users and purchasing representatives. Customer participation in side-by-side comparisons involving TacAlert, current onsite equipment, and other competitor’s models will provide convincing evidence that TacAlert’s benefits outweigh the initial apprehension and skepticism with new products.

Due to its revolutionary and intuitive user operation, holding and wearing the product leave lasting and convincing impressions to accompany otherwise brief presentations to law enforcement officers and decision makers. To accelerate the firm’s ability to engage customers as well as funding sponsors, a demonstration vest was fabricated with infrared sensors, so as to eliminate health and safety concerns associated with a demonstration by way of ionizing radiation (*e.g*, x and gamma rays).

For the hands-on demonstration, one participating officer dons the vest, and the remaining group forms a circle around the officer. Each member of the circular formation has an infrared source directed in the general vicinity of the officer. The infrared source is similar in size and shape to a laser pointer, but its emissions are invisible. Only one of the infrared sources has active batteries, to ensure only one radioactive source is simulated. Both infrared and ionizing radiation are invisible to the human eye. Without visible clues to differentiate the single energized source from the others, everyone is blind to the location of the source—everyone *except* for the TacAlert wearer. When the source is energized, the officer wearing TacAlert feels the system respond. TacAlert responds in real time. As the officer turns, the feedback changes. When the officer moves toward the energized source, the feedback changes again, giving further confirmation that the invisible assailant has been found. In essence, TacAlert gives the officer a sixth sense. Beyond demonstrating the effectiveness of the guidance system, the wearer also appreciates the unobtrusiveness of the product — its small form factor increases the weight of the ballistic vest by less than 2 percent.

**Reaching the Initial Target Market**

Law enforcement agencies of large and medium sized cities, such as New York City, Houston, Los Angeles, Chicago, Washington DC, San Francisco, Portland, or Seattle, and other significant ports of entry comprise TacAlert’s initial target market. For this government-funded market, outreach activities are concentrated at three levels:

* Federal government
* State government
* State and local law enforcement agencies

Accessing local end users requires outreach at state and federal levels because governmental decision makers still influence large- and medium-sized procurements destined for use by local law enforcement. The President of Alert R&D is a member of a working group providing guidance to the State of Texas on preventive detection of radiological and nuclear materials. Federal government contractors assemble these meetings and are responsible for coordinating and supporting similar efforts in other states. These groups welcome presentations on new products and concepts. Presentation to the home working group is a given once a functional prototype is available for demonstrating ionizing radiation detection, but moreover, a positive reception of the technology will compel organizers to schedule similar demonstration experiences in other states. Positive outreach visits will also include the U.S. Department of Homeland Security hubs. During an invited visit to the Domestic Nuclear Detection Office in Washington, DC, Dr. Benke presented new technology aligned with the agency’s mission. As a result, this technological area was included in a list of federal funding priorities. In 2017, he was invited to the National Urban Security Technology Laboratory in New York City.

Lawrence Livermore National Laboratory and Pacific Northwest National Laboratory provide technical support to the Domestic Nuclear Detection Office. Visiting these laboratories is valuable because staff assemble market information and test new technologies for the federal government. Given the less-than-certain future of the National Urban Security Technology Laboratory (NUSTL) in the New York City location, essential functions could shift to these national laboratories.

If our marketing research reveals that medium-sized cities are preparing to purchase radiation detection equipment, we will include them in our promotional tour. Even an order of 50 units would raise nearly $100,000 in revenue. If not, our attention will remain at claiming an appreciable market share from existing detector companies selling to law enforcement organizations.

**Marketing Strategy & Anticipated Risks**

TacAlert’s marketing strategy depends on relationships. The company’s executives have already met with the chief scientist of the New York City Police Department under a nondisclosure agreement. Dr. Hamby’s contacts at the Corvallis Police Department and the Benton County Sheriff’s Office have already been supportive and helpful.

A relationship approach is favored over a sales approach. This means expanding our contacts and slowly expanding our network. Respected within the nuclear and radiation safety fields, Drs. Benke and Hamby find themselves in a close-knit community of professionals, familiar from academic research, private industry, conferences and state and federal agencies. Some of these colleagues are former students of TacAlert’s co-founders. These close colleagues are not expected to purchase large numbers of detectors, but could become early adopters who contribute testimonials and additional feedback.

Customer service is a known weakness of our competitors. Initially, contracts will be obtained and maintained by our founders, and later by account managers. Because our competitors are not as strong at customer support, we plan to assign the account manager as the primary point of contact with respect to sales, maintenance, troubleshooting, and customer feedback. Testimonials on positive customer support experiences from early adopters may prove to be a catalyst for larger contracts. As previously stated, maintaining contact with federal government staff is important for securing small business innovation research grants and staying apprised of new trends and areas of need.

**Marketing Timeline**

The marketing timeline for TacAlert is shown in Table 8.1. Much of this strategy will be adjusted during the next five years in order to optimize the process.

**Table 8.1:** Marketing Timeline

|  |  |
| --- | --- |
| **Year** | **Task** |
| **Year 1** | Begin to Establish Industry Contacts |
|  |  |
| **Year 2** | Continue to Foster Industry Relationships |
|  | Launch Website |
|  | On-site demonstrations in Texas, Oregon, & New York |
|  | On-site demonstrations in Washington DC |
|  | On-site demonstrations in California and Illinois |
|  | On-site demonstrations in Washington and Florida |
|  |  |
| **Year 3** | Increase Online Presence |
|  | Target Smaller Contracts |
|  | Utilize Account Executives to Create and Pursue Leads |
|  |  |
| **Year 4** | Expand Marketing Efforts to all US Cities |
|  |  |
| **Year 5** | Expand Marketing Efforts Overseas |
|  | Partner with Local Community Events |

**Pricing**

TacAlert is developing a high-end product that needs to be of the utmost quality and durability, capable of extended use in rough situations. For these reasons, superior product manufacturing is paramount and will be reflected in the price point. Originally, TacAlert will offer the system at $1,976 but will likely propose contract pricing. Others use this contract pricing strategy in the industry. As manufacturing increases, we will explore ways to lower production costs, but must be careful not to sacrifice quality. Future additions to the original detection and guidance systems will create new pricing lines.

**Sales Team**

As has been discussed before, TacAlert sees our sales team as instrumental to company success. We most likely will create these positions as account executives because, while they will be actively engaged in sales, it will be much more similar to building and maintaining customer relationships. There may be some initial contacts that could be seen as cold calling, but it is not something that this position would be doing routinely. An initial contact will be well researched and thought out before we contact a potential new client. We will also attempt to leverage our existing networks to find ways to avoid choosing potential clients at random and contacting them.

The ideal sales process would start with an introduction to a potential client through known network contacts. We would hope to get to know them and set up an in-person product demonstration. Finally, they would be able to approve or direct us toward those who could approve future purchases as the department or organization needs. Since the radiation detection field and law enforcement are both close-knit, we feel we would be able to continue making these connections and later bring in account executives who will build on our existing relationships.

**Website and Social Media**

TacAlert will launch a company website once intellectual property has been secured. The website will have relevant company information, sales and contact information, clear explanation of the product and overall product information. We feel this is critical, as it will allow interested customers to find information about our product, purchasing and contact information.

To protect our intellectual property, we do not anticipate having an initial strong social media focus in the early stages. Due to the nature of the target market, these types of accounts are less important. If we do expand into social media, the firm would open Twitter, Instagram and Facebook accounts. The accounts would be used for marketing purposes, but would also take into account the user groups generally using these social platforms. For instance, Instagram relies on visual aesthetics including bright, interesting or fun photos. Twitter on the other hand is more content driven, offering a unique and interesting perspective. The important point is that content is compelling, encouraging users to engage, like and follow. A flat or uninspired social media campaign may end up discouraging customers rather than encouraging them.

**Chapter 9: Financial and Economic Details**

We have conducted an analysis of the financial and economic factors that will influence our first five years. Our financial analysis was conducted with a realistic sales forecast so as to lay a foundation of how the company would run given realistic sales for the first five years. This forecast does not include sales that could arise from the expansion of our product line or a move into international markets. These financials do not include government grants that could provide a source of technology development for government agencies. Finally, there is a strong probability that domestic sales could be higher than predicted; therefore, we include a section analyzing higher sales volumes and the associated rise in net income.

We compiled financial data with estimated sales of 9,775 units over 5 years, creating revenue of $19,315,400 million. These projections include an investment of $500,000 to fund the first two years of operations until revenue wholly covers firm expenses. With $19,315,400 million in revenue, we estimate that our cost of goods sold will be $8,553,125 million and our operating expenses will be $7,260,390 million. This will leave a five-year net income of $4,001,885 before taxes.

Conservatively, our sales estimates are equivalent to capturing about 1.5% of the domestic law enforcement market in the first five years. This represents a solid start, but is just beginning to scratch the surface of claiming market share from existing detector suppliers. Market replacement by TacAlert units is fathomable within the target market and within the stated timeframe. Our sales data do not take into account entrance into new markets or international sales.

Data is used from our market analysis, i.e., from sales estimates for domestic law enforcement agencies and a realistic view of foundational activities during the first five years of operation. Based largely on innovation and outreach, we will achieve success through our dedicated sales teams and their use of our IR and prototypic demonstrations.

**Unit Price and Details**

We intend to offer our first detector starting at $1,976 per unit. With a unit production cost of $875 this will leave a unit contribution of $1,101 per unit (Table 9.1). We provide the details of the unit cost, price and contribution below.

**Table 9.1:** Rad Alert Unit Sales Price and Contribution Margin

|  |  |
| --- | --- |
| **Unit Price** | $1,976 |
| **Cost Per Unit** | $875 |
| **Unit Contribution** | $1,101 |
| **Unit Contribution Margin** | 56% |

**Unit Costs**

The process of developing each unit is discussed in Chapter 7. The development costs include direct labor, parts, warranty, facility, etc. Each unit consists of four radiation detectors, four haptic indicators and a systems control unit resulting in a current estimate of $875 per unit.

As we grow, we will look into larger scale manufacturing options that would be cheaper and more efficient. However, these options make sense cost and time wise when we have begun to sell higher volumes. The trip costs alone to set up an overseas manufacturing chain would be cost prohibitive in our first three years of operations. We also are confident that our manufacturing chain could handle large orders and is the most efficient choice at this early stage.

**Table 9.2:** Unit cost estimates

|  |  |  |  |
| --- | --- | --- | --- |
| **Product Costs:** | **Unit Cost**  **(5 Units)** | **Unit Cost (50 Units)** | **Unit Cost (500 Units)** |
| **PCB fabrication** | $5 | $2 | $1 |
| **PCB assembly** | $100 | $90 | $80 |
| **BGO Crystals (4)** | $200 | $160 | $120 |
| **Detector PCB Fabrication (4)** | $20 | $15 | $10 |
| **Detector PCB assembly (4)** | $100 | $80 | $60 |
| **3D Plastic Components** | $5 | $4 | $3 |
| **Connectors and other parts** | $10 | $8 | $6 |
| **Assembly** | $10 | $10 | $10 |
| **Battery** | $3 | $2 | $1 |
| **Charger** | $6 | $5 | $4 |
| **Motors (4)** | $12 | $8 | $4 |
| **Facility** |  |  |  |
| **Warranty** |  |  |  |
| **Labor** | $450 | $491 | $400 |
| **PRODUCT COST** | **$921** | **$875** | **$699** |

**Unit Price**

The unit price of $1,976 was derived by examining our cost per unit, current market prices, current contract prices and industry standards. The first item we analyzed was the industry standards of similar firms (with particular focus on Thermo Fisher Scientific). These firms were found to operate with a contribution margin ranging between 45% to 60%. Our contribution margin is 55%, which fits well with other firms in similar industries.

Next, we analyzed the large-scale purchase of the LAPD. This purchase consisted of 1,800 basic PRD units in 2014 with an average cost of $1,610[[18]](#footnote-18). These units provide no directional guidance, but only are alarm-capable for high radiation levels.

The final metric we used in estimating our price was the U.S. Department of Homeland Security report that analyzed eleven PRDs with an average cost of $3,478[[19]](#footnote-19). We hope to eventually get our price down even further to around $1,500 per unit, which we feel would give us a significant competitive advantage and increase overall income through much higher demand and sales.

**Sales Projections:**

Sales projections of the TacAlert units show an estimated 9,775 units sold over 5 years (Figures 9.1 and 9.2), resulting in a total revenue of $19,315,400. We base our sales projections on a number of factors including creating and fostering relationships with decision makers who can approve purchases, current market trends and potential future trends. One key component of our projections was the Los Angeles purchase of 1,800 units for nearly $3 million dollars. We know that this is a particularly large purchase for a highly populated metropolitan area, but it provides a good indicator of potential sales.

