Public Safety & Autonomous Devices:

A plan for augmenting law enforcement and improving planned event safety

**Team 3:** Guru Ananthaneni, Annabelle Blair, Yannick Forbes, Han Lai, Umesh Mishra

**Mentor:** Jeff Bartlett

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# 1 Executive Summary Many law enforcement departments across the U.S. struggle to provide timely and quality services due to staffing challenges and shortages that reduce response time, limit availability for in-person interventions, and leave communities vulnerable to public safety threats.

# Resignation and retirement rates for law enforcement personnel are high (a recent study reported increases of 18% and 45%, respectively), which means large overtime budgets for cities and law enforcement agencies. Overtime wages from an average police officer in the U.S. costs agencies hundreds of thousands of dollars weekly. Reduction of the workforce also stretches existing resources thin, meaning less time spent improving public safety.

Our business plan presents a solution for these issues, saving customers 17-20% per year in OT costs. We will augment staffing at large, planned events, leveraging AT&T’s 5G network and FirstNet and MEC capabilities, and integrating AT&T’s 5G network with smart, autonomous drones. This will not only help law enforcement agencies reduce overtime costs, but also alleviate a staffing shortage, leading to enhanced public safety and improved situational awareness for the officers on the ground.

In the following pages, we’ll outline a business case for our solution and product offering. It will address market research and opportunities, competitor analysis, technical solutions, operating timelines and development costs, target market research, customer personas and customer journey mapping, product challenges, marketing and sales plans, and financial timelines and tables, which include revenue and break-even analyses.

AT&T is uniquely positioned for a smart drone 5G solution for law enforcement, largely due to its technical capabilities, existing relationships within law enforcement and first responders through its FirstNet program, and strong customer service support system. We believe there is also a strong financial incentive for AT&T to consider this business proposal. Our business plan will deliver healthy growth in revenues, profit and operating income, reaching a break-even point two years from the product launch when the project will begin to generate operating income.

Demand for Unmanned Ariel Vehicle (UAV), or drone, technology is predicted to grow exponentially in coming years, especially for law enforcement and first responder officials, and the event security and crowd management industry is trending upwards as well.

While there are a few challenges we’ve addressed in this plan, such as federal approval for operating unmanned aircraft Beyond Visual Line of Sight, we are confident about the solutions we’ve also provided to mitigate them.

This business proposal provides a healthy IRR of 24% at the end of year 5, after the product launch. This is higher than average market returns, indicating that our 5G-capable, smart drone proposal for law enforcement agencies is a sound investment for AT&T. We also believe there are significant opportunities to grow and expand product offerings into other customer groups within the public safety category, as well as additional capabilities for UAV technology and AT&T’s core offerings and services.

# 2 Technology Analysis & Assessment of Fit of Need and Solution

## 2.1 Problem Statement

Law enforcement plays a critical role in keeping our gatherings safe. Every concert, convention, festival, fair, sporting event, etc., requires a significant amount of police work in terms of pre-planning and staffing/resources. In fact, the Seattle Police Department (SPD) spent 150,748 hours and $10.3 million in wages on work related to special events in 2016.

Additionally, much of this work is conducted on overtime (OT) because police do not have enough staff to manage both day-to-day responsibilities and special events during their shifts. To put this in perspective, special events accounted for 33% of SPD’s total OT hours in 2016.

Excessive overtime is not only costly to police departments but can also cause many unintended consequences associated with police officer fatigue – which is overall detrimental to public safety.

Law enforcement administrators and security experts have long called for reassessment of existing methods of planned event management in order to utilize more efficiently an already strained staff. Recent circumstances including the COVID-19 pandemic, the current political climate, and continuing issues with recruitment and retention have led to critical staffing shortages that only further highlight this need.

## 2.2 Solution

Our solution is tapping into new police technology in order to automate some event staffing and planning functions – including utilizing unmanned aerial vehicles (UAVs) or drones.

Specifically, we propose a smart, autonomous drone fleet designed to augment security services for planned events in a few key capacities:

1. **Crowd Monitoring & Management** –Equipped with high definition cameras and enabled by behavioral analytics and machine learning (ML), the fleet will autonomously monitor the event space and identify potentially dangerous situations, such as crowd surges, weapons, or even signs of human trafficking, kidnapping, and assault. The fleet will flag these incidents for a dispatcher to review.
2. **Aerial Mapping & Pre-Planning** –Prior to and during the event, audiovisual information captured by the fleet will be used to update an aerial map of the event space automatically and continuously. Artificial intelligence (AI) will identify potential problem areas and evacuation routes. This map will be available as a resource to law enforcement and can be used to improve situational awareness.
3. **Assisting Officers During an Active Crisis** – In the event of a crisis, the drone fleet, equipped with LEDs, can use light patterns to direct crowds along evacuation routes or to clear a path for public safety response. Drones can also be mobilized to illuminate a dimly lit area or track a fleeing suspect through the crowd.

Our solution will be offered as a bundled package of software, hardware, and service. It will utilize A&T’s FirstNet service, 5G network, and Network Edge for real-time, uninterrupted performance – specifically in urban environments with high network traffic. Training for use of the hardware and software will be included.

### 2.2a Technologies

#### Drones

Drone technology is already being utilized by many police departments for search and rescue, disaster management, SWAT operations, and monitoring crime and traffic. More recently, law enforcement has been utilizing small drone fleets during sporting events, festivals, demonstrations, and other large gatherings for surveillance. Increased drone usage has led to lower environmental impact, improved surveillance discretion, and reduced costs (in comparison with traditional approaches to special event security/surveillance).

However, presently, most drones are only capable of being flown within line of sight, limiting the area able to be monitored and requiring dedicated staff to operate.

Our unique solution addresses these limitations and takes this technology one step further by utilizing the benefits of 5G connectivity to enable autonomous, beyond visual line of sight (BVLOS) operations.

#### 5G Connectivity & Edge Computing

AT&T is uniquely positioned to provide 5G connections for law enforcement applications because of their role as the maintainers/operators of FirstNet, the first nationwide network dedicated to public safety. Additionally, AT&T’s Network Edge, dedicated assets in the FirstNet fleet, and investments into their network can be leveraged to meet the uplink requirements of our drone solution.

##### Ultra-Reliable & Low Latency Communications (URLLC)

URLLC describes 5G’s unique technical functionality that promises exceptionally faster speeds (up to 10X faster than 4G/LTE) with expansive bandwidth and capacity, ultra-low latency with goals of less than 10ms of latency or delay, and 99.999% reliability.

This feature supports drone autonomy and the use of video streaming and AI/ML analytics to make real-time decisions.

##### Edge Computing

Edge computing is a computing paradigm that enables data considered sensitive or proprietary to be processed at a local level, limiting the need to send it to a centralized data server.

Our solution will utilize AT&T’s Network Edge to offload data processing from drones to an AI/ML application hosted at the edge of a wireless network. This is beneficial in several ways:

* **Real-Time Request Fulfillment** – Edge computing helps enable the URLLC features of 5G networks so drones can be managed in real-time.
* **Improved Battery Efficiency** – The smart features of our drone solution are computationally intensive and can quickly drain battery life. Offloading these tasks to the edge will improve battery efficiency.
* **Improved Data Privacy** – Keeping data local reduces the risk of sensitive information (e.g. facial information) being leaked on the open internet during uplink to the cloud.

##### Uplink Requirements

Our solution involves streaming large amounts of video data which requires massive bandwidth. Especially at large events, many devices will be trying to access the same network, limiting the amount of bandwidth available and adversely affecting our solution performance.

To mitigate this, our solution utilizes AT&T’s FirstNet which offers priority access to first responders, so network congestion can be bypassed. Additionally, FirstNet has a fleet of mobile communications assets or “deployables” which, upon request and at no additional cost, can be used to temporarily boost FirstNet capacity and coverage. However, a way to expand the business in the future and a more long-term solution would be to allow agencies to purchase their own deployables (specifically CRDs or compact rapid deployables) for use with this solution and for other coverage needs. Another option is allowing agencies to purchase antennas which can be attached to mobile command vehicles.

Lastly, AT&T has made several network investments that will contribute to addressing uplink concerns. Beamforming, in particular, will be beneficial to our drone solution.

Beamforming involves multiple antennae sending the same signal to a specific receiving device. Because the signal is not being spread out in multiple directions from the broadcasting antennae, there is less risk of disruption and improved reliability. Additionally, there is improved signal strength which may be necessary if drones operate above the preferred coverage area for a cell tower. Furthermore, while not part of our solution, beamforming can be optimized for drone applications by exploiting position and mobility information to predict drone movement and form beams to track drones for signal enhancement and interference cancellation.

Another more novel option is to programmatically tilt antennae to serve planned events. This is not something our solution will explore but is an option.

### 2.2b Products

As mentioned, our product offering will be a bundled package of software, hardware, and service – consisting of 4 major components, summarized in the figure below:

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**Figure 1.** Components of Product Offering

#### Hardware & Maintenance

Autonomous drones with 5G capability, spotlights, and high-definition (HD) cameras will be available at $30K per drone. This includes the landing pads and charging stations required for each drone. The average solution will include 8 drones, but this number is customizable per agency needs. Additionally, thermal sensors, night-vision cameras, and additional batteries will be available as add-ons. Expanding to include other drone attachments and accessories (at an additional cost) is on our roadmap but not part of our current product offering.

Additionally, we will charge a $200 per drone monthly maintenance fee that covers routine maintenance as well as repairs on failed or faulty drones.

#### Service

A subscription to FirstNet and the edge computing infrastructure/resources required to deploy our drone solution will be included in the packaged solution at a rate of $200 per drone per month. Included with this is all the benefits a regular FirstNet subscriber would have, including network priority and access to deployables that can be requested to increase coverage at particularly crowded events.

#### Software

Lastly, our software, consisting of (1) the Drone Operations & Crowd Management Portal (DOCMP) and (2) the AI/ML engine, will be included in the solution at a rate of $400 per drone per month. The DOCMP is the platform the customer will use to launch/manage drone operations, view camera footage, handle alerts generated by the AI component, and access the AI generated map of the event space. The AI/ML engine is hosted on the edge and will analyze video/sensor data for crowd management and security insights.