**Figure 9.1:** TacAlert Five Year Sales Projections

**Figure 9.2:** TacAlert Units Sold

Additionally, sales projections are based on estimates where Alert R&D utilizes our investment funding to finalize our product development and utilizes sales revenue to hire additional sales account managers. Table 9.3 shows an overview of our sales and financial projections for the first five years of operations.

**Table 9.3:** TacAlert Five Year Operations Data

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** |  | **Total** |
| **Units Sold** | 0 | 100 | 1,250 | 2,750 | 5,675 |  | 9,775 |
| **Revenue** | $0 | $197,600 | $2,470,000 | $5,434,000 | $11,213,800 |  | $19,315,400 |
| **COGS** | $0 | $87,500 | $1,093,750 | $2,406,250 | $4,965,625 |  | $8,553,125 |
| **Investment** (Operating Expenses) | $225,000 | $275,000 | $0 | $0 | $0 |  | $500,000 |
| Operating Expense | $0 | $69,160 | $864,500 | $1,901,900 | $3,924,830 |  | $6,760,390 |
| **Total OE** | $225,000 | $344,160 | $864,500 | $1,901,900 | $3,924,830 |  | $7,260,390 |
| **Operating Income** | **$0** | **$40,940** | **$511,750** | **$1,125,850** | **$2,323,345** |  | **$4,001,885** |

**Operating Expenses**

Our operating expenses cover all fixed costs not directly tied to unit sales (Table 9.4). As the company grows, these costs will rise proportionally to total sales, but will still be considered fixed costs. Initially, firm leadership may be hired at lower salaries, yet compensated with equity or stock options. Alert R&D expects to experience increasing growth every year of operations, and plans to operate a dynamic and growing firm. A summary of operating expenses if provided in Tables 9.4 and 9.5.

**Table 9.4:** Total Five Year Expenditure by Cost Category

|  |  |
| --- | --- |
| **Category** | **Expenditure** |
| Research and Development | $241,400 |
| Selling General and Administrative | $6,444,900 |
| Rent | $144,800 |
| Utilities | $57,600 |
| Office Supplies | $54,000 |
| Travel Expense | $201,600 |
| Insurance | $18,400 |
| Legal | $97,690 |
| **Total** | $7,260,390 |

**Table 9.5:** Detailed Five Year Expenditure

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Category** | **Item** | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** | **Total** |
| Labor | CEOe | $20,000 | $50,000 | $140,000 | $180,000 | $175,000 | $565,000 |
| Labor | CTOe | $20,000 | $40,000 | $130,000 | $160,000 | $180,000 | $530,000 |
| Labor | CFOe | $10,000 | $20,000 | $40,000 | $160,000 | $180,000 | $410,000 |
| Labor | CMOe | $10,000 | $20,000 | $40,000 | $160,000 | $180,000 | $410,000 |
| Labor | VP of Engineeringe | $30,000 | $50,000 | $85,000 | $160,000 | $170,000 | $495,000 |
| Labor | VP of Salese | $10,000 | $40,000 | $80,000 | $160,000 | $170,000 | $460,000 |
| Labor | Nuclear Engineer | $0 | $0 | $0 | $0 | $130,000 | $130,000 |
| Labor | Electrical Engineer | $0 | $0 | $120,000 | $130,000 | $130,000 | $380,000 |
| Labor | Electrical Engineer | $0 | $0 | $0 | $130,000 | $130,000 | $260,000 |
| Labor | Electrical Engineer | $0 | $0 | $0 | $0 | $130,000 | $130,000 |
| Labor | Senior Electrical Engineer | $0 | $0 | $0 | $0 | $180,000 | $180,000 |
| Labor | Senior Software Engineer | $0 | $0 | $0 | $0 | $180,000 | $180,000 |
| Labor | Software Engineer | $0 | $0 | $0 | $0 | $130,000 | $130,000 |
| Labor | Software Engineer | $0 | $0 | $0 | $0 | $130,000 | $130,000 |
| Labor | Software Engineer | $0 | $0 | $0 | $0 | $130,000 | $130,000 |
| Labor | Account Executive | $0 | $0 | $75,000 | $90,000 | $90,000 | $255,000 |
| Labor | Account Executive | $0 | $0 | $0 | $90,000 | $90,000 | $180,000 |
| Labor | Account Executive | $0 | $0 | $0 | $0 | $90,000 | $90,000 |
| Labor | Account Executive | $0 | $0 | $0 | $0 | $90,000 | $90,000 |
| Labor | Account Executive | $0 | $0 | $0 | $0 | $90,000 | $90,000 |
| Labor | Administrative Assistant | $0 | $0 | $0 | $75,000 | $75,000 | $150,000 |
| Labor | Administrative Assistant | $0 | $0 | $0 | $0 | $75,000 | $75,000 |
| Labor | Business/Accountant | $0 | $0 | $0 | $0 | $100,000 | $100,000 |
| Labor | Web and Graphic Designer | $0 | $0 | $0 | $0 | $90,000 | $90,000 |
| Labor | Office Manager | $0 | $0 | $0 | $0 | $120,000 | $120,000 |
| Labor | Human Resources | $0 | $0 | $0 | $0 | $95,000 | $95,000 |
| Labor | Interns | $0 | $0 | $0 | $80,000 | $80,000 | $160,000 |
|  | Contract Labor (1099) |  |  |  |  |  |  |
| Labor | Electrical Engineer | $27,200 | $23,800 | $15,000 | $45,000 | $20,000 | $131,000 |
| Labor | Nuclear Engineer | $6,000 | $6,000 | $6,000 | $10,000 | $20,000 | $48,000 |
| Labor | Design Engineer | $4,000 | $4,000 | $2,000 | $10,000 | $20,000 | $40,000 |
| Labor | Manufacturing Engineer | $8,000 | $8,000 | $4,000 | $20,000 | $20,000 | $60,000 |
| Labor | Graphic Designer | $0 | $0 | $4,000 | $40,000 | $34,300 | $78,300 |
| R and D | Engineering Supplies | $23,000 | $19,000 | $26,000 | $30,000 | $46,000 | $144,000 |
| R and D | Equipment | $8,000 | $4,000 | $10,000 | $30,000 | $45,400 | $97,400 |
| SGA | Software | $7,200 | $2,200 | $7,200 | $20,000 | $36,000 | $72,600 |
| Rent | Office Rent | $18,000 | $18,000 | $24,000 | $32,000 | $52,800 | $144,800 |
| Utilities | Utilities ($1000/month) | $7,200 | $7,200 | $9,600 | $12,000 | $21,600 | $57,600 |
| Insurance | Liability Insurance | $1,000 | $1,000 | $2,000 | $2,400 | $12,000 | $18,400 |
| Supplies | Office Supplies | $2,000 | $2,000 | $6,000 | $12,000 | $32,000 | $54,000 |
| Travel | Travel | $8,400 | $16,800 | $25,200 | $42,000 | $109,200 | $201,600 |
| Legal | Legal Fees | $5,000 | $12,160 | $13,500 | $21,500 | $45,530 | $97,690 |
|  | **TOTAL** | **$225,000** | **$344,160** | **$864,500** | **$1,901,900** | **$3,924,830** | **$7,260,390** |

**Income Statement**

We have developed a five-year income statement based on our sales projections and operating expenses (Table 9.6). The operating expenses in Years 1 and 2 are covered by the financial investment. In Year 3, revenue from sales will allow the firm to become self-sustaining.

**Table 9.6:** TacAlert Five-Year Income Statement

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** |
| **Revenue** |  |  |  |  |  |
| Total Revenue | $0 | $197,600 | $2,470,000 | $5,434,000 | $11,213,800 |
|  |  |  |  |  |  |
| **Cost of Revenue (Goods Sold)** |  |  |  |  |  |
| Labor, Materials and Supplies | $0 | $87,500 | $1,093,750 | $2,406,250 | $4,965,625 |
| Total Cost of Revenue | $0 | $87,500 | $1,093,750 | $2,406,250 | $4,965,625 |
|  |  |  |  |  |  |
| **Gross Profit** | $0 | $110,100 | $1,376,250 | $3,027,750 | $6,248,175 |
|  |  |  |  |  |  |
| **Operating Expenses** |  |  |  |  |  |
| Research and Development | $31,000 | $23,000 | $36,000 | $60,000 | $91,400 |
| Selling General and Administrative | $152,400 | $264,000 | $748,200 | $1,720,000 | $3,560,300 |
| Rent | $18,000 | $18,000 | $24,000 | $32,000 | $52,800 |
| Utilities | $7,200 | $7,200 | $9,600 | $12,000 | $21,600 |
| Office Supplies | $2,000 | $2,000 | $6,000 | $12,000 | $32,000 |
| Travel Expense | $8,400 | $16,800 | $25,200 | $42,000 | $109,200 |
| Insurance | $1,000 | $1,000 | $2,000 | $2,400 | $12,000 |
| Legal | $5,000 | $12,160 | $13,500 | $21,500 | $45,530 |
| Other (Hiring Expense + Misc) |  |  |  |  |  |
| Total Operating Expenses | $225,000 | $344,160 | $864,500 | $1,901,900 | $3,924,830 |
|  |  |  |  |  |  |
| Operating Income | -$225,000 | -$234,060 | $511,750 | $1,125,850 | $2,323,345 |
| Investment | $225,000 | $275,000 | $0 | $0 | $0 |
|  |  |  |  |  |  |
| **Operating Income (w Investment)** | $0 | $40,940 | $511,750 | $1,125,850 | $2,323,345 |

**Variations on Sales Forecasts**

It is important to look at a range of potential sales forecasts that could be experienced by Alert R&D in our first 5 years of operations (Table 9.8). More optimistically, it is entirely feasible that large orders could be realized over the course of five years that reach levels shown below (Table 9.8).

**Table 9.8:** Sales Forecasts for Five Years at Ten Potential Sales Levels

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Sales** | **Units Sold** | **Cost of Revenue** | **Operating Expenses** | **Income** | **Investor Return at 20% Equity** |
| $98,800,000 | 50,000 | $43,750,000 | $34,580,000 | $20,470,000 | $4,094,000 |
| $88,920,000 | 45,000 | $39,375,000 | $31,122,000 | $18,423,000 | $3,684,600 |
| $79,040,000 | 40,000 | $35,000,000 | $27,664,000 | $16,376,000 | $3,275,200 |
| $69,160,000 | 35,000 | $30,625,000 | $24,206,000 | $14,329,000 | $2,865,800 |
| $59,280,000 | 30,000 | $26,250,000 | $20,748,000 | $12,282,000 | $2,456,400 |
| $49,400,000 | 25,000 | $21,875,000 | $17,290,000 | $10,235,000 | $2,047,000 |
| $39,520,000 | 20,000 | $17,500,000 | $13,832,000 | $8,188,000 | $1,637,600 |
| $29,640,000 | 15,000 | $13,125,000 | $10,374,000 | $6,141,000 | $1,228,200 |
| $19,760,000 | 10,000 | $8,750,000 | $6,916,000 | $4,094,000 | $818,800 |
| $9,880,000 | 5,000 | $4,375,000 | $3,458,000 | $2,047,000 | $409,400 |

Sales could increase due to a number of circumstances as our product becomes commercially available. The first would be that law enforcement agencies work to equip officers in the U.S. at a higher coverage percentage than our sales forecasts estimate. Our forecasts intentionally were calculated at a moderate level, but we will actively work to bring in revenue above these levels. Secondly, to expand in international markets would be an achievement for which our current sales projections do not account. International expansion is quite feasible early on and certainly would be worth the effort as the firm grows. In addition, political events could dramatically increase demand worldwide. Finally, we may be able to expand our product lines or develop new technologies in the first five years of R&D.

Due to these potentially higher levels of sales, we include sales projections for TacAlert ranging from 5,000 to 50,000 units (Table 9.8). Assuming market growth continues during this five-year period, the optimistic sales forecast implies TacAlert would garner between 10 to 20 percent of total sales in the market. The estimated operating expenses include a forecast of what it would cost to build and run a team at this level of revenue. This would include bringing in a well-paid staff of engineers who can continue to lead Alert R&D’s new production innovation and development.

**Use of Venture Funds**

The funding that Alert R&D is seeking would be used primarily during the first two years of operation (Table 9.9). These funds will cover the costs of labor directly tied to finalizing production units and generating sales contracts with major cities. A portion of the funding also would be used to cover legal expenses required to secure intellectual property.

**Table 9.9:** User of Venture Investment

|  |  |  |
| --- | --- | --- |
| **Investment: $500,000** | | |
|  | **Year 1** | **Year 2** |
| **Item** | **Budget** | **Budget** |
| CEOe | $20,000 | $30,000 |
| CTOe | $20,000 | $30,000 |
| CFOe | $10,000 | $10,000 |
| CMOe | $10,000 | $10,000 |
| VP of Engineering | $30,000 | $30,000 |
| VP of Sales | $10,000 | $10,000 |
| Contract Labor (1099) |  |  |
| Electrical Eng | $27,200 | $40,000 |
| Nuclear Eng | $6,000 | $16,640 |
| Design Eng | $4,000 | $8,000 |
| Manufacturing Eng | $8,000 | $8,000 |
| Engineering Supplies | $23,000 | $19,000 |
| Equipment | $8,000 | $4,000 |
| Software | $7,200 | $2,200 |
| Office Rent | $18,000 | $18,000 |
| Utilities ($200/mo) | $7,200 | $7,200 |
| Liability Insurance | $1,000 | $1,000 |
| Office Supplies | $2,000 | $2,000 |
| Travel^ | $8,400 | $16,800 |
| Legal Fees | $5,000 | $12,160 |
| **TOTAL** | **$225,000** | **$275,000** |

**Break Even Analysis**

We conducted a break-even analysis to estimate the varying levels of sales that would be needed to cover fixed and variable costs. The total unit sales needed to break even was analyzed for fixed costs ranging from $150,000 to $5,000,000 and includes the associated variables costs for each level of sales (Table 9.10). This assumes that each unit sold has a contribution margin of $1,101. We already have brought in a financial team member and plan to make sure that our sales are sufficient to cover fixed costs to prevent cash flow issues.

**Table 9.10:** Break Even Analysis at Multiple Revenue Levels

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Fixed Costs (FC)** | **Variable Costs (VC)** | **Total Costs** | **Break Even Unit Sales** | **Total Revenue** |
| $150,000 | $122,093 | $272,093 | 140 | $272,093 |
| $250,000 | $203,488 | $453,488 | 233 | $453,488 |
| $500,000 | $406,977 | $906,977 | 465 | $906,977 |
| $1,000,000 | $813,953 | $1,813,953 | 930 | $1,813,953 |
| $1,500,000 | $1,220,930 | $2,720,930 | 1395 | $2,720,930 |
| $2,500,000 | $2,034,884 | $4,534,884 | 2326 | $4,534,884 |
| $5,000,000 | $4,069,767 | $9,069,767 | 4651 | $9,069,767 |

**Financial Metrics**

Since TacAlert is currently in product development, a number of key financial metrics were used to guide financial projections. These were taken from industry standards from public companies producing radiation detectors and in the hardware and software industries. These benchmarks are used as guidance to ensure the firm is operating at levels that match leaders in the industry and that we do not significantly over- or under-estimate important financial indicators.

**Revenue per Employee**

Revenue generation per employee is a benchmark used to guide Alert R&D’s projected hiring. Our target goals are derived from industry leaders and all operations are based on staying in the target range of $400,000 to $700,000 in revenue generated per employee. These estimates are simply a guide to ensure we do not underestimate labor expenses since labor is one of the highest contributors to overall fixed expenditures. All Alert R&D operations use this figure in determining labor costs.

**Profit Margin**

Another important metric is TacAlert’s profit margin. For this metric, we used the firm’s earnings before interest, tax, depreciation and amortization (EBIDTA). Utilizing industry standards, we found that our profit margin of about 20% was reasonable for this industry.

**Chapter 10: Legal, Intellectual Property and Ethical Issues**

Alert R&D operates in a highly technical field requiring years of education and training in order to develop a product that meets current industry standards. The industry and competitor analysis reveals that there are high barriers to entry in this industry and that extensive knowledge is needed to develop a competing product. This being the case, Alert R&D is actively pursuing lowering competition through multiple avenues including patents, customer loyalty, and constant innovation. Our initial product is protected with a patent application for the unique hands-free system that gives front line law enforcement officers the ability to passively locate and detect potential radiological terrorist threats.

**Business Entity and Status**

Alert R&D, LLC, is a Texas-based limited liability company developing the TacAlert system. The two founders each hold 50% of the parent company. The firm will form a Board of Directors within the first five years whose initial members would include the two founders and investment partners.

**Intellectual Property and Patents**

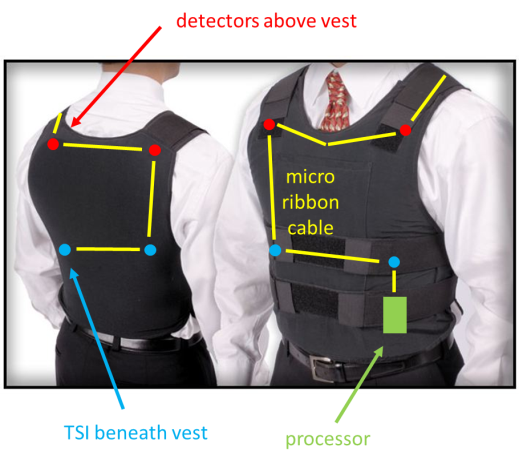
Alert R&D has filed one patent application which is discussed below. As the company moves forward, we will actively pursue new intellectual ideas and work to secure them through patents, trademarks and copyrights. As we expand our research and development capabilities, we plan to allow employees the freedom to develop and contribute their own ideas and develop a rewards system for their contributions.

Currently we work with a patent attorney in Portland, Oregon, who was instrumental in constructing our initial patent application. Our budget always allocates funds for legal fees related to advancing and securing our intellectual property and protecting our business interests.

**Patent**

The patent application under which TacAlert is produced[[20]](#footnote-20) is related to giving the law enforcement officer the ability to locate a radioactive threat without sacrificing his/her tactical advantage. This application is based on four miniature radiation detectors placed on the ballistic vest; two of these are positioned on the chest and two on the back. These detectors are placed high on the vest giving the best down-range visibility for the detectors. The detectors are small but very sensitive to incident gamma rays and X rays. The processor slides into a small pouch inside the vest as can be seen in Figure 10.1. The overall patent application protects our interests in threat detection and positioning systems for passive nuclear, biological or chemical detection and localization.

**Figure 10.1:** Location Sensing Technology



**Managing Legal Liability Risks**

Alert R&D plans to be proactive in managing any legal risks that may arise. We are protecting intellectual property with patents, and managing risks through the purchase of product liability insurance and general business insurance to cover firm operations and employees. As the company grows, we will continue to work to insure compliance with all appropriate state and federal legislations related to conducting business in a sound and reasonable manner.

**Chapter 11: Company Risks**

All new firms face various risks. And, as Alert R&D evolves, new risks will emerge. We analyze our risks below with potential solutions to minimize threats.

**Risks to Venture and Investors**

**Sales Risks**

One of the greatest risks that Alert R&D faces is finding and making the right contacts to initiate sales. Our product is unique and geared toward specific markets. This creates both positive and negative aspects with regard to generating sales. The fact that our product is designed specifically for a pressing need gives us a competitive advantage that will allow us to grow rapidly. The difficulty will exist in marketing the product, making the right contacts, and getting our sales teams involved early enough for budget approvals in targeted law enforcement agencies.

We intend to mitigate this risk through a number of strategies. First, both founders are actively engaged in networking with local law enforcement agencies, industry members and government contacts. As sales account managers come on board, they not only introduce their own industry connections, but also will be woven into the founders’ existing social networks. We are confident our product is superior as a way to actively prevent nuclear terrorist attacks and feel that by demonstrating the product and getting the right individuals involved, we can lower sales risk.

**Cash on Hand**

A potential threat to any business is the availability of liquid assets to meet current accounts payable due each month. Some key areas where this could become an issue include meeting lease deadlines, paying staff, and having the operating capital to fund product manufacturing for future sales. Alert R&D plans to handle this risk through limited overhead operation during the first two years, careful budgeting, securing development grants from the federal government, and not expanding beyond our means.

The four major ways we anticipate bringing money into the firm include product sales, outside investment, government grants, and traditional loans. We intend to maintain working capital for the first two years through either an outside investment or securing government grants. Through continued investment by both founders, a current demonstration model of TacAlert is available for initial meetings with potential government sponsors. This mockup could be responsible for bringing in a grant before the product has been completely finalized. If a grant is awarded, our development timeline would be accelerated and this plan would be revised accordingly. Government development grants allow technology companies to finalize products and generate revenue from relatively small working capital.

**Marketing Methods**

We do not anticipate our original product being purchased by the everyday consumer. Company success will depend on convincing local, state, and federal decision makers that TacAlert provides a superior value to law enforcement agencies over existing PRDs. By this nature, marketing our product becomes more difficult. Early on, our marketing efforts will rely on targeted networking. To mitigate marketing risk, Alert R&D has recently engaged a retired professor of Marketing to advise our staff on various marketing and sales strategies. Additionally, both founders are actively engaged in establishing and developing key government, industry, and customer relationships.

**Legal Risks from Product Failure**

Since TacAlert is used to prevent catastrophic attacks, there is the chance that an active threat might be missed due to product malfunction. This threat is considered very low, but Alert R&D plans to handle this through the purchase of general liability insurance and product efficacy insurance. Field-testing will quantify the instrument performance in realistic and challenging operational environments. Demonstration of TacAlert’s superior performance compared to the competition would alleviate most of these concerns.

As the firm expands and considers international markets, overseas regulations will be reviewed on a country-by-country basis. These situations are not expected within the first 5 years and are not elaborated further in this plan.

**Meeting Federal Requirements for an Alarming PRD**

Alert R&D is developing a sophisticated PRD with a personal guidance system. The government requires any alarming PRD to meet the standards presented in the *American National Standard Performance Criteria for Alarming Personal Radiation Detectors for Homeland Security*. This risk is being minimized by following these standards during the development process. As stated earlier, the two founders have a combined 55 years of radiological experience and both hold PhDs directly related to develop systems in accordance with these standards. Alert R&D currently has an engineering and product design staff of four individuals, three of whom are at least Master’s level engineers and one of whom is a long-time Marine with tactical gear expertise.

**Overall Risk Assessment**

Prior to demonstration of superior performance of TacAlert in laboratory or field settings, the layperson may consider the overall risk to be high. Relying on their collective experience, however, the two founders, and the team they have formed, consider the overall risk to be medium (instead of high) but are making strides to prove the concept by self-funding the venture and clearly showing its merits. After successful demonstrations, the overall perceived risk immediately plummets to low-to-moderate. After receipt of a government development grant or external funding, the overall company risk becomes low.

**Chapter 12: Venture Offering**

Alert R&D is seeking an investment of $500,000 in order to quickly expand and take advantage of the market’s need for our product. With our current sales forecasts, this would allow for a return on investment of around $800,377 for the investor during the first five years of operations. We will use the investment to finalize the development of a market-ready product. We anticipate this process taking two years given significant development progress already achieved with our demonstration unit.

**Investment Offer**

Alert R&D is seeking an investment of $500,000 dollars for a 20% equity in the firm. This places a current valuation of $2.5 million on the firm. As our firm grows and increases its worth, this initial equity investment provides an even greater return as our product lines expand globally beyond the first 5 years.

**Use of Funds**

The investment will cover Alert R&D’s operating expenses for roughly the first two years of operation. After that, we plan to support costs through sales revenue and government R&D grants. Initial funding allocations will cover a number of critical activities for producing a consumer ready product as quickly as possible (Figure 12.1 and Table 12.1).

**Figure 12.1: Use of Investment Funds by Category**

The major use of funds would be tied directly to labor and staffing needs to support product development. This includes paying a CEO to run the firm and contract engineers who are part of the development team. The next major expenses is related to research and development and any software or hardware that will be needed to finalize the TacAlert prototype. A portion of the funds will be used for legal expenses to continue securing our intellectual property. Another portion will be used for travel expenses for sales teams to call on potential clients and to finalize purchase contracts. Finally, part of the investment will be used for a small office and expenses related to utilities.

**Table 12.1:** DetailedUse of Investment Funds

|  |  |  |
| --- | --- | --- |
|  | **Year 1** | **Year 2** |
| **Item** | **Budget** | **Budget** |
| CEOe | $20,000 | $30,000 |
| CTOe | $20,000 | $30,000 |
| CFOe | $10,000 | $10,000 |
| CMOe | $10,000 | $10,000 |
| VP of Engineering | $30,000 | $30,000 |
| VP of Sales | $10,000 | $10,000 |
| Contract Labor (1099) |  |  |
| Electrical Eng | $27,200 | $40,000 |
| Nuclear Eng | $6,000 | $16,640 |
| Design Eng | $4,000 | $8,000 |
| Manufacturing Eng | $8,000 | $8,000 |
| Engineering Supplies | $23,000 | $19,000 |
| Equipment | $8,000 | $4,000 |
| Software | $7,200 | $2,200 |
| Office Rent | $18,000 | $18,000 |
| Utilities ($200/mo) | $7,200 | $7,200 |
| Liability Insurance | $1,000 | $1,000 |
| Office Supplies | $2,000 | $2,000 |
| Travel^ | $8,400 | $16,800 |
| Legal Fees | $5,000 | $12,160 |
| **TOTAL** | **$225,000** | **$275,000** |

**Return on Investment**

Alert R&D has a five-year sales estimate of $19.3 million dollars. After covering operating expenses and the cost of goods sold, about $4,001,885 million remains in operating income, which equates to a five-year return of $800,377 for the initial investment.