### 2.2c Value Proposition

Our service is intended to provide police agencies with a tool that will continue boosting the previously stated increased drone usage benefits and improve the efficiency of planned event management.

Additionally, it will help to shield officer shortages, and, therefore, reduce overtime and save thousands of dollars in the process.

To quantify the potential savings in terms of overtime wages, we looked at three cities: New York, Chicago, and Los Angeles. Each of these locations has reported exceeding its budget over the last year and tapped into its overtime reserves to continue critical services. For example, according to the NYC Comptroller’s site, through February 2023 the NYPD has spent $472M on overtime, already exceeding its yearly budget by $98M. Furthermore, reports show that recruiting and hiring police officers can take several months to a year, so accommodating even the most predictable or scheduled crowd sizes throughout the year can be challenging.

Applying a conservative approach, and forecasting a small percentage (i.e., 10% of staff leaning into 5 hours of OT per week), will provide a staggering opportunity for potential savings when our drone service is appropriately engaged. These results are summarized in the table below.

**Table 1*.*** Potential Savings for Top Three Staffed Cities

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Hourly Rate** | **Overtime Rate** | **Employee Count** | **Savings on wages for 10% of Staff @5 hours weekly** |
| **New York** | $33.06 | $49.60 | 33,987 | $842,832.67 |
| **Chicago** | $30.63 | $45.95 | 11,516 | $264,570.41 |
| **Los Angeles** | $31.60 | $47.41 | 9,284 | $220,054.23 |

To put these numbers in perspective, on average, most police officers work between 15 and 40 hours of overtime a month, with 9% of this time being on special events (SE). Based on this, a large agency would save a minimum of 55% on weekly OT wages for SE with our drone service.

## 2.3 Our Approach vs Present Mode of Operation (PMO)

To assess how our solution performed against the PMO for event security and surveillance, we compared helicopter operations and police patrolling to our drone solution. Additionally, we used conservative estimates to develop a customer breakeven case to highlight the minimum amount of savings our solution would offer a medium-sized agency.

Traditionally, the tasks associated with patrolling officers at events include:

* Crowd control - maintain order and manage large crowds
* Security - identify security threats and respond
* Traffic management - prevent congestion and accidents
* ER response - coordinate with emergency services
* Crowd safety - ensure safety and help people navigate

We assert our drone solution can help increase the efficiency of the following tasks at events:

* Crowd monitoring - monitor crowds and provide awareness
* Traffic management - monitor congested areas and provide updates
* Search & rescue - locate missing individuals quickly
* Surveillance - monitor suspicious activity/threats in real time
* Evidence - capture photos/videos of incidents during events

On average, this will free up 4 officers who we assume spend 22 hours per week on events (that is 4 hours per event for 5-6 events per week) for more pertinent law enforcement functions. Additionally, helicopters are also used at events to monitor traffic and assist with search and rescue operations if needed. Since drones can assist with these tasks, there are also savings associated with helicopter operations.

These savings are summarized in the table and figure below. Agencies can expect to break even on their investment by year 3 and save $118K a year with our drone solution. This is a reasonable breakeven timeline because of how long law enforcement spending cycles are.

To add some perspective, Arlington County PD spent $574K and Austin PD spent $684K on events OT in 2019 and 2015, respectively. With our projected savings, that’s 17-20% savings on OT wages spent on events.

**Table 2.** Customer Savings with Drone Solution

Table

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**Figure 2.** Customer Breakeven on Drone Solution

# 3 Industry & Market Analysis

## 3.1 Industry & Environment Overview

According to Statista, the event security & crowd management industry is trending upward, with music and sports events set to drive growth in the next few years.

While this industry solutions caters to both private security and public security agencies, our focus will be on use cases for the public security agencies.

### 3.1a Technology Trends Enhancing the Industry

There are a few technology trends enhancing the industry that our solution takes advantage of:

#### Drones

Drones, like the internet and GPS before, are expanding from military roots to become valuable corporate tools. They made it to the consumer market, and they're already being used in commercial and civil government applications ranging from firefighting to farming. The event security & crowd management Industry is no stranger to this technology and is developing innovative solutions utilizing drone technology.

Favorable government policies, advancements in drone technology, and rising demand from businesses across a range of industries has driven drone technology adoption in the U.S. Additionally, the Federal Aviation Administration (FAA) in the U.S. has published new rules to create more logical and uniform guidelines for the legal and safe use of UAVs in business settings. These regulations will reduce entry barriers and increase product adoption in the area of event security & crowd management.

#### AI/ML Analytics

Drones operated by artificial intelligence rely largely on computer vision since it is bringing drone technology to a new level of creativity. Thanks to this technology, drones can detect items in the air and evaluate and gather data on the ground. These drones can give users the ability to make data-driven decisions by using quick data collecting, processing, and transfer methods. Faster data processing and other advanced features made possible by incorporating ML and AI technology into drones will encourage professionals in the event industry to use them and maximize their performance.

#### 5G

High bandwidth & low latency offered by 5G networks will enable drones to stream high-definition video in real time, sending the information to analytics engines located at edge of the networks. This will enable faster data processing, threat detection, and decision making related to event security and crowd management.

### 3.1b Environmental Challenges

However, there are some environmental challenges that could impede our product offering’s impact to be considered as well:

#### Culture

A significant public concern with police surveillance technology and drone use is privacy violation and misuse by law enforcement agencies. The current society, including the Defund the Police movement, has already put law enforcement on a bit of a defense in some respects, as agencies grapple with pervasive law enforcement officer misconduct and abuse. A simple Google search of “police drone technology” brings up many organizations and articles that highlight concerns with police use of drones for surveillance.

These concerns come from public interest groups, such as Electronic Frontier Foundation (EFF), a nonprofit dedicated to defending civil liberties. In a 2022 article, an EFF writer argues that police use of drone surveillance can be used to “chill free speech and political expression through fear of reprisal and retribution from police,” especially when used during protests. It references the use of police drones during the 2020 Black Lives Matter protests and unrest in Minnesota, following the murder of George Floyd. The nonprofit, and other similar civil rights and public rights groups argue that drone surveillance is an inappropriate tool in the hands of the police. While these concerns are valid, our business plan only includes the use of drones for surveillance only in the context of large scale planned events (not riots or other unplanned social demonstrations), where the need for public safety is important enough to warrant the use of drone technology, and attendees know the drones will be present for safety reasons.

There are some thoughtful and helpful ways to approach cultural pushback to drone technology. The Police Executive Research Forum (PERF) is a nonprofit organization that specializes in police research and policy as well as management services, technical assistance, and education. They published a 2020 report outlining the case for increased drone technology and addressing some of the technical and social challenges law enforcement departments face in integrating drone technology. One topic the report addresses is measures that law enforcement agencies can take to better implement drone technology and ensure localized support from their communities. The primary recommended action is community outreach.

#### Economy

According to economists like J.P. Morgan, the U.S. economy is likely to continue slowing in 2023 and enter a mild recession. Research from the 2008 economic downturn suggests that slowing economies do have an impact on police budget and spending. According to PERF research from 2010, previous recessions tightened the budget for some agency plans to spend on new technology. However, the technologies that were still successful during this time were those that could “improve outcomes and increase efficiency.” Since our technology will take time to develop, test and sell, we recommend taking a guarded approach to economic headwinds and tailwinds and working with law enforcement agencies that are interested in expanding tech capabilities and are committed to investing in those services over the next 5 years.

#### Federal Regulation

A significant challenge for our business plan is working with federal agencies to obtain approval to operate a drone beyond an operator’s visual line of sight (VLOS). Additionally, AT&T will need to closely monitor the UAV regulation scene for new laws related to operating UAVs BVLOS.

##### General UAV Operations

UAVs are heavily regulated by the Federal Aviation Administration (FAA) in the U.S., especially when it comes to civil and public use, according to a 2022 industry report from IBISWorld. Regulations are often classified by aircraft weight, with drones falling under different regulations depending on if they weigh more or less than 55 pounds. This will be a factor to consider when engineering drones and equipping them with batteries. (IBIS reports that drones weighing under 55 pounds fall under the FAA's Part 107 regulation, which includes restrictions such as operating only in daytime, requiring a visual-line-of-sight to the operator, and obtaining pilot certification for operators.)

The FAA also mandated that public UAV operators, such as government agencies, obtain a Certificate of Waiver or Authorization (COA). According to IBISWorld, this includes “certification of airworthiness of the aircraft for its intended mission and certification that a collision with another aircraft is extremely improbable, that the aircraft system complies with appropriate cloud and terrain clearances and that the operator or spotter of the aircraft is generally within one half-mile laterally and 400 feet vertically of the aircraft while in operation.” There may be some flexibility for public safety drone operators under the FFA’s Part 97 regulation, which makes provisions for amateur radio communications in certain use cases, including emergencies.

This will likely be an evolving area to watch and assess as drone regulations evolve. IBISWorld research indicates that heavy regulations are expected to trend downward in the future.

##### Beyond Visual Line of Sight (BVLOS)

Since our business plan involves autonomous drones, current and future government regulations around BVLOS drone operation will need to be considered. In the U.S., it is currently not permissible for to operate a UAV BVLOS without a special waver from the FAA.

The BVLOS requirements for UAV operation mean that an operator must have a line of sight to the drone they are operating. ScaleFlyt, an advanced technology company and drone equipment maker, describes BVLOS as “a type of UAS operation in which the remote pilot maintains continuous, unaided visual contact with the unmanned aircraft. In its simplest term, the aircraft must always be visible to the pilot.”

For a pilot to fly a UAV, extensive training is needed, which will need to be budgeted into the expected cost of maintaining and operating UAVs for law enforcement departments. UAV pilots are required to obtain and maintain certification from the FAA, and additional authorization is needed to conduct flights BVLOS. Currently, the only option to fly BVLOS comes in the form of special approval from the FAA under its Part 107 regulation. However, these waivers are rarely given, and limited insight is available into the application and approval process. Global consulting firm Geospatial World published a 2019 article stating that more than 1200 BVLOS waiver applications have been submitted by commercial drone operators, with 99% failing to secure a permit.

However large e-commerce businesses, including Uber, Amazon, and UPS, are already investing in UAVs that can be operated autonomously. We see this trend, and we believe it will continue to impact the public safety space as well.

To secure an FAA BVLOS waiver, AT&T and its partners will need to have strong standard operating procedures, command and control equipment, and flight safety standards. As a Civil Aviation Authority (CAA) Recognized Assessment Entity, training, and consulting business Consortiq recommends following these three guidelines.

##### Current political climate for UAVS

There is change on the horizon for drone manufacturers and cases like ours seeking looser regulations around BVLOS operation. As recently as February 2023, Senate lawmakers introduced the “Increasing Competitiveness for American Drones Act of 2023,” a bill that would require the FAA to issue a new rule allowing BVLOS operations under certain circumstances.

The bipartisan bill, introduced by Democrat Senator Mark Warner of Virginia and GOP Senator John Thune of South Dakota, “requires the FAA to establish a ‘risk methodology,’ which will be used to determine what level of regulatory scrutiny is required,” according to Senator Warner’s website. The bill outlines regulations based on UAV weights (the three categories are under 55 pounds, 55 to 1,320 pounds, and over 1,320 pounds). It would also create an administrator position for the program and a UAS Certification Unit with the goal of speeding up the regulatory approval process and making the U.S. more competitive in its drone technology capabilities.

Warner identifies a clear advantage to the U.S. economy and capabilities with this statement: “If we want the drones of tomorrow to be manufactured in the U.S. and not in China, we have to start working today to integrate them into our airspace. Revamping the process for approving commercial drone flight will catapult the United States into the 21st century, allowing us to finally start competing at the global level as technological advancements make drone usage ever more common.”

The bill currently sits with the Senate Committee on Commerce, Science, and Transportation.

Another bill to prevent the misuse of drones was introduced in the Senate in January and is currently under review. In the opinion of the Small UAV Coalition, an advocacy group for small UAVs (those under 55 pounds), “this year is a critical time for the drone industry.”

This challenge is a major one, but we believe that the need for this type of advanced technology will continue to receive attention in Congress and from government and private agencies. There will be potential resolutions to the current BVLOS setback if the “Increasing Competitiveness for American Drones Act of 2023” passes. Regardless, we believe change is coming for the drone regulation scene.

## 3.2 Total Addressable Market (TAM)

The total addressable market (TAM) can be calculated based on the assumption of approaching each police agency in the United States. This amounts to over 18,000 agencies. While the first 30 agencies – due to their larger size – will need more drones, we estimate each agency has a need for at least 8 drones. Therefore, calculations run as follows: (18,000 agencies \* 8 drones) Given the average price of a drone is $30K, the TAM in dollars is estimated to be $4.32 billion.

Growing interest in drone technologies by law enforcement agencies and police executives will drive our market capture rate. The Police Executive Research Forum (PERF) conducted a 2018 survey of 282 law enforcement departments across the U.S. with a response rate of 33%. They found that using drones is a growing trend—with 47% of respondents saying they currently use drones, and 34% stating that they are interested in purchasing drones in the future. PERF also conducted interviews with 50 police executives and members of departments who had either implemented, or were considering implementing, a drone program.

## 3.3 Defining the Customer

### 3.3a Customer Personas

Our customer profile is centered on the end user, which will be law enforcement. However, we also identify and address profiles for decision makers and influencers who are responsible and influential when it comes to procuring technology for city and county police agencies. We break down personas into three areas: end user, purchaser, and decision maker.`

*Persona: End User*

The end user will be field officers who are staffing planned events.

**Table 3.** Law Enforcement End User Persona

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Who Are They?** | **What is Their Main Goal?** | **What is the Main Barrier to Achieving Goal?** |
| *Field Officer* | Field officer on duty, providing security services at a large, planned event | To keep people safe; minimize risk to themselves and other officers; mitigate issues before they turn deadly or hazardous | Limited resources |
| *Squad Leader / Sergeant* | Squad leader of a field team in charge of planned event security | Maintain secure and safe premises and ensure field officers are equipped with tools and training; oversees event security operations and receives drone data | Not having the right people and tools in place at the right time, inadequate funding or training, limited purchasing power |

*Persona: Purchaser & Decision Maker*

This persona describes our purchasers and decision makers. Depending on the scope of our product and the planned event being covered, this could include city and county governments, elected officials, and law enforcement agencies. These personas can be further divided into city and county agencies and police departments.

**Table 4.** Purchaser & Decision Maker Persona

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Who Are They?** | **What is Their Main Goal?** | **What is the Main Barrier to Achieving Their Goal?** |
| *City or County Police Department* | City mayor, city council members, city and state elected officials (includes district attorney, police chief & constables) | Keep constituents happy; keep campaign promises; maintain safe cities with low crime rates. | Politics, resources, funding, and nonworking relationships with other branches of city and state governments |
| *Law Enforcement Agency* | Agency that is led by a lieutenant or police chief (usually at a city or county level) | Keep people safe, minimize risk to themselves and their officers; mitigate security issues | Limited resources, limited budget, limited personnel |

### 

### 3.3b Buyer Behavior

The market we are serving is designated as a “high involvement buyer” when it comes to researching and procuring new technologies. This means that AT&T can expect a rigorous procurement process, according to Jim McMillan, Lead Solutions Architect for FirstNet at AT&T and former assistant Chief Technology Officer for the Harris County Law Enforcement Department. Especially for planned events, McMillan stated that drone technology would likely require companies to respond to Requests for Proposals from law enforcement agencies, competing with other companies that may also respond.

There are two standard approaches when selling to law enforcement agencies, according to McMillan:

* **Bottom-up approach:** this includes connecting with field officers to identify needs, sharing about the potential drone solution, and encouraging them to approach higher-ranking lieutenants with their requests. For this approach, the customer segment is more interested in the product’s practicality, use of ease, and quality. They need it to work quickly and effectively and are not concerned with costs.
* **Top-down approach:** this includes marketing the product to law enforcement executives and city officials. AT&T could hire a lobbyist, network with the city mayor and city council members and commissioners, and market use cases and data from other cities that are implementing the technology. This approach would require data that shows the drone technology has an impact on crime or demonstrates desired statistics, such as a reduction in officer safety incidents. This customer segment is more budget conscious, as they must balance technology costs with other needs.

AT&T’s strength, when it comes to serving this broad customer base with different personas for end users and purchasers, is their current FirstNet offerings and prior relationships with large police departments. These already existing relationships and established trust with law enforcement agencies will greatly support their customer engagement.

## 3.4 Competitive Dynamics Assessment

### 3.4a Direct Competitors

AT&T has three major competitors in this space: (1) Verizon, (2) Motorola Solutions, and (3) smaller drone companies.

#### Verizon

Verizon is a major competitor in terms of the service component. Like AT&T’s FirstNet, Verizon Frontline offers 5G capability and priority and preemption for first responders. Currently, Verizon Frontline has a slightly higher adoption rate at a 45% market-share lead [Source: Urgent Communications], with 5.1M connected devices and more than 30,000 public safety agency customers [Source: Fierce Wireless], compared to FirstNet’s 4.4 million connections and 24,000 customers [Source: AT&T 4Q22 Report]. However, in terms of coverage, according to WhistleOut, Verizon Frontline only covers 12.8% of the nation, while AT&T covers 29.5%.

Another key difference is their areas of focus. Verizon Frontline generally markets their service toward addressing large-scale disasters such as pandemics, wildfires, and hurricanes; whereas AT&T aims to provide network and tools for a wider variety of use cases, including planned events. Specifically, FirstNet advertises its ability to deliver readily available capacity during large events. This is aligned with AT&T’s claim that FirstNet is the market leader for law-enforcement agencies and, according to several industry sources, Verizon Frontline is the most popular with fire agencies.

Verizon’s Response Team (VRT) launched an unmanned aerial system (UAS) for first responders in 2021 (under Verizon Frontline) that supported missions from risk and damage assessment to search and rescue operations, although the program has been terminated. It is unclear if or how Verizon may build out this technology in the future. Regardless, Verizon has since indicated its strong interest in incorporating smart technologies and drones into public safety capacities.

Lastly, Verizon has a private edge business model that is directly comparable to AT&T’s. AT&T’s MEC offering connects customers with Microsoft, IBM, and Google; whereas Verizon partners with Amazon Web Services (AWS), Microsoft, and Google. As the edge computing industry is relatively new, it’s hard to say which service will perform better. However, according to industry analyst Roger Entner, AT&T’s strength is large enterprise, and Verizon’s is small and medium businesses (SMB).

Overall, Verizon tends to focus on large-scale, natural disaster use cases as opposed to everyday use cases (such as planned events), but it has the means and assets (including a MEC service) to become a major direct competitor. However, AT&T can leverage its large enterprise and law enforcement connections to remain competitive.

#### Motorola Solutions

Motorola Solutions is another direct competitor, but in terms of the software component. Motorola Solutions sells the CAPE Drone Software and CommandCentral Aware drone management platform. This software is marketed toward law enforcement in terms of allowing local and remote piloting, livestreaming, and capturing and managing evidence-grade video. Though Motorola has yet to work AI and autonomous capabilities into their drone software, they have a well-developed mission critical AI workflow that they can leverage at any time. Furthermore, they sell smart AI cameras for surveillance, which can directly compete with our product. Lastly, Motorola’s software has FAA approval – a major pain point for developing any drone-related technology. Adding autonomy and smart capabilities to their software would certainly require further approval, but they are in a better position than AT&T in this area.

In terms of numbers, it's hard to draw a direct comparison to AT&T because Motorola Solutions has a very different type of offering, but it should be noted that Motorola Solutions serves more than 100,000 customers, has a market value of $42,689 [Source: Fortune] and, according to their website, is a “leader in mission-critical communications products, solutions & services.”