We are focused on building a profitable, mission driven company with multiple products. In five years, it is quite possible that a higher level of sales is achieved than our estimate. We anticipate the investor making far more back through greater product sales over the life of the company through increased purchases of our detector and our future product lines. Beyond the first 5 years, odds increase of a larger firm acquiring us or of a positioning for public offerings.

**Exit Strategies**

Alert R&D operates as a privately held firm. For more than 20 years, companies including direct competitors in this market have relied on conventional user interfaces — devices with displays plus audible, visual, and vibratory alarms. Equipping law enforcement officers with PRDs for homeland security has occurred more recently. Our revolutionary feedback system will receive plenty of attention, even at the onset. However, in this newer market segment, the predominant detector manufactures are rather risk adverse and will likely wait for TacAlert’s success to be proven and sustained before they consider new model features or product lines to compete with us directly. For these medium- to large-sized companies, their costs to innovate and develop new products, on their own while not infringing on our intellectual property rights, will be large compared to ours. Even for established companies that manufacture a broad range of scientific instruments, radiation detection divisions must independently demonstrate profitability. In other words, strategic vision of these companies to concede disproportionately precious corporate overhead and internal research funds for the long‑term welfare of their small radiation detection division will not be well received despite loses of market share to TacAlert.

At this point, economics favor these established companies to acquire our small firm, but because some will not act quickly and instead wait until TacAlert actually impacts their sales, our company will have become profitable and thus we will be negotiating from a position of comfort rather than exhaustion or desperation. Depending on details of these offers and the willingness to negotiate them further, turning down initial buy-out offers will probably yield much larger offers one year later.

Other applications of our intellectual property in larger markets bodes well for Alert R&D after the firm becomes a self-sustaining entity. Accessing these new markets falls outside the 5-year time period considered in this plan and will not be discussed further.

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**Appendices**

\* Make this change throughout …. Alert R&D is the company name, and TacAlert is the product name, with a model number of TA-100 (or similar)

**Appendix 1: The Company**

\*No current Appendix

**Appendix 2: The Product**

\*No current Appendix

**Appendix 3: Market and Industry Analysis**

**Appendix 3.1:** Total Sworn Officers

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **State** | **Sworn Officers** | **State** | **Sworn Officers** | **State** | **Sworn Officers** |
| Alabama | 9,329 | Kentucky | 6,280 | North Dakota | 1,024 |
| Alaska | 821 | Louisiana | 12,556 | Ohio | 22,785 |
| Arizona | 14,629 | Maine | 2,000 | Oklahoma | 6,220 |
| Arkansas | 5,528 | Maryland | 11,016 | Oregon | 5,285 |
| California | 66,866 | Massachusetts | 15,461 | Pennsylvania | 20,572 |
| Colorado | 9,649 | Michigan | 15,748 | Rhode Island | 2,527 |
| Connecticut | 6,838 | Minnesota | 7,887 | South Carolina | 9,431 |
| Delaware | 1,087 | Mississippi | 5,662 | South Dakota | 1,299 |
| District of Columbia | 3,070 | Missouri | 11,773 | Tennessee | 13,411 |
| Florida | 41,714 | Montana | 1,460 | Texas | 45,582 |
| Georgia | 20,277 | Nebraska | 2,921 | Utah | 3,788 |
| Hawaii | 2,983 | Nevada | 5,323 | Vermont | 647 |
| Idaho | 2,701 | New Hampshire | 2,514 | Virginia | 16,008 |
| Illinois | 33,004 | New Jersey | 24,459 | Washington | 9,877 |
| Indiana | 11,138 | New Mexico | 3,825 | West Virginia | 2,201 |
| Iowa | 4,483 | New York | 64,578 | Wisconsin | 11,439 |
| Kansas | 6,054 | North Carolina | 18,671 | Wyoming | 1,267 |
| **Total 625,668** | | | | | |

**Appendix 3.2:** Distributor Firms in the Radiation Detection Industry

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Competitor** | | | | **Direct Competitor** | **Industry** | **Company Size** | **Threat Level** | **Threat Notes** | **Description** |
| Alpha Spectra | | | | No | Radiation Detectors | Medium | Low |  | They are a distributor of radiation detection products |
| Atlantic Nuclear Corp | | | | No | Nuclear, Homeland Security | Small | Low |  | Sells Instrumentation and Calibration Services |
| EcoTest | | | No | Retailer | Medium | Low |  | Offers a wide range of nuclear and radiation equipment |
| Fluke Biomedical | | No | Medical | Large | Low |  | Fluke is a medical company that has a range of radiation dosimeters and safety products. They do not appear to focus on Homeland Security |
| FujiFilm Holdings | | No | Healthcare and Others | Large | Low |  | FujiFilm offers a range of products and touches on radiopharmaceuticals and diagnostic equipment. |
| Gamma Data | | No | Nuclear Industry, Science | Large | Low |  | Gamma Data is a supplier of instruments and tools related to the nuclear field and optronics |
| James Fisher Nuclear | No | Nuclear Industry | Large | Low |  | A range of nuclear industry related products and services |
| Laurus Systems Inc | No | Detection Products | Medium | Low |  | Laurus offers products related to multiple fields including hazmat, nuclear energy, oil and gas, homeland security, hospitals, military and education |
| Nuclear Technology Services, Inc. | No | Consulting | Small | Low |  | Offer books, software and consulting related to nuclear industry |
| Owens Scientific Inc | Potentially | Radiation Detection, Nuclear | Medium | Low |  | Sells a range of radiation related products |
| Qaltek | No | Radiation, Consulting, Nuclear | Medium | Low |  | Qaltek distributes radiation products and also works in consulting and installation |
| Radiation Detection Co | No | Dosimetry | Medium | Low |  | Radetco offers dosimetry solutions to a range of industries |
| Shimadzu | No | Healthcare, Medical | Large | Low |  | Medical Related Distributor |
| Southern Scientific LTD | Potentially | Radiation Detection, Nuclear | Large | Low |  | Offers a range of products some related to homeland security but it appears they are mostly a distributor |

**Appendix 3.3:** Firms Operating in the Nuclear Industry

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Competitor** | **Direct Competitor** | **Industry** | **Company Size** | **Threat Level** | **Threat Notes** | **Description** |
| AccuSync | No | Medical | Small | Low |  | Manufactures nuclear medicine and measurement Devices |
| AGFA Healthcare | No | Medical | Large | Low |  | They have Digital Radiography, Enterprise Imaging and Hospital IT |
| Arktis | Potentially | Tactical Apparel | Large | Low |  | Manufacturer of gear for special forces and law enforcement |
| Arrow Tech | Yes | Homeland Security, Healthcare, Academia | Medium | Low | Arrowtech does not currently offer any competitive SPRDs | Arrowtech was founded in 1982 by FEMA. They offer a range of detectors that span across many industries including Homeland Security |
| Ashland | No | Medical, Radiography, Multiple Other | Large | Low |  | They offer a huge range of products but do not appear to be detector related |
| Beckman Coulter | No | Life Sciences | Very Large | Low |  | Healthcare, research and discovery |
| Berkeley Nucleonics Corporation | Yes | Radiation Detection | Medium | Medium | Offer a range of detectors; Able to create competing products; Current products are too large and bulky for active duty law enforcement | Manufacturer of electronic field‑portable radiation detectors and instruments for nuclear research. |
| Berthold | No | Nuclear, Bioanalytic | Large | Low |  | Specializes in EM (electromagnetism) detection including radiation |
| Bertin Instruments / Saphymo | Yes | Nuclear, Defense, Life Sciences, Environmental | Large | Medium |  | Many products relate to environmental monitoring but no PRDs. |
| Bruker | Yes | Detection, Biology, Medical, Multiple others | Large | Low | No directly competing product at the moment | High quality detection products for a range of industries |
| Bubble Technology Industries, Inc. | Yes | Homeland Security Law Enforcement | Medium | Low | Dosimeters and large scale detection devices; no SPRD products | Multiple products for radiation protection from terrorist threats. Recently received a $3M grant ($3,339,169.28) |
| Canberra | Yes | Nuclear, Radiation Safety | Medium | Medium | Currently don’t offer many PRD or SPRDs; capability to expand into this line | Acquired by Mirion |
| Carestream Health | No | Medical, Dental | Large | Low |  | Radiology, x-ray, medical and dental equipment |
| Centronic Nuclear | Potentially | Defense, Nuclear, Aerospace, Research, Oil and Gas, Medical | Large | Low |  | Lab related equipment, not relevant to law enforcement |
| CIRS inc | Low | Medical | Large | Low | Mostly focuses on medical industry |  |
| Cividec | Potentially | Radiation Detection, Nuclear | Large | Low | Appear to advertise instruments from other detector manufacturers | Range of detectors for lab and field usage |
| CP Medical | Potentially | Medical | Large | Low |  | Offer a range of medical device products |
| DigiRad | No | Healthcare, Nuclear | Large | Low |  | Offers mobile and on site solutions for imaging including cameras |
| Eckert & Ziegler Group | No | Nuclear, Healthcare | Large | Low |  | Offers products related to radiation therapy, isotope products, radiopharmaceuticals |
| Environics | Potentially | Multiple | Medium | Low | They do not appear to have a directly competing product at the moment | Computerized gas flow instrumentation |
| Environmental Instruments Canada | No | Consulting, Software, Nuclear | Small | Low |  | Works in radiation safety and training has released an android app |
| Esaote | No | Medical and Healthcare | Large | Low |  | Esaote offers a range of range of equipment and software related to the medical field in including ultrasound and MRI equipment. |
| Flir | Yes | Defense, Aviation, Nuclear, Tactical, Homeland Security, Military, Multiple Others | Large | Medium |  | Flir offers imaging systems to many different firms and industries and has a range of radiation detection products. They are a major technology company in a range of industries |
| Fluke Biomedical | No | Medical | Large | Low |  | Fluke is a medical company that has a range of radiation dosimeters and safety products. They do not appear to focus on Homeland Security |
| FujiFilm Holdings | No | Healthcare and Others | Large | Low |  | FujiFilm offers a range of products and touches on radiopharmaceuticals and diagnostic equipment. |
| Gamma Pix | Potentially | Radiation Detection | Medium | Medium | Low cost solution, currently lacks sensitivity needed for preventive detection | They have created an app for mobile phones to detect radiation |
| GE Healthcare | No | Healthcare, Medical | Large | Low |  | They offer a range of medical products including those related to radiology |
| GeoRadis | Potentially | Radiation Detection | Medium | Medium |  | Products for radiation detection and environmental monitoring |
| Global Medical Isotope Systems | No | Healthcare, Nuclear | Small | Low |  | Develop compact medical isotope systems |
| Hitachi Healthcare | No | Medical | Large | Low |  | Offers a range of medical products including MRI, Ultrasound and CT Equipment |
| Kromek | Yes | Radiation Detection, Nuclear | Large | High | They offer products directly related to homeland security | They are a large company with a range of detector and imaging products |
| Lab Impex Systems Ltd | Potentially | Security and Safety, Nuclear, Medical, Laboratory | Large | Low |  | Handheld and larger devices are not well suited for Law Enforcement. Acquired by Ultra Electronics, Nuclear Control Systems. |
| Landauer | Potentially | Nuclear | Large | Low | No PRDs in product line | Focus on occupational radiation monitoring |
| Leidos, Inc. | Potentially | Civil, Defense, Healthcare | Large | Medium | Offers large scale radiation detection products | Leidos is a huge company with multiple products and services Leidos received a grant($5,223,410) |
| Ludlum Instruments | Potentially | Radiation Detection | Large | Medium | Industry leader for handheld radiation survey instruments; no PRDs in product line | Ludlum offers a range of products related to radiation detection |
| Merge and IBM Company | No | Healthcare, Radiology, Software | Large | Low |  | Merge is part of IBM and offers a range of healthcare products and services |
| Mirion Technologies | Yes | Nuclear, Radiation Detection | Large | High |  | A large firm offering radiation detection and safety solutions |
| Nordion | No | Healthcare | Large | Low |  | Nordion offers gamma technologies and medical isotopes relevant to the healthcare field |
| Nuclear Solutions Division | No | Consulting | Small | Low |  | Nuclear Solutions Division mainly functions as a consultant in the nuclear industry. |
| NucSafe | Potentially | Radiation Detection, Nuclear | Medium | Medium | They are in the direct industry of TacAlert but do not have any current PRDs | Offers a range of radiation detection products |
| On Site Systems | No | Software | Medium | Low |  | On Site System develops radiation related software products |
| Ortec Ametek | Potentially | Nuclear Detection | Large | Medium | Industry leader for high performance gamma-ray spectrometers; no PRDs in product line | Ortec Ametek directly manufactures multiple technologies related to radiation detectors, nuclear instrumentation and software |
| Oxford Instruments | Potentially | Instrument Manufacturing | Large | Low | They offer a range of radiation products but do not appear to have any PRDs | Oxford Instruments is a large company with products covering a range research and multiple Industries |
| Passport Systems | Potentially | Homeland Security | Large | Medium | They do not currently have many competing products but could expand into PRDs and SPRDs | Passport Systems offers large scale as well as networked portable solutions to radiation detection and protection. They work directly with the Federal Government and Homeland Security. They recently won a large grant ($4,376,707). |
| Philips Healthcare | No | Medical | Large | Low |  | Offers a range of medical products including MRI, Ultrasound and CT Equipment and Diagnostic Imaging Equipment |
| Physical Sciences, Inc. | Potentially | Gas and Radiation Detection | Large | Low | 1) Does not appear to have PRDs 2) Site was potentially hacked [*caution for further exploration*] | They have a range of detection products related to the gas and nuclear industry. grant ($4,837,559) |
| Pico Envirotec | Potentially | Radiation, Geophysics | Medium | Low | No current PRD | Radiation and geophysical measurement in the air or ground |
| Polimaster\* | Yes | Radiation Detection | Large | High |  | Polimaster manufactures a range of radiation detection products |
| Protean Instruments | No | Radiation Detection | Medium | Low |  | Protean builds high performance alpha and beta counting systems |
| Radcomm Systems | Potentially | Radiation Detection | Large | Low |  | Radcomm builds radiation detection systems |
| Radiation Solutions Inc | No | Radiation Detection, Nuclear | Large | Low |  | Specialize in large vehicle-based detection systems for airplanes, helicopters, boats, etc. Appear to offer products from other manufacturers, not as primary business. |
| RAE Systems | Yes | Detection | Large | High |  | Rae Systems is a large manufacturer of detection systems. They appear to be a part of Honeywell |
| Saphymo | Potentially | Radiation Detection, Nuclear | Large | Low |  |  |
| Sensor Technology Engineering | Yes | Radiation Detection | Small | Medium | They offer gamma and neutron handheld detectors | They have 3 different hand held radiation detectors |
| Siemens Healthcare | No | Medical | Large | Low |  | Offers medical and diagnostic equipment |
| Smiths Detection | Potentially | Detection, Inspection | Large | Medium | No current PRD | They offer a range of detection systems from small to a very large scale, but no PRDs |
| Sun Nuclear | Potentially | Medical | Large | Low | Mostly focuses on medical industry | Offers a range of products related to medical field |
| Symetrica | Potentially | Radiation Detection, Homeland Security | Large | Medium | No current PRD | They offer a range of detection products specifically for homeland security related tasks |
| Technical Associates Nuclear Instruments and Systems | Yes | Radiation Detection, Safety Systems | Large | Medium | Other than aerial drone platform, company seems content with older technology. | They offer a range of radiation related products and also safety related equipment |
| The MJW Companies | No | Consulting | Medium | Low |  | They offer a range of consulting services geared towards the nuclear industry |
| Thermo Fisher Scientific | Yes | Life Sciences | Large | High |  | Thermo Fisher Scientific is a massive company with products covering multiple industries. They specifically manufacture radiation equipment |
| Toshiba Medical | No | Technology, Healthcare | Large | Low |  | They offer a range of products including radiation products. They mostly focus their radiation products in the healthcare sector |
| Tracerco | Potentially | Radiation Detection, Nuclear | Large | Low |  | They offer a range of detection and dosimetry equipment |
| Alpha Spectra | No | Radiation Detectors | Medium | Low |  | They are a distributor of radiation detection products |
| Atlantic Nuclear Corp | No | Nuclear, Homeland Security | Small | Low |  | Sells Instrumentation and Calibration Services |
| EcoTest | No | Retailer | Medium | Low |  | Offers a wide range of nuclear and radiation equipment |
| Fluke Biomedical | No | Medical | Large | Low |  | Fluke is a medical company that has a range of radiation dosimeters and safety products. They do not appear to focus on Homeland Security |
| FujiFilm Holdings | No | Healthcare and Others | Large | Low |  | FujiFilm offers a range of products and touches on radiopharmaceuticals and diagnostic equipment. |
| Gamma Data | No | Nuclear Industry, Science | Large | Low |  | Gamma Data is a supplier of instruments and tools related to the nuclear field and optronics |
| James Fisher Nuclear | No | Nuclear Industry | Large | Low |  | A range of nuclear industry related products and services |
| Laurus Systems Inc | No | Detection Products | Medium | Low |  | Laurus offers products related to multiple fields including hazmat, nuclear energy, oil and gas, homeland security, hospitals, military and education |
| Nuclear Technology Services, Inc. | No | Consulting | Small | Low |  | Offer books, software and consulting related to nuclear industry |
| Owens Scientific Inc | Potentially | Radiation Detection, Nuclear | Medium | Low |  | Sells a range of radiation related products |
| Qaltek | No | Radiation, Consulting, Nuclear | Medium | Low |  | Qaltek distributes radiation products and also works in consulting and installation |
| Radiation Detection Co | No | Dosimetry | Medium | Low |  | Radetco offers dosimetry solutions to a range of industries |
| Shimadzu | No | Healthcare, Medical | Large | Low |  | Medical Related Distributor |
| Southern Scientific LTD | Potentially | Radiation Detection, Nuclear | Large | Low |  | Offers a range of products some related to homeland security but it appears they are mostly a distributor |