In terms of service components, Motorola does not offer 5G mobile broadband, but they do have devices for mission critical communications such as two-way radios, private LTE, and broadband push-to-talk. While 5G and MEC are essential to our solution, as an experienced provider of police technology, Motorola is still in a competitive position to address the same need using different technologies.

Overall, Motorola is in the best position to develop the kind of smart software our packaged product will include and should be considered a potential major direct competitor. However, it’s unclear whether Motorola Solutions will target the planned event space with their products as they seem to be focused on general law enforcement applications and not specific use cases. If they do, AT&T’s main competitive advantage is the packaged service, software, and hardware. Having an all-in-one product is not only convenient to manage, but timesaving for law enforcement agencies who would otherwise have to go through several procurement processes – another pain point. Conversely, since the software component for AT&T will be developed externally, Motorola should also be considered a potential partner.

#### Smaller Drone Companies

Smaller drone companies that provide drone software on hardware marketed for law enforcement applications, specifically for surveillance and security, are grouped together and considered the third major direct competitor.

The main competitive advantage of these smaller drone companies is that they have already developed smart, autonomous, AI-enabled drones. While these drones have law enforcement uses cases, they don’t cater specifically to law enforcement needs. These drones are simply surveillance drones meant to capture high quality audiovisual (and thermal) information. The smart processing our AI/Video analytics engine will do is a differentiating feature. Additionally, these competitors lack the 5G/MEC aspect that enables mission critical performance.

A few examples include:

* DJI Enterprise - mission situational awareness, collision reconstruction and forensics
* Skydio - search and rescue, tactical deployment, and crime and crash scene documentation
* FlytNow - site security (patrol and detect intruders), monitor areas with criminal activity/areas beyond human reach, and track suspects

All these firms offer smart AI drones with law enforcement use cases. Of these, DJI Enterprise (China based) and Skydio (U.S. based) are in the top three commercial drone manufacturers. DJI has long dominated the industry, holding somewhere around 87% of the market share with little competition. However, in recent years, Skydio has been gaining wider use. Currently, they hold 1.5% of the market share [Source: SkyWatch]. This number is still small, but significant. The fact that Skydio is making headway despite DJI’s control of the market is promising for new entrants. Lastly, in terms of the other category (which FlytNow falls under), they hold 6.3% of the market share. It's important to note that these are what has been captured for the commercial drone manufacturer market and do not describe law enforcement adoption rates. However, DJI drones are some of the most popular with law enforcement because of their affordability.

That being said, a huge issue with some of these cheap, commercially available drones - like those made by DJI - is that they are made by Chinese government owned businesses. As a result, public safety often has buying restrictions from those parties for security reasons. In 2017, several federal agencies issued memos warning against the potential cybersecurity dangers of using Chinese-based drone manufacturers. In 2019, Congress took this a step further and issued bans on Chinese-based drone manufacturers and parts. In 2021, the Senate introduced a five-year ban on all U.S. government purchases of foreign drones and parts. While law enforcement agencies still use these drones, they may face restrictions on how and where as well as issues with funding in the future. Public sentiment is aligned with this - especially in light of the Chinese spy balloon incident. This is something for AT&T to keep in mind in terms of the competitive advantage they may have if they source their components domestically.

Overall, the key takeaway is this: small drone companies have hardware with software advantage, especially in the AI-enabled drone area. Additionally, some of these established firms have FAA approval for use in law enforcement. However, our product’s AI will go beyond enabling autonomy and simplistic detection thanks to the computational benefits provided by 5G and MEC. The same benefits of including connectivity in the package (as mentioned for Motorola Solutions) apply, and these companies should also be considered potential partners (specifically U.S. based companies).

### 3.4b Indirect Competitors

Indirect competitors can be divided into T-Mobile and four categories: drone software providers, drone hardware providers, network providers for public safety, and private MEC providers.

#### T-Mobile

The largest of these is T-Mobile. T-Mobile has the largest 5G network by far at 8 times larger than AT&T’s and 28 thousand times larger than Verizon’s – covering 53.79% of the nation. They also have their own equivalent of FirstNet and Frontline, called Connecting Heroes, which offers priority and preemption, but this is not as flushed out as the others. Furthermore, they have MEC service in the works with its deal with Lumen Technologies.

T-Mobile is exploring drone use cases for 5G but has mostly focused on consumer applications such as racing drones for streaming sporting events. The main reason T-Mobile was labeled an indirect competitor and not a direct competitor is because it has not expressed interest in developing technology for public safety (except for traffic management) – though they can do so.

#### Drone Software Providers/Drone Hardware Providers

This includes all drone companies – not just those specifically targeting law enforcement customers. For some perspective, of the 1,076 drone companies worldwide, 12.9% are drone software manufacturers (138 companies), 37.6% are drone service providers (404 companies), and 49.5% are hardware providers (532 companies). In this context, drone service providers are companies that offer programmed drones that perform specific services. Examples include Aerodyne Group, Terra Drone Corporation, and Cyberhawk; but these providers are predominantly used for large-scale industrial applications and not public safety. However, much like the smaller companies considered direct competitors, these drone providers have an advantage in terms of their existing smart drone technology, but disadvantage in that they lack a connectivity component.

#### Network Providers for Public Safety/Private MEC Providers

While these services aren’t necessarily 5G with priority and preemption, they are network providers whose target market is law enforcement. Examples include Rivada Networks, Mutualink Incorporated, and RACOM Corporation. However, these companies serve a smaller number of agencies and have not tapped into drone technology. For example, Mutualink has around 10,000 public safety users. Other private MEC providers such as Azure, AWS, Huawei have similar shortcomings, but offer the infrastructure required of our solution. The following figure shows the current edge landscape according to LF Edge Landscape.

### 3.4c Future Competitors

The crowd management & security industry and the law enforcement market should continue to grow and may introduce alternative ways to address the needs of law enforcement in the planned event space. Solutions are not limited to just drone technology, as robots and other AI/video analytics-based technology can also improve the space. Increasing FirstNet users, establishing key vendor relationships, and creating a large client base before these competitors move into the market is imperative.

### 3.5d Porter’s 5 Forces

An analysis of Porter’s 5 Forces, summarizes the points made in the previous sections of this competitor analysis and yields the following key results:

* **Intensity of Competition:** Moderate; Verizon and Motorola have the means to compete directly with AT&T but, as of now, do not offer a packaged solution for planned events
* **Threat of New Entrants:** Moderately low; T-Mobile has the means but has yet to express interest. There are also a number of barriers to entry, including but not limited to FAA approval, high investment cost, high competition for funding, etc.
* **Threat of Substitutes:** Moderately high; Several other technologies exist that may be deemed sufficient for planned event use.
* **Bargaining Power of Buyers:** High;Law enforcement will play a large role in the development of the product as they are the end user. Specifically, the AI aspect of the software component is highly dependent on data from law enforcement.
* **Bargaining Power of Suppliers**: High; Hardware and software is developed externally. This gives suppliers more bargaining power since AT&T will be looking for specific vendors with existing law enforcement use or potential.

Diagram

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**Figure 3.** Porter's 5 Forces

## 3.6 Attractiveness of Industry/Market

Given the growth in the event security & crowd management industry, evolving requirements for planned event security, and the positive momentum and acceptability of drone technology usage by law enforcement, we believe it is the right time for AT&T to bring a drone-based solution to this industry and market. AT&Ts 5G and edge computing capabilities are competitive in this space, and they will help contribute to a strong product offering. This is in addition to the company’s strong customer base in the public safety sector and its current FirstNet offering that continues to be successful.

## 3.7 SWOT Analysis

Our SWOT analysis shows key strengths and opportunities for this product while also outlining weaknesses and threats.

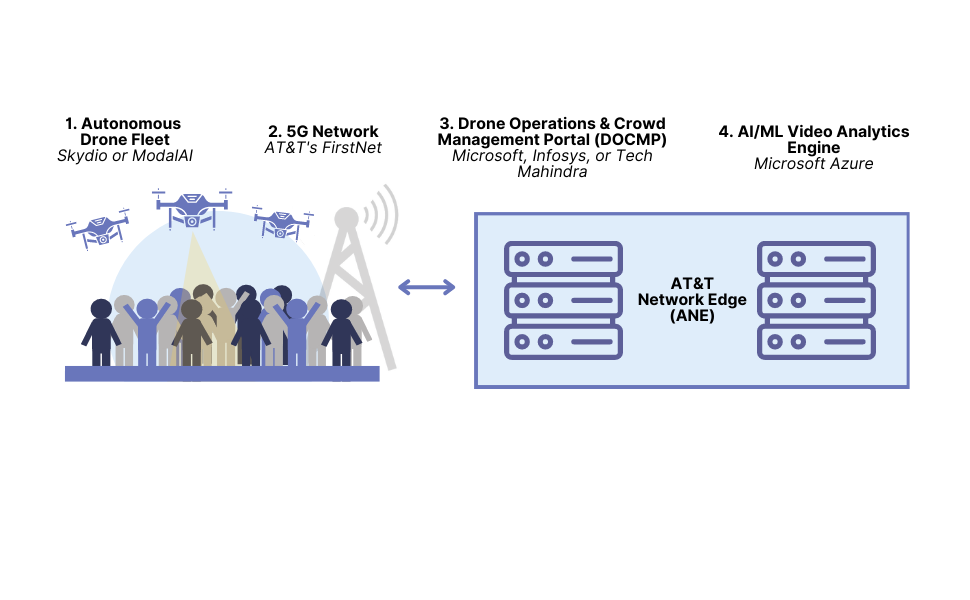
**Table 5.** SWOT Analysis

|  |  |
| --- | --- |
| **Strength:**   * The first and only congressionally authorized dedicated network for first responders * Existing established relationship with first responders’ agencies * Established connectivity brand in USA with biggest IoT footprint * Experience with working with multiple partners & building solutions for business customers | **Weakness:**   * Initial solution cost can be high, especially with MEC service * Risk of existing remote-controlled drones & event surveillance cameras being considered sufficient for the planned event safety * Need to identify & on-board right drone HW & SW partners. * Long sales cycle involving RFP & RFQ process |
| **Opportunities:**   * AI/ML & MEC help create new value propositions helping get more agencies on FirstNet. * Additional opportunities to leverage the same use case for private sector of event security. * Commercial drone industry is growing with new applications, 5G autonomous drones use case can be extended to multiple verticals outside of public safety | **Threat:**   * FAA regulation for BVLOS & DAA * Verizon & T-Mobile offer priority and preemption for first responders on their networks * Verizon has published an autonomous drone surveillance use case for public safety & focusing in this area * T-Mobile has an edge in 5G coverage & has made commitments for increased investment in a network for first responders |