**Appendix 4: Competitor Analysis**

**Appendix 4.1:** Detailed Competitor and Individual Product Analysis

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Company** | **Detector name** | **Type** | **Price** | **Potential Competitor** | **Gamma** | **Neutron** | **Notes** |
| Arrow Tech | DMC 2000GN Electronic Dosimeter, Gamma & Neutron | PRD |  | Potentially | Yes | Yes | No Gamma Spectrum |
| Arrow Tech | DMC 3000 Electronic Personal Dosimeter, X-ray & Gamma | PRD |  | Potentially | Yes | No | 1) No Gamma Spectrum  2) Same detector as Mirion DMC 3000 |
| Arrow Tech | RAD-60R Personal Electronic Dosimeter | PRD |  | Potentially | Yes | No | No Gamma Spectrum |
| Berkeley Nucleonics Corporation | Model 945- SAM III Isotope Identifier with Reachback | Handheld |  | Potentially | Yes | Optional | 1) Smartphone based application combined with detector |
| Berkeley Nucleonics Corporation | Model 950- Ruggedized Isotope Identifier | Handheld |  | Potentially | Yes |  | 1) Detects and identifies radionuclides 2) Meets ANSI 42.34 Standards 3) Patented Smartphone based hand-held RIID |
| Bubble Technology Industries, Inc. | RadCompass | Handheld |  | Potentially | Yes |  | 1) Offers a handheld detector with location based source finding |
| Canberra | UltraRadiac-Plus Personal Radiation Monitor | Handheld |  | Potentially | Yes |  | 1) Made to be used in extreme environments |
| Environmental Instruments Canada | GammaGuard | Handheld |  | Potentially | Yes |  | This is an application that runs on the users phone |
| FLIR | identiFINDER R100 | PRD |  | Yes | Yes |  |  |
| FLIR | identiFINDER R200 | SPRD |  | Yes | Yes |  |  |
| FLIR | identiFINDER R300 | SPRD | $9,950 | Yes | Yes | Optional |  |
| Kromek | D3S | Handheld |  | Yes | Yes | Yes | 1) Thermal neutron scintillator detector and CsI(Tl) gamma detector  2) Bluetooth Connectivity  3) Integrates with phone |

**Appendix 4.1:** Detailed Competitor and Individual Product Analysis (continued)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Company** | **Detector name** | **Type** | **Price** | **Potential Competitor** | **Gamma** | **Neutron** | **Notes** |
| Mirion Technologies | DMC 2000 GN | Neutron Dosimeter | PRD |  | No | Yes | Yes | 1) Appears to match Arrow Tech DMC 2000 GN |
| Mirion Technologies | DMC 3000 PRD Module | PRD |  | Potentially |  |  | Radiation Counting |
| Mirion Technologies | PDS GO | PRD |  | Yes | Yes |  |  |
| Mirion Technologies\* | PDS-100GN | PRD | PRD | $3,000 | Yes | Yes | Yes | Separate Gamma and Neutron Channel |
| Mirion Technologies\* | PDS-100GN/ID | Spectroscopic Personal Radiation Detector (SPRD) | SPRD | $4,950 | Yes | Yes | Yes | 1) Can distinguish types of radiation on the spot (NORM, Background, SNM) |
| Passport Systems | G300 SmartShield | Handheld |  | Yes | Yes |  | 1) Allows for Geolocation of radiological sources 2) Can be linked to other detectors 3) Adds Map Functionality 4) Has three parts detector, phone and master software application |
| Polimaster | Gamma Personal Radiation Detector PM1401GNB | SPRD | $4,800 | Yes | Yes | Yes | 1) Detect and identify radioactive and nuclear materials |
| Polimaster | Gamma Personal Radiation Detector PM1401MB | SPRD |  | Yes | Yes | Yes | 1) Detect and identify radioactive and nuclear materials |
| Polimaster | Personal Combined Radiation Detectors/Dosimeters PM1703MO-1A | SPRD |  | Yes | Yes |  | 1) Bluetooth Connectivity 2) Isotope Identification 3) Networking Software |
| Polimaster | Personal Combined Radiation Detectors/Dosimeters PM1703MO-1B | SPRD |  | Yes | Yes |  | 1) Bluetooth Connectivity 2) Isotope Identification 3) Networking Software |

**Appendix 4.1:** Detailed Competitor and Individual Product Analysis (continued)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Company** | **Detector name** | **Type** | **Price** | **Potential Competitor** | **Gamma** | **Neutron** | **Notes** |
| Polimaster | Personal Radiation Detectors PM1703 GNB | SPRD |  | Yes | Yes | Yes | 1) Has gamma detection and neutron detection  2) Uses Csi(TI) for gamma and LiL(Eu) for neutron  3) Bluetooth Connectivity  4) Isotope Identification  5) Networking Software |
| Polimaster | Personal Radiation Detectors PM1703 MB | SPRD | $4,312 | Yes | Yes | Yes | 1) Has gamma detection and neutron detection 2) Uses Csi(TI) for gamma and LiL(Eu) for neutron 3) Bluetooth Connectivity 4) Isotope Identification 5) Networking Software |
| Polimaster | PM1401GNA | PRD | $3,667 | Yes | Yes | Yes | 1) Portable detector can search for gamma and neutron radiation |
| Polimaster | PM1401MA/MB | PRD |  | Yes | Yes |  | 1) Can detect gamma even if shielded  2) Designed for harsh environments |
| Polimaster | PM140GNB | PRD |  | Yes | Yes | Yes | 1) Portable detector for gamma and neutron radiation |
| Polimaster | PM1701M | PRD |  | Yes | Yes |  | 1) Able to distinguish between background radiation |
| Polimaster | PM1703GN | PRD | $2,933 | Yes | Yes | Yes | 1) Detector for radioactive and nuclear materials |
| Polimaster | PM1703GNA | PRD | $3,389 | Yes | Yes | Yes | 1) Detector for radioactive and nuclear materials |

**Appendix 4.1:** Detailed Competitor and Individual Product Analysis (continued)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Company** | **Detector name** | **Type** | **Price** | **Potential Competitor** | **Gamma** | **Neutron** | **Notes** |
| Polimaster | PM1703GNB | PRD | $3,200 | Yes | Yes | Yes | 1) Detector for radioactive and nuclear materials |
| Polimaster | PM1703GNM | PRD |  | Yes | Yes | Yes | 1) Detector for radioactive and nuclear materials |
| Polimaster | PM1703M/MA/MB | PRD |  | Yes | Yes |  | 1) Detector for gamma  2) Provides dose rates |
| Polimaster | PM1703MO-1/MO-2/MO-1BT | PRD |  | Yes | Yes |  | 1) Has two detection modules 2) Can search for gamma and provide dose rates |
| Polimaster | Spectroscopic Personal Radiation Detectors PM1704 (Basic) | SPRD |  | Yes | Yes |  | 1) Has CsI(TI) scintillator and creates gamma-spectra 2) Identify sources |
| Polimaster | Spectroscopic Personal Radiation Detectors PM1704 A-GN | SPRD |  | Yes | Yes | Yes | 1) Has two detectors spectroscopic gamma (CsI(TI) and neutron detector |
| Polimaster | Spectroscopic Personal Radiation Detectors PM1704 A-GNM | SPRD | $4,187 | Yes | Yes | Yes | 1) Has three detectors two for gamma and one for neutrons: CsI(Tl), GM tube and LiI(Eu) |
| Polimaster | Spectroscopic Personal Radiation Detectors PM1704 A-M | SPRD |  | Yes | Yes |  | 1) Two gamma-detectors spectroscopic CsI(Tl) and GM tube  2) Long range to measure exposure and rate |
| Polimaster | Spectroscopic Personal Radiation Detectors PM1704 GN | SPRD | $3,987 | Yes | Yes | Yes | 1) Adds LiI(Eu) detector for neutrons |
| Polimaster | Spectroscopic Personal Radiation Detectors PM1704 M | SPRD |  | Yes | Yes |  | 1) Adds a GM tube to expand dose rate measurement over basic version |

**Appendix 4.1:** Detailed Competitor and Individual Product Analysis (continued)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Company** | **Detector name** | **Type** | **Price** | **Potential Competitor** | **Gamma** | **Neutron** | **Notes** |
| Polimaster | Spectroscopic Personal Radiation Detectors PM1704A | SPRD | $3,987 | Yes | Yes |  | 1) Basic gamma model with spectroscopic CsI(Tl) detector |
| Radcomm Systems | Mspec | Handheld |  | Yes | Yes |  | 1) Appears to be more for scanning material to check for and categorize categorizes the result as Industrial, Medical or NORM |
| RAE Systems | DoseRAE Pro | Handheld |  | Potentially | Yes |  | 1) For response to gamma ray threats |
| RAE Systems | GammaRAE II R | PRD |  | Yes | Yes |  | 1) For first responders has BlueTooth connectivity and can allows real time threat monitoring with ProRAE Guardian software |
| RAE Systems | NeutronRAE II | PRD | $2,995 | Yes | Yes | Yes |  |
| Saphymo | MiniTRACE Gamma S10 / S100 | Handheld |  | Yes | Yes |  | 1) Detector that can be used for homeland security purposes |
| Sensor Technology Engineering | HRM-Handheld Radiation Monitor | Handheld | $5,500 | Yes | yes | Yes | 1) Can detect gamma and thermal neutrons |
| Sensor Technology Engineering | Radiation Pager | Handheld |  | Yes | yes |  | 1) Detector with PM tube and Scintillator |
| Sensor Technology Engineering | Radiation Pager-S | Handheld |  | Yes | yes |  | 1) More advanced version of the original Radiation Pager |
| Technical Associates Nuclear Instruments and Systems | DSI-2GN | PRD | $3,950 | Yes | Yes | Yes | 1) Uses a BGO Scintillator |
| Thermo Fisher Scientific | RadEy GF/GF-10 Personal Radiation Detectors | Handheld |  | Potentially | Yes |  |  |
| Thermo Fisher Scientific | RadEye B20 and B20-ER Multi-Purpose Survey Meters | Handheld |  | Potentially | Yes | no |  |

**Appendix 4.1:** Detailed Competitor and Individual Product Analysis (continued)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Company** | **Detector name** | **Type** | **Price** | **Potential Competitor** | **Gamma** | **Neutron** | **Notes** |
| Thermo Fisher Scientific | RadEye G Ex series Personal Radiation Detectors | Handheld |  | Yes | Yes |  | 1) For use in environments that may have explosives present |
| Thermo Fisher Scientific | RadEye G/G-10 Personal Dose Rate Meters | Handheld |  | Yes | Yes |  | 1) For first responders to measure gamma and x-ray dose rates |
| Thermo Fisher Scientific | RadEye GN Gamma Neutron Pagers | PRDs | $3,250 | Yes | Yes | Yes |  |
| Thermo Fisher Scientific | RadEye GN+ Gamma Neutron Pagers | PRDs | $3,950 | Yes | Yes | Yes |  |
| Thermo Fisher Scientific | RadEye NL Personal Highly Sensitive Neutron Radiation Detectors | PRD | $2,420 | No | No | Yes | 1) This is just a neutron detector |
| Thermo Fisher Scientific | RadEye SPRD-GN Spectroscopic Personal Radiation Detector | SPRD | $5,000 | Yes | Yes | Yes | 1) Similar to RadEye SPRD but can detect thermal neutrons |
| Thermo Fisher Scientific | RadEye X Series Survey Meters | Handheld |  | Potentially | Yes |  | 1) Essentially operates as a survey meter |
| Thermo Fisher Scientific | RadEyeSPRD Spectroscopic Personal Radiation Detector | SPRD | $3,950 | Yes | Yes | No | 1) This is a SPRD that could be a direct competitor |

**Appendix 5: Overall Schedule (5 year plan)**

**Appendix 6: Management and Human Resources**

**Appendix 7: Operations Plan**

**Appendix 7.1:** Estimated Salary Levels and Total Compensation

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Employee Type** | **Level** | **Salary (Low)** | **Salary (High)** | **Benefits (raw)** | **Benefits (adjusted)** | **Total Compensation (Low)** | **Total Compensation (High)** | **Optional Benefits** |
| CEO | 1 | $15,000 | $450,000 | $65,625 | $21,875 | $140,625 | $515,625 | Equity |
| CEO | 2 | $15,000 | $550,000 | $79,375 | $26,250 | $164,375 | $629,375 | Equity |
| CEO | 3 | $20,000 | $650,000 | $93,750 | $43,750 | $193,750 | $743,750 | Equity |
| CTO | 1 | $15,000 | $350,000 | $53,125 | $20,625 | $128,125 | $403,125 | Equity |
| CTO | 2 | $15,000 | $400,000 | $60,000 | $25,000 | $140,000 | $460,000 | Equity |
| CTO | 3 | $20,000 | $450,000 | $68,125 | $36,875 | $163,125 | $518,125 | Equity |
| VP of Sales | 1 | $15,000 | $300,000 | $46,875 | $20,625 | $121,875 | $346,875 | Stock |
| VP of Sales | 2 | $15,000 | $350,000 | $53,750 | $25,000 | $133,750 | $403,750 | Stock |
| VP of Sales | 3 | $15,000 | $400,000 | $61,875 | $36,875 | $156,875 | $461,875 | Stock |
| VP of Engineering | 1 | $15,000 | $300,000 | $46,875 | $20,625 | $121,875 | $346,875 | Stock |
| VP of Engineering | 2 | $15,000 | $350,000 | $53,750 | $25,000 | $133,750 | $403,750 | Stock |
| VP of Engineering | 3 | $20,000 | $400,000 | $61,875 | $36,875 | $156,875 | $461,875 | Stock |
| Engineer | 1 | $60,000 | $125,000 | $23,125 | $18,750 | $83,125 | $148,125 | Stock |
| Engineer | 2 | $70,000 | $150,000 | $27,500 | $23,750 | $97,500 | $177,500 | Stock |
| Engineer | 3 | $85,000 | $175,000 | $32,500 | $33,125 | $117,500 | $207,500 | Stock |
| Sales | 1 | $35,000 | $100,000 | $16,875 | $12,500 | $51,875 | $116,875 | Commission + Stock |
| Sales | 2 | $45,000 | $110,000 | $19,375 | $15,625 | $64,375 | $129,375 | Commission + Stock |
| Sales | 3 | $60,000 | $120,000 | $22,500 | $22,500 | $82,500 | $142,500 | Commission + Stock |
| Administrative Assistant | 1 | $35,000 | $70,000 | $13,125 | $15,625 | $48,125 | $83,125 | Stock |
| Administrative Assistant | 2 | $40,000 | $75,000 | $14,375 | $15,625 | $54,375 | $89,375 | Stock |
| Administrative Assistant | 3 | $45,000 | $80,000 | $15,625 | $15,625 | $60,625 | $95,625 | Stock |
| IT Staff | 1 | $60,000 | $125,000 | $23,125 | $18,750 | $83,125 | $148,125 | Stock |
| IT Staff | 2 | $70,000 | $150,000 | $27,500 | $23,750 | $97,500 | $177,500 | Stock |
| IT Staff | 3 | $85,000 | $175,000 | $32,500 | $33,125 | $117,500 | $207,500 | Stock |

**Appendix 7.2:** Yearly Budget Allocation for $100k and $75k

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **$100 K** | |  | **$75 K** | |
| **Item** | **Budget** |  | **Item** | **Budget** |
| CEOe | $45,000 |  | CEOe | $25,000 |
| Contract Labor (1099) |  |  | Contract Labor (1099) |  |
| Electrical Engineer | $12,000 |  | Electrical Engineer | $12,000 |
| Nuclear Engineer | $6,000 |  | Nuclear Engineer | $6,000 |
| Engineering Supplies | $7,000 |  | Engineering Supplies | $7,000 |
| Equipment | $5,000 |  | Equipment | $2,600 |
| Software | $5,000 |  | Software | $5,000 |
| Office Rent | $4,800 |  | Office Rent | $4,800 |
| Utilities ($200/month) | $2,400 |  | Utilities ($200/month) | $2,400 |
| Office Supplies | $1,000 |  | Office Supplies | $1,000 |
| Travel | $4,200 |  | Travel | $4,200 |
| Legal Fees | $7,600 |  | Legal Fees | $5,000 |
| **TOTAL** | **$100,000** |  | **TOTAL** | **$75,000** |

**Appendix 7.3:** Yearly Budget Allocation for $200k and $150k

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **$200 K** | |  | **$150 K** | |
| **Item** | **Budget** |  | **Item** | **Budget** |
| CEOe | $20,000 |  | CEOe | $48,000 |
| CTOe | $15,000 |  | Contract Labor (1099) |  |
| CFOe | $15,000 |  | Electrical Engineer | $15,000 |
| CMOe | $0 |  | Nuclear Engineer | $6,000 |
| VP of Engineeringe | $15,000 |  | Design Engineer | $4,000 |
| VP of Salese | $0 |  | Manufacturing Engineer | $8,000 |
| Contract Labor (1099) |  |  | Engineering Supplies | $12,000 |
| Electrical Engineer | $29,000 |  | Equipment | $8,000 |
| Nuclear Engineer | $12,000 |  | Software | $7,400 |
| Design Engineer | $4,000 |  | Office Rent | $18,000 |
| Manufacturing Engineer | $8,000 |  | Utilities ($600/month) | $7,200 |
| Graphic Designer | $2,000 |  | Liability Insurance | $1,000 |
| Engineering Supplies | $23,000 |  | Office Supplies | $2,000 |
| Equipment | $8,000 |  | Travel | $8,400 |
| Software | $7,200 |  | Legal Fees | $5,000 |
| Office Rent | $18,000 |  | **TOTAL** | **$150,000** |
| Utilities ($600/month) | $7,200 |  |  |  |
| Liability Insurance | $1,000 |  |  |  |
| Office Supplies | $2,000 |  |  |  |
| Travel | $8,600 |  |  |  |
| Legal Fees | $5,000 |  |  |  |
| **TOTAL** | **$200,000** |  |  |  |

**Appendix 7.4:** Yearly Budget Allocation for $300K and $250K

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **$300 K** | |  | **$250 K** | |
| **Item** | **Budget** |  | **Item** | **Budget** |
| CEOe | $45,000 |  | CEOe | $40,000 |
| CTOe | $30,000 |  | CTOe | $20,000 |
| CFOe | $30,000 |  | CFOe | $20,000 |
| CMOe | $0 |  | CMOe | $0 |
| VP of Engineeringe | $30,000 |  | VP of Engineeringe | $20,000 |
| VP of Salese | $30,000 |  | VP of Salese | $20,000 |
| Contract Labor (1099) |  |  | Contract Labor (1099) |  |
| Electrical Engineer | $20,000 |  | Electrical Engineer | $22,000 |
| Nuclear Engineer | $10,000 |  | Nuclear Engineer | $6,000 |
| Design Engineer | $4,000 |  | Design Engineer | $4,000 |
| Manufacturing Engineer | $8,000 |  | Manufacturing Engineer | $8,000 |
| Graphic Designer | $4,000 |  | Graphic Designer | $10,000 |
| Engineering Supplies | $23,000 |  | Engineering Supplies | $23,000 |
| Equipment | $10,000 |  | Equipment | $8,000 |
| Software | $7,200 |  | Software | $7,200 |
| Office Rent | $18,000 |  | Office Rent | $18,000 |
| Utilities ($600/month) | $7,200 |  | Utilities ($600/month) | $7,200 |
| Liability Insurance | $1,000 |  | Liability Insurance | $1,000 |
| Office Supplies | $2,000 |  | Office Supplies | $2,000 |
| Travel | $8,600 |  | Travel | $8,600 |
| Legal Fees | $12,000 |  | Legal Fees | $5,000 |
| **TOTAL** | **$300,000** |  | **TOTAL** | **$250,000** |