# 4 Development & Operations Plan

## 4.1 Technology/Product Design & Development

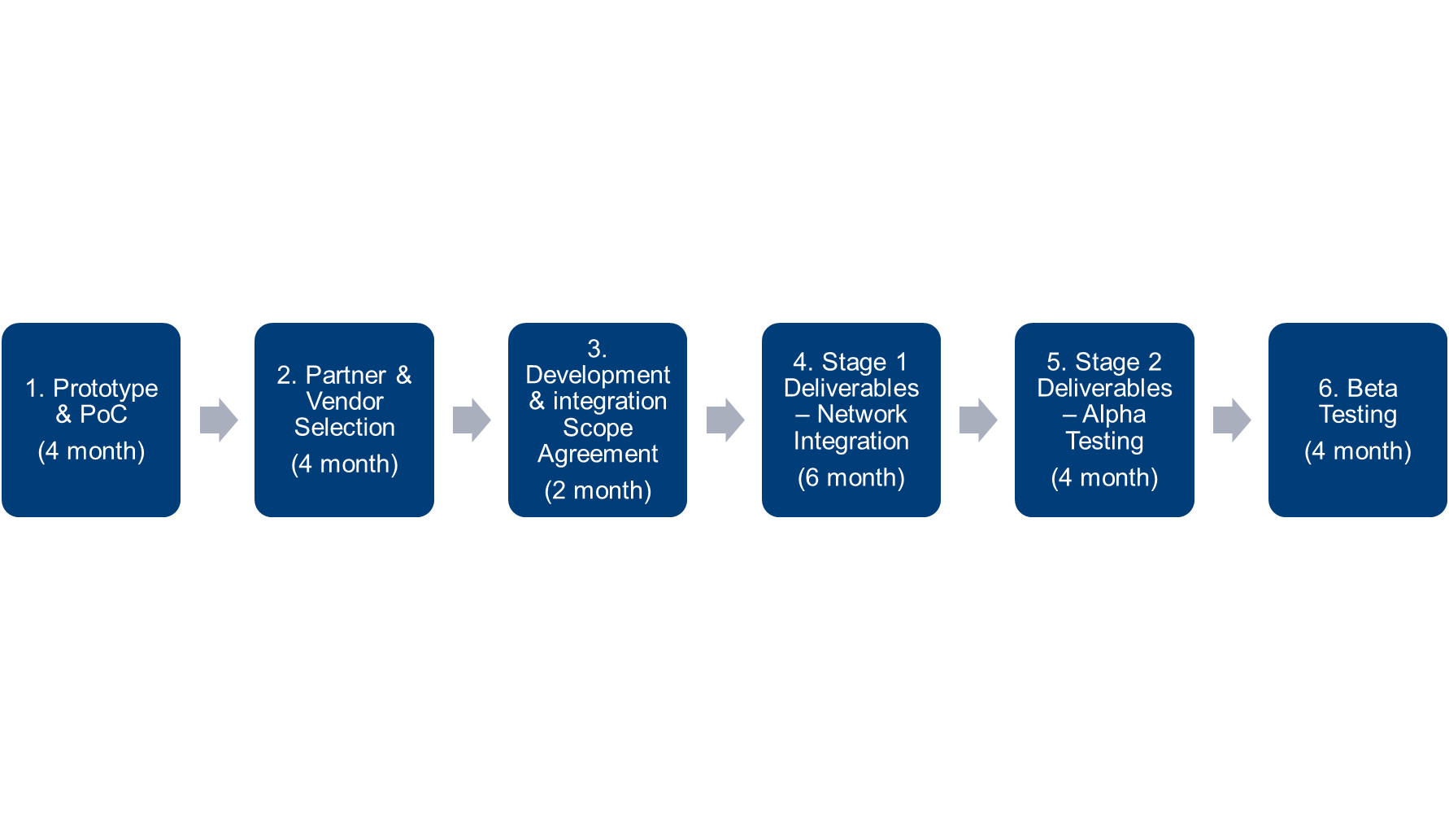
As a recap, the high-level architecture of our solution is depicted below:



**Figure 4.** High Level Architecture Diagram

For development, we’ll rely on partners for capabilities outside of AT&T’s expertise, and we anticipate splitting resources between AT&T and our partners for hardware and software capabilities. Shortlisted vendors include: Skydio or Modal AI for the drones, Microsoft Azure for the AI/ML engine, and Microsoft, Infosys, or Tech Mahindra for the system integrator or DOCMP development. AT&T will develop and own intellectual property only for the DOCMP.

A 24-month-long timeline is proposed for the development of the product offering and depicted in the figure below. The DOCMP will be developed in Stage 1 and integrated with the AI/ML engine in Stage 2. Key product milestones include an initial 4-month phase of prototype development followed by a 20-month development and testing phase including the start of the FAA approval process.



**Figure 5.** Product Development Timeline

### 4.1a Low Cost Prototype Development & Proof of Concept

A low cost prototype will be developed with a third party contractor for proof of concept (PoC) testing within four months.

The low cost prototype will involve the following:

* Autonomous drones with high-quality cameras, lights, and 5G capability
* Edge & connectivity resources
* Platform to manage drone, drone feeds, and view alerts
* AI/ML component integrated into platform (can analyze camera feed but is not yet configured for law enforcement use cases until development phase)

In terms of the PoC, there are three main objectives:

1. Identify a customer (at the police department level) from current law enforcement customers on AT&T’s FirstNet network
2. Demonstrate viability of the product & receive actionable insights from the customer
3. Allows AT&T to verify partner/vendor capability for building the solution before making the vendor selection.

It should be noted that the choice of customer and PoC results are important to secure public safety grants to fund this project.

### 4.1b Partner/Vendor Selection

Partner/vendor selection will be the first step after the prototyping and PoC phase. This is the start of the iterative product development phase.

Success of this solution offering depends on identifying the right partners to address the target use case. This solution offering will have 4 major partners: the drone hardware (HW) providers, the AI/ML analytics engine providers, the system integrator, and AT&T.

#### Drone Vendors

Drone vendor selection will be based on the following broad criteria:

1. 5G connectivity ready or 5G connectivity on roadmap
2. Autonomous capability with 360-degree obstacle avoidance
3. 4K HDR cameras with ability to zoom and spotlight system
4. Ability to integrate add-ons (e.g. thermal sensors, sound detectors, speakers)

Shortlisted vendors based on the above criteria include Skydio and ModalAI.

#### AI/ML Analytics Engine Providers

AI/ML analytic engine provider selection will be based on following broad criteria:

1. Consumes a wide variety of video and sensor data
2. Analyzes feed from multiple drones and generates alerts for public safety threats
3. Provides actionable insights for crowd management

The preferred partner for this component is Microsoft Azure.

#### System Integrator

System integrator partner selection will be based on following broad criteria:

1. Ability to develop software to map drone control and management from physical controllers to a cloud-based application.
2. Works in collaboration with drone HW vendors
3. Harmonizes drone management from multiple drone HW vendors to a single portal
4. Develops portal for planning and launching fleet of drone for planned events
5. Develops a portal for providing a holistic view of drone video and sensor feeds
6. Incorporates trends, patterns and threats analyzed by AI/ML engine in the portal
7. Sends alerts to appropriate law enforcement personnel based on AI/ML feedback

Shortlisted vendors based on the above criteria include Microsoft, Infosys, Fusus, and Tech Mahindra.

### 4.1c Development & Integration Scope Agreement

Once the partners are selected, AT&T and their partners will agree on the development and integration scope/requirements prior to development of the first iteration of the product. Below are the required integration and development items as well as the partners involved for each.

**Table 6.** Development & Integration Scope

|  |  |  |
| --- | --- | --- |
|  | **Integration/Development Items** | **Partners Involved** |
| a | On-boarding & certifying drones onto AT&T’s 5G cellular network | AT&T & Drone Vendor |
| b | Development of DOCMP hosted at AT&T Edge Cloud | AT&T, Drone Vendor & System Integrator |
| c | Configuring required Quality of Service (QoS) for autonomous drone management & collection of video/sensor data | AT&T |
| d | Development of AI/ML Analytic Engine for receiving drone data & providing crowd management insights to DOCMP | AI/ML Analytic Engine Provider & System Integrator |

Development cost will be borne by drone HW vendors and AI/ML analytic engine providers for any additional development needed in their product area (beyond their existing products/services and its potential configurations). Any other costs will be borne by AT&T.

4.1d Stage 1 Deliverables (Network Integration)

AT&T, the system integrator partner, and drone HW vendor(s) are responsible for stage 1 integration/development deliverables. These include:

1. Drones are equipped with 5G connectivity and on-boarded on AT&T cellular network.
2. Required network resources are allotted and made available for autonomous drone operations.
3. DOCMP is developed in collaboration with drone HW vendors.
4. Drone management and control are migrated to the DOCMP hosted on the AT&T Network Edge.
5. Drone operations involving multiple drones can be launched and controlled via the DOCMP, eliminating the need for one pilot per drone.
6. Drone operator(s) can view camera/sensor feed from multiple drones in a single holistic view from the DOCMP.
7. Quality of Service (QoS) configuration is completed.

4.1e Stage 2 Deliverables (Alpha Testing)

AT&T, the AI/ML analytic engine provider, and drone HW provider(s) are responsible for stage 2 integration/deliverables. These include:

1. The engine will be able to consume real-time video/sensor feed from multiple drones.
2. Real-time crowd management insights are generated.
3. Public safety alerts are generated, and mitigation actions are suggested.
4. Smart map generation
5. All integration and development items are delivered, and the first iteration of the product is ready for field testing.