**Appendix 7.5:** Yearly Budget Allocation for $400K and $350K

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **$400 K** | |  | **$350 K** | |
| **Item** | **Budget** |  | **Item** | **Budget** |
| CEOe | $50,000 |  | CEOe | $50,000 |
| CTOe | $40,000 |  | CTOe | $35,000 |
| CFOe | $35,000 |  | CFOe | $35,000 |
| CMOe | $40,000 |  | CMOe | $35,000 |
| VP of Engineeringe | $35,000 |  | VP of Engineeringe | $35,000 |
| VP of Salese | $35,000 |  | VP of Salese | $35,000 |
| Contract Labor (1099) |  |  | Contract Labor (1099) |  |
| Electrical Engineer | $30,000 |  | Electrical Engineer | $9,400 |
| Nuclear Engineer | $10,000 |  | Nuclear Engineer | $2,000 |
| Design Engineer | $4,000 |  | Design Engineer | $2,000 |
| Manufacturing Engineer | $8,000 |  | Manufacturing Engineer | $2,000 |
| Graphic Designer | $4,400 |  | Graphic Designer | $1,000 |
| Engineering Supplies | $23,000 |  | Engineering Supplies | $23,000 |
| Equipment | $8,000 |  | Equipment | $8,000 |
| Software | $7,200 |  | Software | $7,200 |
| Office Rent | $24,000 |  | Office Rent | $24,000 |
| Utilities ($600/month) | $9,600 |  | Utilities ($800/month) | $9,600 |
| Liability Insurance | $2,000 |  | Liability Insurance | $2,000 |
| Office Supplies | $4,000 |  | Office Supplies | $4,000 |
| Travel | $16,800 |  | Travel | $16,800 |
| Legal Fees | $14,000 |  | Legal Fees | $14,000 |
| **TOTAL** | **$400,000** |  | **TOTAL** | **$350,000** |

**Appendix 7.6:** Yearly Budget Allocation for $600K and $500K

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **$600 K** | |  | **$500 K** | |
| **Item** | **Budget** |  | **Item** | **Budget** |
| CEOe | $80,000 |  | CEOe | $60,000 |
| CTOe | $60,000 |  | CTOe | $60,000 |
| CFOe | $60,000 |  | CFOe | $35,000 |
| CMOe | $60,000 |  | CMOe | $35,000 |
| VP of Engineeringe | $60,000 |  | VP of Engineeringe | $35,000 |
| VP of Salese | $60,000 |  | VP of Salese | $35,000 |
| Account Executive | $75,000 |  | Account Executive | $75,000 |
| Contract Labor (1099) |  |  | Contract Labor (1099) |  |
| Electrical Engineer | $14,400 |  | Electrical Engineer | $30,000 |
| Nuclear Engineer | $8,000 |  | Nuclear Engineer | $10,000 |
| Design Engineer | $4,000 |  | Design Engineer | $4,000 |
| Manufacturing Engineer | $8,000 |  | Manufacturing Engineer | $8,000 |
| Graphic Designer | $2,000 |  | Graphic Designer | $4,400 |
| Engineering Supplies | $23,000 |  | Engineering Supplies | $23,000 |
| Equipment | $8,000 |  | Equipment | $8,000 |
| Software | $7,200 |  | Software | $7,200 |
| Office Rent | $24,000 |  | Office Rent | $24,000 |
| Utilities ($800/month) | $9,600 |  | Utilities ($600/month) | $9,600 |
| Liability Insurance | $2,000 |  | Liability Insurance | $2,000 |
| Office Supplies | $4,000 |  | Office Supplies | $4,000 |
| Travel | $16,800 |  | Travel | $16,800 |
| Legal Fees | $14,000 |  | Legal Fees | $14,000 |
| **TOTAL** | **$600,000** |  | **TOTAL** | **$500,000** |

**Appendix 7.7:** Yearly Budget Allocation for $800K and $700K

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **$800 K** | |  | **$700 K** | |
| **Item** | **Budget** |  | **Item** | **Budget** |
| CEOe | $90,000 |  | CEOe | $90,000 |
| CTOe | $80,000 |  | CTOe | $80,000 |
| CFOe | $75,000 |  | CFOe | $70,000 |
| CMOe | $75,000 |  | CMOe | $75,000 |
| VP of Engineeringe | $75,000 |  | VP of Engineeringe | $70,000 |
| VP of Salese | $75,000 |  | VP of Salese | $70,000 |
| Account Executive | $75,000 |  | Account Executive | $75,000 |
| Administrative Assistant | $60,000 |  | Contract Labor (1099) |  |
| Contract Labor (1099) |  |  | Electrical Engineer | $25,000 |
| Electrical Engineer | $10,000 |  | Nuclear Engineer | $8,000 |
| Nuclear Engineer | $10,000 |  | Design Engineer | $4,000 |
| Design Engineer | $6,000 |  | Manufacturing Engineer | $8,000 |
| Manufacturing Engineer | $8,000 |  | Graphic Designer | $4,000 |
| Graphic Designer | $4,000 |  | Engineering Supplies | $23,000 |
| Engineering Supplies | $23,000 |  | Equipment | $8,000 |
| Equipment | $20,000 |  | Software | $7,200 |
| Software | $14,000 |  | Office Rent | $31,200 |
| Office Rent | $31,200 |  | Utilities ($800/month) | $9,600 |
| Utilities ($1000/month) | $12,000 |  | Liability Insurance | $2,000 |
| Liability Insurance | $2,000 |  | Office Supplies | $5,000 |
| Office Supplies | $5,000 |  | Travel | $21,000 |
| Travel | $33,600 |  | Legal Fees | $14,000 |
| Legal Fees | $16,200 |  | **TOTAL** | **$700,000** |
| **TOTAL** | **$800,000** |  |  |  |

**Appendix 7.7:** Yearly Budget Allocation for $1M and $900K

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **$1 M** | |  | **$900 K** | |
| **Item** | **Budget** |  | **Item** | **Budget** |
| CEOe | $130,000 |  | CEOe | $120,000 |
| CTOe | $90,000 |  | CTOe | $85,000 |
| CFOe | $90,000 |  | CFOe | $85,000 |
| CMOe | $90,000 |  | CMOe | $85,000 |
| VP of Engineeringe | $90,000 |  | VP of Engineeringe | $85,000 |
| VP of Salese | $90,000 |  | VP of Salese | $85,000 |
| Account Executive | $75,000 |  | Account Executive | $75,000 |
| Administrative Assistant | $65,000 |  | Administrative Assistant | $65,000 |
| Interns | $49,000 |  | Contract Labor (1099) |  |
| Contract Labor (1099) |  |  | Electrical Engineer | $20,000 |
| Electrical Engineer | $20,000 |  | Nuclear Engineer | $10,000 |
| Nuclear Engineer | $10,000 |  | Design Engineer | $6,000 |
| Design Engineer | $6,000 |  | Manufacturing Engineer | $8,000 |
| Manufacturing Engineer | $8,000 |  | Graphic Designer | $14,000 |
| Graphic Designer | $20,000 |  | Engineering Supplies | $23,000 |
| Engineering Supplies | $23,000 |  | Equipment | $20,000 |
| Equipment | $20,000 |  | Software | $14,000 |
| Software | $16,000 |  | Office Rent | $31,200 |
| Office Rent | $32,000 |  | Utilities ($800/month) | $12,000 |
| Utilities ($800/month) | $12,000 |  | Liability Insurance | $2,000 |
| Liability Insurance | $2,400 |  | Office Supplies | $5,000 |
| Office Supplies | $8,000 |  | Travel | $33,600 |
| Travel | $33,600 |  | Legal Fees | $16,200 |
| Legal Fees | $20,000 |  | **TOTAL** | **$900,000** |
| **TOTAL** | **$1,000,000** |  |  |  |

**Appendix 7.8:** Yearly Budget Allocation for $1.5M and $1.25M

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **$1.5 M** | |  | **$1.25 M** | |
| **Item** | **Budget** |  | **Item** | **Budget** |
| CEOe | $160,000 |  | CEOe | $130,000 |
| CTOe | $130,000 |  | CTOe | $120,000 |
| CFOe | $130,000 |  | CFOe | $120,000 |
| CMOe | $130,000 |  | CMOe | $120,000 |
| VP of Engineeringe | $130,000 |  | VP of Engineeringe | $120,000 |
| VP of Salese | $130,000 |  | VP of Salese | $120,000 |
| Electrical Engineer | $120,000 |  | Account Executive | $75,000 |
| Account Executive | $85,000 |  | Engineer | $120,000 |
| Account Executive | $85,000 |  | Administrative Assistant | $75,000 |
| Administrative Assistant | $75,000 |  | Interns | $27,000 |
| Interns | $50,000 |  | Contract Labor (1099) |  |
| Contract Labor (1099) |  |  | Electrical Engineer | $10,000 |
| Electrical Engineer | $18,600 |  | Nuclear Engineer | $10,000 |
| Nuclear Engineer | $10,000 |  | Design Engineer | $6,000 |
| Design Engineer | $6,000 |  | Manufacturing Engineer | $10,000 |
| Manufacturing Engineer | $20,000 |  | Graphic Designer | $20,000 |
| Graphic Designer | $20,000 |  | Engineering Supplies | $23,000 |
| Engineering Supplies | $30,000 |  | Equipment | $20,000 |
| Equipment | $30,000 |  | Software | $16,000 |
| Software | $20,000 |  | Office Rent | $32,000 |
| Office Rent | $32,000 |  | Utilities ($1000/month) | $12,000 |
| Utilities ($1000/month) | $12,000 |  | Liability Insurance | $2,400 |
| Liability Insurance | $2,400 |  | Office Supplies | $8,000 |
| Office Supplies | $12,000 |  | Travel | $33,600 |
| Travel | $42,000 |  | Legal Fees | $20,000 |
| Legal Fees | $20,000 |  | **TOTAL** | **$1,250,000** |
| **TOTAL** | **$1,500,000** |  |  |  |

**Appendix 7.9:** Yearly Budget Allocation for $2.5M and $1.75M

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **$2.5 M** | |  | **$1.75 M** | |
| **Item** | **Budget** |  | **Item** | **Budget** |
| CEOe | $175,000 |  | CEOe | $160,000 |
| CTOe | $155,000 |  | CTOe | $140,000 |
| CFOe | $155,000 |  | CFOe | $140,000 |
| CMOe | $155,000 |  | CMOe | $140,000 |
| VP of Engineeringe | $150,000 |  | VP of Engineeringe | $140,000 |
| VP of Salese | $150,000 |  | VP of Salese | $140,000 |
| Senior Electrical Engineer | $140,000 |  | Electrical Engineer | $120,000 |
| Nuclear Engineer | $130,000 |  | ElectricalEngineer | $120,000 |
| Electrical Engineer | $130,000 |  | Account Executive | $85,000 |
| Electrical Engineer | $130,000 |  | Account Executive | $85,000 |
| Software Engineer | $120,000 |  | Administrative Assistant | $75,000 |
| Business/Accountant | $100,000 |  | Interns | $60,000 |
| Account Executive | $85,000 |  | Contract Labor (1099) |  |
| Account Executive | $85,000 |  | Electrical Engineer | $26,000 |
| Account Executive | $85,000 |  | Nuclear Engineer | $20,000 |
| Administrative Assistant | $70,000 |  | Design Engineer | $6,000 |
| Interns | $60,000 |  | Manufacturing Engineer | $8,000 |
| Contract Labor |  |  | Graphic Designer | $12,000 |
| Electrical Engineer | $15,000 |  | Engineering Supplies | $36,400 |
| Nuclear Engineer | $7,000 |  | Equipment | $40,000 |
| Design Engineer | $10,000 |  | Software | $28,800 |
| Manufacturing Engineer | $10,000 |  | Office Rent | $48,000 |
| Graphic Designer | $10,000 |  | Utilities ($1200/month) | $14,400 |
| Engineering Supplies | $36,400 |  | Liability Insurance | $4,800 |
| Equipment | $40,000 |  | Office Supplies | $16,000 |
| Software | $28,800 |  | Travel | $54,600 |
| Office Rent | $48,000 |  | Legal Fees | $30,000 |
| Utilities ($1800/month) | $21,600 |  | **TOTAL** | **$1,750,000** |
| Liability Insurance | $12,000 |  |  |  |
| Office Supplies | $32,000 |  |  |  |
| Travel | $109,200 |  |  |  |
| Legal Fees | $45,000 |  |  |  |
| **TOTAL** | **$2,500,000** |  |  |  |