4.1f Beta Testing at Small-Scale Events

AT&T already has several law enforcement agencies as customers as part of its FirstNet program. In this stage, the AT&T team will identify a couple of law enforcement agencies, including the agency they worked with for the prototype PoC, for beta testing of the product at small-scale events such as local festivals or gatherings.

At the end of beta testing, customer feedback will be collected to identify areas of improvement in the solution offering and be used to iteratively develop the product.

The AT&T team will be leading the beta testing with support from all partners.

## 4.2 Technical Challenges

The most significant technical issues that could impede the development of our product include:

#### Battery Life

Currently, drone battery capacity is limited to an hour while the average event is 4-5 hours long. While we have various design considerations in place to address this - including (1) offloading computation to the edge and (2) including a number of drones in each packaged solution, so they can be rotated out during events - extending, and optimizing battery life is a technical challenge we must address during development.

#### Uplink Requirements

Uplink requirements was also a concern which was discussed in a previous section. Antenna or deployables for purchase, beamforming, and or a programmatic antenna solution may end up being required for our solution if the current architecture is not sufficient to meet the uplink requirements. This will not only require increased development costs, but set our timeline back, so we should remain aware of this potential technical challenge.

#### Autonomy

Drone autonomy is a relatively new technology and will come with its own set of challenges. These will be mitigated partially because we are sourcing our drone hardware externally and can defer to our contractors for support, but not completely.

#### Safety Features

UAVs will need additional safety features to mitigate the possibility of crashing during a live event and injuring people or damaging property. The solution for this potential technical challenge will include building redundancy capabilities into UAVs with parachutes on board that will be deployed to reduce harm in the event of emergency landing. If a drone has low battery power or physical capability challenges, it will receive instructions to return to its base to avoid running out of batteries or falling out of the sky while deployed.

## 4.3 Operations Plan

### 4.3a Frontstage Initiatives

#### Marketing Team

To ensure the successful launch of our product, we will have a team of marketing professionals who will attend conferences, meet with prospective customers and users, including police chiefs and law enforcement agency leaders, and engage in targeted advertising and other related public relations initiatives. Our team will work tirelessly to build relationships with key stakeholders in the law enforcement industry, including LE Lieutenants and other decision-makers. Through our outreach efforts, we aim to raise awareness of our product and its unique features and benefits, as well as generate interest and demand among potential customers. Our team will be highly visible and engaged in the community, actively promoting our product and cultivating relationships that will help drive sales and ensure the long-term success of our venture.

#### Sales Team

Our dedicated team of sales professionals is actively engaged in defining our sales initiatives, forecasting sales projections, and identifying key accounts that will help drive successful sales outcomes. Through a rigorous process of research and analysis, our sales team will work closely with other departments to identify market trends, analyze law enforcement needs and preferences, and develop targeted sales strategies that are tailored to meet the unique demands of our industry.

### 4.3b BackstageInitiatives

#### Development Team

Our research and development team will actively partner with key alliances that we identified in prior sections as the drones manufacturer and AI/ML Analytics teams. By collaborating with these partners, we can leverage their expertise, knowledge, and resources to develop innovative and cutting-edge drone technologies that meet the unique needs and demands of the law enforcement industry. With a focus on quality, performance, and reliability, we are confident that our partnerships with key alliances in drone manufacturing will help us to deliver exceptional drones and services that meet the evolving needs of law enforcement agencies.

#### Support Team

To ensure the success of our business model, we have assembled a team of highly skilled AT&T support members who have extensive knowledge and experience in network connection and architecture. Our support team will leverage their expertise to ensure that our products and services are seamlessly integrated with AT&T's existing network infrastructure, providing a seamless and reliable user experience for our customers. In terms of the software and hardware components (the DOCMP platform including the AI/ML engine and the drones), our support team will defer to contractors and their expertise as needed but will be the client-facing party.

### 4.3c Organization Chart

A screenshot of a computer

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**Figure 6.** Operations Organization Chart

### 4.3d Inventory Management

We require a dedicated 5G network connection, and one possible solution could be to leverage the capabilities of network slicing to utilize the existing AT&T FirstNet network instead of creating a new dedicated network. This option should be seriously considered during the planning phase, as it could significantly reduce the initial setup costs for AT&T's 5G network, which can typically be expensive. By utilizing network slicing, we can create a virtual network within the existing infrastructure, which can be customized to meet our specific requirements while ensuring optimal performance, reliability, and security. This approach can help us achieve our objectives while also minimizing the financial burden on AT&T.

Our product solution requires extensive collaboration with other vendors who manufacture the drones we use. To avoid bottlenecks in the production process, we plan to proactively procure devices based on forecasted sales. This will require storage facilities for the hardware purchased, which could be a shared space within an existing warehouse of a partner company such as AT&T. The storage space could be used to store not only the drones but also other equipment such as network cables, thereby maximizing the use of available resources.

### 4.3e Partners

The success of this solution offering is contingent upon identifying suitable partners to cater to the intended use case. AT&T would be responsible for procuring the drone devices and overseeing the implementation of the service for law enforcement agencies. The diagram below depicts the partners affiliated with our solution. After conducting an initial market analysis, we have narrowed down our options for drone hardware providers to Skydio and ModalAI, while Microsoft Azure would be the natural choice for an AI/ML analytics engine provider.

Graphical user interface, diagram, application

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**Figure 7.** Solution Partners

### 4.3g Operational Flow Diagram

The operational flow diagram depicts the product transition between the drone manufacturer, AT&T and the end use case for our UAV product. It includes 5G capabilities as well as analytical services our product will need to successfully accomplish our business goals.

Graphical user interface, text, application

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**Figure 8.** Operational Flow Diagram

## 4.4 Scaling

Our plan for the first year is to focus on the top 10 largest police agencies by employee count before expanding nationwide, as these markets coincide with AT&T's 5G maturity and provide the greatest potential for success. In the second year, we aim to target six law enforcement agencies, annually. As drone adoption becomes more widespread in the law enforcement industry, we anticipate that all agencies will eventually adopt some form of drone fleet with a provider.

Furthermore, based on our performance and product offering, we can explore other potential growth opportunities for this technology.

For instance, the development of this technology will allow for aerial capabilities and drone usage to extend beyond law enforcement customers and reach other first responders, such as paramedics, firefighters, detectives, natural disaster responders, and other public safety groups. By tailoring our smart AI drone technology to support the unique needs of these customer groups, we can expand our customer segment beyond law enforcement.

In addition, another opportunity for growth is to expand 5G capabilities from urban to rural settings, which will be useful for disaster response and law enforcement needs that require drone and aerial support but may lack access to reliable 5G networks.

A third option is expanding beyond the first responder customer base to private event security services, especially those that already have ongoing partnerships with law enforcement agencies. While our drones are solely intended for law enforcement at this time, this could be a way to broaden the planned event industry as the number and size of events continues to grow.

## 4.5 Timeline

While costs while be expanded on in a later section, the following figures summarize development & operations timelines and associated costs.

Table

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**Figure 9.** Development Timeline & Costs

Table

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**Figure 10.** Operations Timeline & Costs

# 5 Marketing & Sales Plan

## 5.1 Overall Marketing & Sales Plan

### 5.1a First Customer

For a first customer, we recommend partnering with a current FirstNet customer of AT&T, which could be the local Plano Police Department in Texas. AT&T can involve this partner in demo and testing product stages, setting the stage for acquisition when the product is ready to go to market. In addition to targeting the 10 largest police departments in the nation, we recommend targeting a local, FirstNet customer—possibly offering a discounted rate for the first year in exchange for data that helps work through any bugs in the system and identified key area of improvement for the end user. AT&T leverage of already existing relationships and established trust with law enforcement agencies will heavily support initial customer engagement.

### 5.1b Market Positioning

In terms of market positioning, AT&T will position itself as a key player in the drones for public safety market by offering a range of services that are designed to meet the specific needs of public safety agencies. These services include:

1. **Network Connectivity** - AT&T's network connectivity services are a key selling point for our drone solutions. The company's nationwide wireless network enables agencies to transmit data and images from drones in real-time, which is critical for situational awareness and emergency response.
2. **Training and Support** - AT&T will offer training and support services to public safety officials to get the most out of our drone solutions. These services include training on drone operation and maintenance, as well as technical support to ensure that drones are operating effectively.
3. **Regulatory Compliance** - AT&T will also position itself as a leader in regulatory compliance for public safety drone operations. The company works closely with regulatory agencies to ensure that its drone solutions meet all safety and privacy requirements.
4. **Cost-Effective Solution** – Our drone solution is designed to be cost-effective for public safety agencies.
5. **Partnerships** - AT&T will establish partnerships with key players in the industry including drone manufacturers and software providers. These partnerships enable AT&T to offer the latest and most advanced technology solutions to its customers.
6. **FirstNet partnership** -AT&T has a partnership with FirstNet, which is a nationwide public safety communications platform. This partnership allows AT&T to provide priority access to public safety agencies for their communications needs, including the use of autonomous drones in public events.

### 5.1b Points of Differentiation

Our differentiation for our product offering and competitive advantage includes the 5G network offering, edge computing technology for local data storage and processing power, and a customized and comprehensive end-to-end solution for law enforcement when it comes to public event security and officer augmentation.

1. **Advanced 5G network** - AT&T’s highly advanced 5G network, which provides faster data transfer speeds, lower latency, and more reliable connectivity than many of its competitors. This allows for more efficient and effective use of autonomous drones in public safety operations.
2. **Edge computing technology** - AT&T's Network Edge allows for data to be processed closer to the source, reducing latency, and improving overall performance. This enables public safety officials to receive real-time data and analytics, improving situational awareness and decision-making.
3. **Improved situational awareness** - The use of AI algorithms can help identify patterns and anomalies in data collected by drones and devices, improving situational awareness for public safety officials. This can include detecting potential threats, identifying missing persons, and analyzing traffic patterns to improve response times
4. **Comprehensive solution** - AT&T provides end-to-end solutions that include not only the drones and devices themselves but also the software, training, and support necessary to deploy and operate them effectively. This makes it easier for public safety agencies to adopt and integrate autonomous drones and devices into their operations.
5. **Customized solution** - AT&T’s R&D department works closely with public safety agencies to develop customized drone solutions based on their specific needs and continuously improving solutions based on the feedback from police officials. This includes integrating existing technologies and systems, as well as providing comprehensive training and support.
6. **Scalability** - our drone solution can be scaled to meet the needs of any size of agency, from small local agencies to large regional or national organizations.