**Appendix 7.10:** Yearly Budget Allocation for $3.75M and $3M

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **$3.75 M** | |  | **$3 M** | |
| **Item** | **Budget** |  | **Item** | **Budget** |
| CEOe | $175,000 |  | CEOe | $175,000 |
| CTOe | $160,000 |  | CTOe | $160,000 |
| CFOe | $160,000 |  | CFOe | $160,000 |
| CMOe | $160,000 |  | CMOe | $160,000 |
| VP of Engineeringe | $150,000 |  | VP of Engineeringe | $150,000 |
| VP of Salese | $150,000 |  | VP of Salese | $150,000 |
| Senior Electrical Engineer | $140,000 |  | Senior Electrical Engineer | $140,000 |
| Nuclear Engineer | $130,000 |  | Nuclear Engineer | $130,000 |
| Electrical Engineer (5) | $650,000 |  | Electrical Engineer (4) | $520,000 |
| Software Engineer | $120,000 |  | Software Engineer | $120,000 |
| Software Engineer | $120,000 |  | Software Engineer | $120,000 |
| Account Executive (5) | $425,000 |  | Account Executive (5) | $425,000 |
| Administrative Assistant | $70,000 |  | Administrative Assistant | $70,000 |
| Finance/Accounting | $100,000 |  | Interns | $80,000 |
| Human Resources | $95,000 |  | Contract Labor | $40,000 |
| IT Staff | $120,000 |  | Engineering Supplies | $46,000 |
| Marketing | $75,000 |  | Equipment | $45,400 |
| Office Manager | $120,000 |  | Software | $36,000 |
| Interns | $80,000 |  | Office Rent | $52,800 |
| Contract Labor | $40,000 |  | Utilities | $21,600 |
| Engineering Supplies | $46,000 |  | Liability Insurance | $12,000 |
| Equipment | $45,400 |  | Office Supplies | $32,000 |
| Software | $36,000 |  | Travel | $109,200 |
| Office Rent | $52,800 |  | Legal Fees | $45,000 |
| Utilities | $21,600 |  | **TOTAL** | **$3,000,000** |
| Liability Insurance | $12,800 |  |  |  |
| Office Supplies | $32,000 |  |  |  |
| Travel | $218,400 |  |  |  |
| Legal Fees | $45,000 |  |  |  |
| **TOTAL** | **$3,750,000** |  |  |  |
|  |  |  |  |  |

**Appendix 7.11:** Yearly Budget Allocation for $5M and $4M

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **$5 M** | |  | **$4 M** | |
| **Item** | **Budget** |  | **Item** | **Budget** |
| CEOe | $200,000 |  | CEOe | $195,000 |
| CTOe | $180,000 |  | CTOe | $180,000 |
| CFOe | $180,000 |  | CFOe | $180,000 |
| CMOe | $180,000 |  | CMOe | $180,000 |
| VP of Engineering | $160,000 |  | VP of Engineeringe | $160,000 |
| VP of Salese | $160,000 |  | VP of Salese | $160,000 |
| Senior Engineer | $155,000 |  | Senior Electrical Engineer | $155,000 |
| Nuclear Engineer | $140,000 |  | Nuclear Engineer | $140,000 |
| Electrical Engineer (6) | $840,000 |  | Electrical Engineer (5) | $700,000 |
| Software Engineer (3) | $390,000 |  | Software Engineer (3) | $390,000 |
| Account Executive (6) | $510,000 |  | Account Executive (5) | $425,000 |
| Administrative Assistant | $70,000 |  | Administrative Assistant | $70,000 |
| Graphic Designer | $70,000 |  | Finance/Accounting | $100,000 |
| Finance/Accounting | $100,000 |  | Human Resources | $95,000 |
| Human Resources | $95,000 |  | IT Staff | $120,000 |
| IT and Web | $120,000 |  | Marketing | $75,000 |
| Marketing | $100,000 |  | Office Manager | $120,000 |
| Office Manager | $120,000 |  | Interns | $80,000 |
| Interns | $95,000 |  | Contract Labor | $35,000 |
| Contract Labor | $60,000 |  | Engineering Supplies | $46,000 |
| Engineering Supplies | $95,000 |  | Equipment | $45,400 |
| Equipment | $65,000 |  | Software | $42,000 |
| Software | $96,000 |  | Office Rent | $62,400 |
| Office Rent | $168,000 |  | Utilities | $36,000 |
| Utilities | $48,000 |  | Liability Insurance | $12,000 |
| Liability Insurance | $22,200 |  | Office Supplies | $32,000 |
| Office Supplies | $64,000 |  | Travel | $119,200 |
| Travel | $436,800 |  | Legal Fees | $45,000 |
| Legal Fees | $80,000 |  | **TOTAL** | **$4,000,000** |
| **TOTAL** | **$5,000,000** |  |  |  |

**Appendix 7.12:** Yearly Budget Allocation for $7.5M and $6M

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **$7.5 M** | |  | **$6 M** | |
| **Item** | **Budget** |  | **Item** | **Budget** |
| CEOe | $240,000 |  | CEOe | $200,000 |
| CTOe | $200,000 |  | CTOe | $180,000 |
| CFOe | $200,000 |  | CFOe | $180,000 |
| CMOe | $200,000 |  | CMOe | $180,000 |
| VP of Engineering | $180,000 |  | VP of Engineering | $160,000 |
| VP of Salese | $180,000 |  | VP of Salese | $160,000 |
| Senior Engineer | $170,000 |  | Senior Engineer | $155,000 |
| Nuclear Engineer (3) | $420,000 |  | Nuclear Engineer (2) | $280,000 |
| Electrical Engineer (9) | $1,260,000 |  | Electrical Engineer (8) | $1,120,000 |
| Software Engineer (5) | $725,000 |  | Software Engineer (4) | $540,000 |
| Account Executive (9) | $810,000 |  | Account Executive (8) | $720,000 |
| Administrative Assistant (2) | $160,000 |  | Administrative Assistant (2) | $160,000 |
| Finance/Accounting (2) | $200,000 |  | Graphic Designer | $70,000 |
| Graphic Designer | $70,000 |  | Finance/Accounting (2) | $200,000 |
| Finance/Accounting (2) | $200,000 |  | Human Resources | $95,000 |
| Human Resources | $95,000 |  | IT Staff | $120,000 |
| IT Staff | $120,000 |  | IT and Web | $120,000 |
| IT and Web | $120,000 |  | Marketing | $100,000 |
| Marketing (2) | $200,000 |  | Office Manager | $120,000 |
| Office Manager | $120,000 |  | Interns | $80,000 |
| Interns | $140,000 |  | Contract Labor | $10,000 |
| Contract Labor | $78,800 |  | Engineering Supplies | $80,000 |
| Engineering Supplies | $100,000 |  | Equipment | $65,000 |
| Equipment | $120,000 |  | Software | $86,000 |
| Software | $120,000 |  | Office Rent | $168,000 |
| Office Rent | $168,000 |  | Utilities | $48,000 |
| Utilities | $60,000 |  | Liability Insurance | $22,200 |
| Liability Insurance | $28,000 |  | Office Supplies | $64,000 |
| Office Supplies | $80,000 |  | Travel | $436,800 |
| Travel | $655,200 |  | Legal Fees | $80,000 |
| Legal Fees | $80,000 |  | **TOTAL** | **$6,000,000** |
| **TOTAL** | **$7,500,000** |  |  |  |

**Appendix 8: Marketing and Sales Strategy**

\*No current Appendix

**Appendix 9: Financial and Economic Details**

\*No current Appendix

**Appendix 10: Legal, Intellectual Property and Ethical Issues**

*\*This investment offer is intended as a guideline. Any legal offer will be handled by TacAlert, the investor and their attorneys. The finalized offer will be the legal basis of all future dealings. Nothing in this document should be considered legally binding or intended as an offer. All negotiations will be finalized with the help of legal counsel and those legal documents will be the basis of any binding agreement reached.*

**Appendix 11: Company Risks**

\*No current Appendix

**Appendix 12: Venture Offering**

**Appendix 12.1:** Implied Firm Valuations Relating to Specific Investor Equity Purchases

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Investment Amount** | **10%** | **15%** | **20%** | **25%** | **30%** | **35%** | **40%** | **45%** | **50%** |
| **$150,000** | $1,500,000 | $1,000,000 | $750,000 | $600,000 | $500,000 | $428,571 | $375,000 | $333,333 | $300,000 |
| **$250,000** | $2,500,000 | $1,666,667 | $1,250,000 | $1,000,000 | $833,333 | $714,286 | $625,000 | $555,556 | $500,000 |
| **$500,000** | $5,000,000 | $3,333,333 | $2,500,000 | $2,000,000 | $1,666,667 | $1,428,571 | $1,250,000 | $1,111,111 | $1,000,000 |
| **$1,000,000** | $10,000,000 | $6,666,667 | $5,000,000 | $4,000,000 | $3,333,333 | $2,857,143 | $2,500,000 | $2,222,222 | $2,000,000 |
| **$1,500,000** | $15,000,000 | $10,000,000 | $7,500,000 | $6,000,000 | $5,000,000 | $4,285,714 | $3,750,000 | $3,333,333 | $3,000,000 |
| **$2,500,000** | $25,000,000 | $16,666,667 | $12,500,000 | $10,000,000 | $8,333,333 | $7,142,857 | $6,250,000 | $5,555,556 | $5,000,000 |
| **$5,000,000** | $50,000,000 | $33,333,333 | $25,000,000 | $20,000,000 | $16,666,667 | $14,285,714 | $12,500,000 | $11,111,111 | $10,000,000 |
| **$10,000,000** | $100,000,000 | $66,666,667 | $50,000,000 | $40,000,000 | $33,333,333 | $28,571,429 | $25,000,000 | $22,222,222 | $20,000,000 |

**Appendix 12.2:** Firm Valuation as a Function of Investment and Equity

|  |  |  |
| --- | --- | --- |
| **Investment Capital** | **Equity** | **Valuation** |
| $150,000 | 10% | $1,500,000 |
| 15% | $1,000,000 |
| 20% | $750,000 |
| 25% | $600,000 |
| $250,000 | 10% | $2,500,000 |
| 15% | $1,666,667 |
| 20% | $1,250,000 |
| 25% | $1,000,000 |
| $500,000 | 10% | $5,000,000 |
| 15% | $3,333,333 |
| 20% | $2,500,000 |
| 25% | $2,000,000 |

**Appendix 12.3:** Estimated Use of Investment Funds from $150 thousand to $5 million

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Venture Capital** | **Staff** | **Office** | **Labor** | **Travel Budget** | **R and D** | **Legal** | **Rent Utilities** |
| **Level 1** | $150,000 | 1 | No | $1,800 | $10,470 | $13,900 | $10,480 | $1,800 |
| **Level 2** | $250,000 | 1 | No | $193,529 | $12,215 | $20,000 | $16,960 | $5,400 |
| **Level 3** | $500,000 | 2 | Yes | $355,058 | $13,960 | $20,000 | $22,440 | $104,688 |
| **Level 4** | $1,000,000 | 4 | Yes | $811,816 | $27,920 | $30,000 | $17,440 | $101,088 |
| **Level 5** | $1,500,000 | 6 | Yes | $1,274,345 | $43,625 | $45,000 | $17,440 | $101,088 |
| **Level 6** | $2,500,000 | 9 | Yes | $2,157,761 | $68,055 | $45,000 | $42,880 | $155,088 |
| **Level 7** | $5,000,000 | 12 | Yes | $4,431,004 | $90,740 | $120,000 | $82,200 | $227,088 |

**Appendix 12.4:** Potential Venture Offerings

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Offering 1** | **Offering 2** | **Offering 3** |
| **Investment Amount** | $150,000 | $250,000 | $500,000 |
| **Equity** | 10% | 16% | 20% |
| **Firm Valuation** | $1,500,000 | $1,562,000 | $2,500,000 |

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17. United States. Department of Homeland Security. National Urban Security Technology Laboratory. *Neutron-Detecting Personal Radiation Detectors (PRDs) and Spectroscopic PRDs Market Survey Report*. 1-36. [↑](#footnote-ref-17)
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19. United States. Department of Homeland Security. National Urban Security Technology Laboratory. *Neutron-Detecting Personal Radiation Detectors (PRDs) and Spectroscopic PRDs Market Survey Report*. 1-36. [↑](#footnote-ref-19)
20. U.S. Patent Application 15/792,706. Passive Alerting and Locating System. Filed on October 24, 2017. [↑](#footnote-ref-20)