### 5.1c Pricing Strategy

When designing a pricing strategy for our drone solution, we considered various factors such as the cost of production, software services, marketing, operational and maintenance expenses, as well as the solution's perceived value to the customer, and the competition in the market. The result is the bundled pricing model we previously detailed.

As a recap, the cost breakdown **per drone** is as follows:

* **Hardware cost**: $30,000 (one-time payment including drone and accessories)
* **Monthly subscription cost**: $600
  + $400 for software (DOCMP and AI/ML engine)
  + $200 for 5G connectivity (FirstNet and AT&T Network Edge)
* **Monthly maintenance cost:** approximately $220 (but may vary month-to-month)

### 5.1d Sales Process and Promotional Mix

To effectively promote autonomous drones to public safety officials, it's important to share real-life stories that showcase the benefits of using these devices. This can be achieved by sharing specific problem/solution cases from our drone customers in the public safety industry. Peer-to-peer referrals and testimonials from other public safety officials can be particularly impactful and help build trust in AT&T's drone solution. AT&T can also consider providing additional details or creating videos that help tell the story and demonstrate the effectiveness of its autonomous drones in public safety operations. By highlighting the concrete benefits of using these devices, AT&T can successfully promote its solutions to public safety officials as part of its promotional mix. The following are some promotional mixes for marketing and selling the products:

1. **Direct marketing:** AT&T sales engineers can conduct direct marketing campaigns to reach out to public safety decision makers directly. This can include email campaigns, direct mail, and targeted online advertising.
2. **Public relations:** AT&T can generate positive publicity by collaborating with public safety agencies to showcase successful use cases of autonomous drones in public safety operations. This can be shared through press releases, social media, and other communication channels.
3. **Trade shows and events:** AT&T can participate in relevant trade shows and events to showcase its autonomous drones and services. These events provide a great opportunity to connect with potential customers, demonstrate product features, and build relationships.
4. **Content marketing:** AT&T can create valuable content such as white papers, case studies, and blog posts that educate public safety officials on the benefits of using autonomous drones in public safety operations. This can help position AT&T as a thought leader in the industry and build credibility with potential customers.

#### A customer-centric approach

As previously mentioned, there are primary approaches for selling AT&T's autonomous drone solution to law enforcement agencies: (1) bottom-up, which starts with field officers and (2) top-down, which involves marketing the product to law enforcement executives and city officials. A combination of these promotional mix elements will help AT&T effectively reach public safety officials and sell its autonomous drones and services for use in large public events.

### 5.1e Distribution & Sales

Below is the process AT&T will follow for selling its drone solution to public safety agencies:

1. **Research and Identify Prospects**: As the first step, the sales team will research potential public safety agencies that could benefit most from AT&T's drone solution focusing on larger agencies with a high number of events happening in their jurisdiction. They will identify key decision makers and stakeholders within those agencies and gather information about their specific needs and pain points regarding overtime budget allocation and usage.
2. **Initial Outreach:** Next, our marketing team will reach out to prospects through email, phone, or in-person meetings to introduce AT&T's drone solution and its benefits. In the initial outreach, providing a high-level overview of the solution and scheduling a follow-up meeting to discuss it in more detail will be the focus.
3. **Product Demo:** Our marketing team will conduct a product demo with proof of concept of AT&T's drone solution to decision makers and influencers with the agency showcasing its features and capabilities, and how it can address the needs identified during our initial research on agency. We will use this demo to demonstrate the value proposition of the solution, and how it can help public safety agencies to improve their operations and reduce the overtime burden on officials.
4. **Objection Handling:** Will involve addressing any concerns or objections that the decision makers or influencers may have about the solution or its pricing. We will use case studies or customer references to demonstrate the success of the solution.
5. **Close the Sale:** Once objections have been addressed and the proposal has been agreed upon, we will close the sale by finalizing the contract and scheduling the implementation of the solution. The sales team will follow up with the agency to ensure a smooth onboarding process and address any additional questions or concerns.
6. **Post-Sales Follow Up:** Lastly, there will befollow up with the agency after the sale to ensure they are satisfied with the solution and that it is meeting their needs . We will offer ongoing support and training as needed to ensure that the agency is getting the most value from the solution.

By following this sales process, AT&T will effectively sell its drone solution to public safety agencies, build strong relationships with its customers, and achieve its business objectives.

Our forecast of AT&T's drone solution for public safety agencies is projected to experience steady growth in the coming years, with an increasing number of agencies adopting the solution to enhance their operations.

In the first year, AT&T expects to onboard five agencies, with an average of 10 drones per agency as we target larger agencies, resulting in a total of 50 drones. By the second year, the number of agencies is expected to triple to 15, with an average of 6 drones per agency, resulting in a total of 90 drones.

In the third year, the number of agencies is expected to increase to 20, with an average of 6 drones per agency, resulting in a total of 120 drones. The fourth year will see the same number of agencies and drones as the third year, with 120 drones. By the fifth year, the number of agencies is projected to increase to 25, with an average of 6 drones per agency, resulting in a total of 150 drones.

These projections indicate that AT&T's drone solution is gaining traction in the public safety industry and has the potential for continued growth in the future. As more agencies adopt the solution and experience the benefits it provides, the demand for the product is expected to increase, resulting in greater revenue for AT&T.

# 6 Financial Plan

## 6.1 Business Model, Revenue & Sales Plan

Our business model is structured around revenue from drone equipment, subscription, and maintenance costs. The one-time cost of purchasing drone hardware and equipment brings in a significant amount of revenue, but AT&T’s consistent source of revenue will come from reoccurring annual subscription fees for our software and 5G capabilities. Since AT&T is not the hardware manufacturer and will be purchasing drone equipment and accessories from a third party vendor. AT&T will sell the drone equipment with a comfortable profit margin and also be able to rely on annual subscription fees for the network services it provides.

The charts below shows financial projections (highlighted in green) for revenues from years 1-5, and our assumptions and calculations for this section will be outlined in more detail below. Total revenue starts out at nearly $1.75 million dollars in year 1 and increases 34% to $11.8 million dollars in year 5.

**Table 7.** Revenue Projections Years 1-5

Table

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6.1a Equipment Revenue

We are planning to capture 5 agencies in the first year, as we get our business up and running. This is based on the pre-seeding work AT&T will do during the testing and prototype phases as it executes successful trials during large-scale events and markets those trial successes to key agencies.

In the first year, we will be targeting the following 10 largest agencies we’ve previously shared details on: New York City (NYPD), Chicago (CPD), Los Angeles (LAPD), Philadelphia (PPD), Houston (HPD), District of Columbia (MPDC), Las Vegas (LVMPD), Dallas (DPD), Miami-Dade (MDPD) and Phoenix (PPD). We assume we’ll be able to capture 2 of these agencies, which increases our average number of drones per agency to 10 (versus 8) to account for higher populations and significantly higher event attendee averages. These two averages are calculated the average number of drones per agency and the average number of drones for a top 10 agency based on average crowd sizes at public events.

**Table 8.** Equipment Revenue Projections Years 1-5

Table

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### 6.1b 5G Subscription Revenue

Our subscription revenue is a flat monthly rate per drone of $600. This includes a subscription to our drone software package that enables smart drone technology and allows for drone updates, connectivity, and smart capabilities. The Drone Operations & Crowd Management Portal (or DOCMP) will act as a single portal for launching autonomous drone operations and management and acting as a visualization layer for crowd monitoring & public threat alert monitoring. The second item in our monthly subscription pricing model is the wireless fees law enforcement agencies will pay for AT&T’s 5G and MEC capabilities.

As mentioned earlier, subscription revenue is a strength of the AT&T business model, and we see it start out slow in year 1 and growing exponentially as we add new customer subscriptions onto existing annual subscriptions. It reaches nearly $4.25 million dollars in year 5.

**Table 9.** 5G Subscription Revenue Years 1-5

Table

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### 6.1c Maintenance Revenue

The projected maintenance revenue recops AT&T costs for fixing failed or problematic drones as well as providing maintenance support to customers throughout the drone life. This isn’t a huge revenue-generating opportunity for AT&T, but it will be important to our business plan as it helps us deliver strong customer service, lending credibility to the brand and product as we continue to market our product to customers. It will also help us gather data about our products that we can share with drone vendors and use to improve services, features and quality. Maintenance revenues start low and will reach $1.59 million dollars by year 5.

Assumptions in this revenue projection include a drone lifespan average of three years, a 25% failure rate of drone equipment products, and increases in labor costs from years 1-5.

**Table 10.** Maintenance Revenue Years 1-5

Table

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## 6.2 Break-Even Analysis

Our business model requires 2 years to achieve positive profit given our anticipated agency capture count. This is when AT&T begins to recoup its costs and break-even on its investment in the product. AT&T’s revenue stream will come from equipment, subscription, and maintenance revenues, while costs include variable costs for equipment Costs of Goods Sold and fixed costs for other expenses. These are detailed below:

* The revenue stream for AT&T from our solution is from three components: equipment revenue, subscription revenue, and maintenance revenue. These three streams of revenue add up to about $38.75 million dollars.
* The equipment COGS at our break-even financial position is nearly $2.5 million dollars in year 2—with the total COGS for year 2 reaching $2.7 million dollars. This cost is considered a variable cost. Specifically, we estimate that 75% of the revenue from each drone sale goes toward covering equipment costs (i.e., COGS, or Cost of Goods Sold).
* The fixed cost includes all the expenses that AT&T incurs regardless of how many drones are sold. This includes expenses such as staff salaries, travel costs, shipping costs, and other expenses listed below. Our fixed costs total approximately $13.7 million dollars.
* Our break-even point is analyzed to be $4,305.58

Our analysis shows that AT&T is in a strong position to reach a break-even position by year 2, since we project sales of 50 drones in year 1 and 120 drones in year 2.

**Table 11.** Break-Even Analysis

Table

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## 6.3 Income Statement (P&L)

Our income statement incorporates revenues, gross profit, operating expenses, and operating income over years 1-5. We see a healthy growth in revenues, profits, and income, while operating expenses continue to increase as we receive more business.

While operating income starts out in year 1 in the negative, we anticipate operating income of $352,158 thousand dollars in year 2. In year 5, we project a total revenue of $11.8 million dollars with a healthy operating income of $4.67 million dollars a. Gross profits trend upwards exponentially, from $620,625 thousand dollars in year 1 to $7.34 million dollars in year 5.

Our COGs total 75% of the equipment revenues for each year, leaving us with 25% gross profit. From years 1-5, costs include travel, shipping, infrastructure, personnel and staff salaries, sales commissions, and G&A expenses. Operating expenses start at $1.35 million dollars in year 1 and continue to increase through year 5, reaching $2.67 million as we ramp up marketing and sales capabilities.

The full breakdown of the calculations for operating expenses is as follows:

Travel Costs

Year 1 is based on an average of $600 for 2 staff members traveling to 30 locations. This estimate increases to 50 locations in years 2 & 3, and then up to 70 locations by years 3 & 4.

#### Shipping Costs

The average weight of a drone is 50 pounds. FedEx estimates the cost to be under $100 per shipment. The first year has a maximum potential of 336 drones and our forecasted capture ratio is 10%. Years 2 through 5 assume each agency can purchase an average of 8 drones and align with location trend increase as stated under travel costs.

#### Business Development (BD) Director

Operating costs factor in one business development director @ $140K. There is a comp increase of 3% each year to accommodate performance and inflation.

Sales Staff

In year 1, operating costs have built in two sales leads @ $80K, followed by a third lead in year 3 and then a fourth lead in year 4. Each lead’s salary is forecasted to increase by 3% year over year to accommodate performance and inflation.

Engineering Staff

In year 1, operating costs have built in two engineers @ $160K, followed by a third lead in year 3. Each engineer’s salary is forecasted to increase by 3% year over year to accommodate performance and inflation.

Marketing Staff

In year 1, operating costs have built in three marketing staff. This includes 1 content writer @ $100K, 1 website programmer @ $100K, and 1 marketing leader @ $160K. Two additional marketing employees for product marketing and operations will be added in year 3 @ $120K each. Each lead’s salary is forecasted to increase by 3% year over year to accommodate performance and inflation.

Sales Commissions

Bonuses are calculated based on the business development director and sales staff salaries and max out at 60% of total salaries.

General & Administrative Commissions

Bonuses are calculated based on marketing and engineering staff salaries and max out at 20% of total salaries.

Graphical user interface, application, table, Excel

Description automatically generated**Table 12.** Income Statement Years 1-5

## 6.4 Investment Needed

Our solution will go through the stages of prototype, integration, and beta testing; and on completion of all these stages, we will have the initial version of our solution to launch.

Our cost for development of the prototype and minimum viable product (MVP) or first iteration of the product is roughly $3.2 million dollars. These costs are spread over two years and include labor hours for developing and integrating the DOCMP, managing project and integration, and running customer trials at different stages of product development. The below table provides a breakdown of how the initial product development investment is utilized by stage.

**Table 13.** Financial Investment at Each Stage of Solution Development

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Activities Performed** | **Resources Utilized** | **Unit Cost Per Year** | **Units** | **Total Cost** |
| Prototype & Proof of Concept Team | 1 x Engineer (4 months) | $100,000 | 0.33 | $549,840 |
| 2 x Software Developer (16 weeks, 40 hours per week, $300 per hour) | $624,000 | 0.66 |
| 1 x Account Manager (4 months) | $150,000 | 0.33 |
| 1 X Product Manager (4 months) | $150,000 | 0.33 |
| Azure Compute & Analytics Package | $6,000 |  |
| Vendor Selection & Integration Agreement | 1X Product Manager (6 months) | $150,000 | 0.5 | $75,000 |
| 1X Solution Architecture (6 months, half-time) | $150,000 | 0.25 | $37,500 |
| Development of DOCMP & Integration (System Integrator Services) | 3 X Software developers (52 weeks, 40 hours per week, $300 per hour) | $624,000 | 3.5 | $2,184,000 |
| Project Management & AT&T Network Integration Activities | 1 X Project Manager (Half-time) | $120,000 | 0.58 | $185,600 |
| 1X Integration Engineer (Full-time) | $100,000 | 1.16 |
| Network Usage, Edge Compute Resources & 5G Antenna | Assumption based on Microsoft Azure Cloud Services & Stream Analytics Package for 6 Drones x 730 hours per year | $60,000 |  | $60,000 |
| AT&T Network Infrastructure Charge | $40,000 | $40,000 |
| AT&T’s Beta Testing Team | 1 X Engineers (4 months) | $100,000 | 0.33 | $82,500 |
| 1X Account Manager (4 months) | $150,000 | 0.33 |
| **Total Cost** |  |  |  | **$3,214,440** |

## 6.5 ROI

Our project requires an upfront investment of $ 3.2M to launch the first version of the solution.

Project will have a negative cashflow for Year 1 as we start marketing our solution to the market, with cashflow turning positive in Year 2 as we ramp up sales of our solution. Cash flow grows at a healthy start of Year 3 as we have recurring service revenue from customers acquired in Year 1 & Year 2.

When evaluating our project’s investment worth by calculating project’s IRR (Internal Rate of Return) using cash flows generated over 5 years, (we have considered operating income as cash flow for this analysis), the project provides a healthy IRR of 24% at the end of year 5.

This IRR is higher than average returns in the market indicating this being a sound project for investment.

Higher IRR can also be interpreted as a measure of efficiency. Our project has high IRR which is an indication of efficiency in term of resource utilization & ability to generate returns.

Chart, waterfall chart

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**Figure 11.** Project’s IRR

# 7 Risk & Success Factors

## 7.1 Risk Factors

Below are the sets of risks & our mitigation strategy as it relates to our business plan:

***Risk:*** *Delay in product launch due to integration challenges.*

Our solution relies on drone’s being 5G capable & certified to work on AT&T’s network. It also requires an AI/ML engine to process footage from the drones to provide crowd management insights. This requires that drone vendors already have 5G capability or have it on their immediate roadmap. Delay in having 5G capability for drones can delay full solution product development and launch.

***Mitigation:*** *Integration activities should be run in parallel.*

While the 5G capabilities of drones are developed, tested & certified on AT&T’s network, video feeds captured & stored by drones should be used to integrate & train the AI/ML engine. This will be lieu of the real-time video stream which will be possible once the drones can stream on the 5G network.

***Risk:*** *Law enforcement’s preference for a particular drone vendor.*

Drone usage has been growing within law enforcement departments over the years for a wide variety of use cases like search & rescue, surveillance etc. It is possible law enforcement departments have relationships with drone vendors & prefer a particular drone vendor.

***Mitigation:*** *Drone vendor selection & partnership process also needs to consider the prevalent drone vendors in law enforcement.*

This would help mitigate the issue where law enforcement departments are hesitant to work with and learn about a new drone vendor.

***Risk:*** *Regulatory approval for Beyond Visual Line of Sight (BVLOS).*

Since our business plan involves autonomous drones, current and future government regulations around BVLOS drone operations will need to be considered. In the U.S. it is currently not permissible to operate a UAV BVLOS without a special waiver from the FAA.

***Mitigation:*** *FAA waiver allowing for BVLOS missions per entity.*

In the near-term, we need formulate a standardized process to assist law-enforcement agencies to file for the waiver of regulations 14 CFR § 107.31, 14 CFR § 107.33(b) & (c)(2), as part of the solution purchase. In the long-term, we should provide support for regulatory approval for BVLOS drone operations similar to how large e-commerce businesses, including Amazon and FedEx, are already actively involved in FAA committees for BVLOS regulations recommendations.

***Risk:*** *Drone vendor partner going out of business.*

Autonomous drone technology is fairly new & evolving, it is possible the vendors we select do not have enough business out of AT&T to be sustainable business.

***Mitigation:*** *It will be prudent to have at least two drone vendor partners on-board before production launch and keep evaluating other drone vendors to on-board on the platform.*

Having multiple drone vendor partners will mitigate the risk to the solution in case one drone vendor goes out of business.

***Risk:*** *Law enforcement departments budget constraints.*

Our solution includes two cost components, (1) an upfront cost for drone hardware and attachments (b) a recurring monthly cost for software, service, and maintenance. For the first year the total cost might be higher due to the upfront hardware costs, which could adversely affect sales.

***Mitigation:*** *Develop an additional optional sales model.*

Upfront drone cost can be split over 3 years in monthly payments allowing for lower year 1 cost for law enforcement and providing them payment flexibility if budgets are constrained.

***Risk:*** *Competition from traditional wireless carriers or drone vendors producing their own solution.*

Verizon & T-Mobile have dedicated networks for public safety & have taken steps to bring drone-based solutions for law enforcement. If they beat us to market & capture market share for our targeted use case, it can hurt our positioning.

Drone vendors can also create a similar solution & can use multiple wireless carriers for the service component. In this case drone vendors will not partner with AT&T in building the solution, making available choices for available drone vendors limited.

***Mitigation:*** *Leverage current relationships with law enforcement to prevent loss of potential customers while expediting product development & launch.*

It could also help if AT&T has a beta testing solution available to demo for prospective customers. Additionally, AT&T can offer drone vendors preference for other project/use cases outside public safety to convince them to partner with AT&T as opposed to other carriers for similar solutions.

## 7.2 Key Success Factors

Below is list of factors which needs happen or stay consistent for our business plan to be successful:

* 5G capability availability for autonomous drones.
* Successful and timely product development/integrations between all solution partners.
* Developing a sales playbook of use cases & value prop from beta testing phase.
* Winning a large, lighthouse customer in the first year of product launch.
* No change in FAA BVLOS waiver granting process.

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