InternetSOS 

Addressing Unmet Needs in Natural Disaster Response

Group 59

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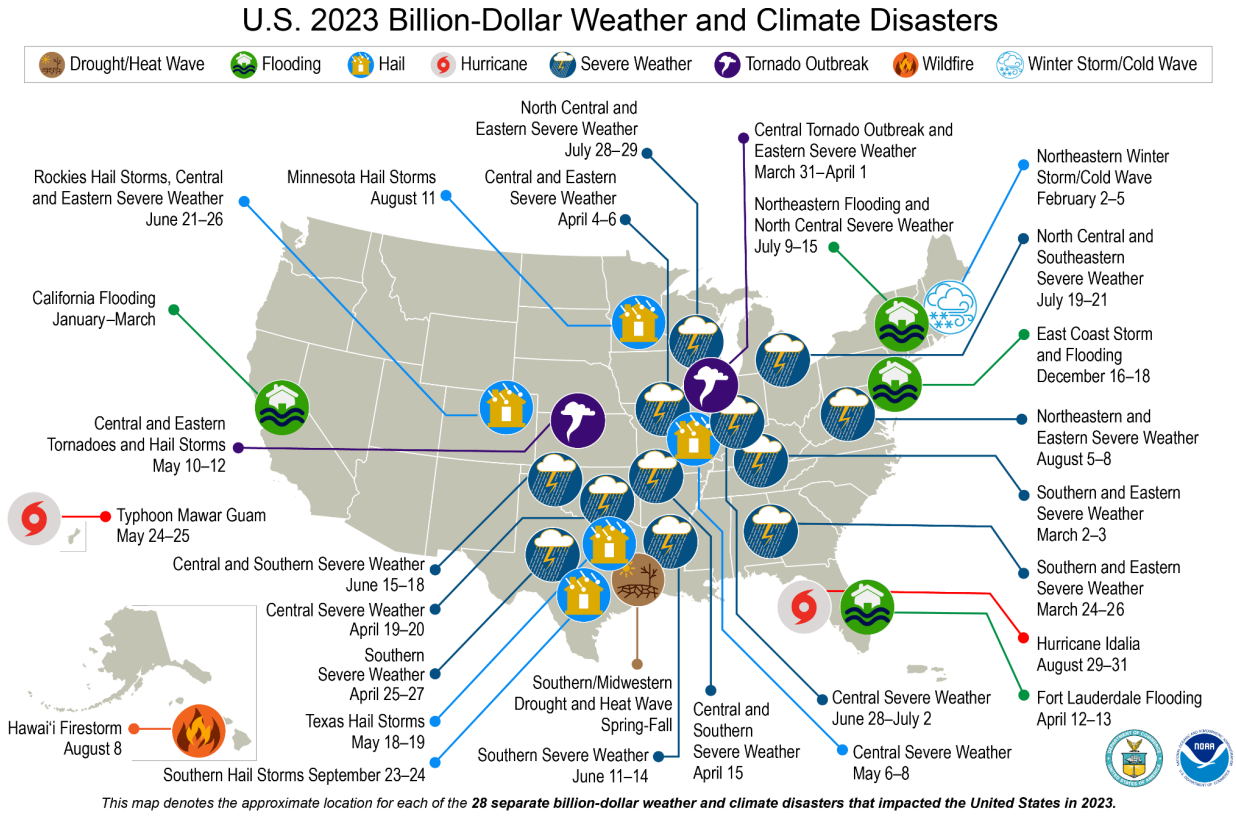
Executive Summary

In a natural disaster, victims often have a limited window of time to call for help. We address this problem by developing a computer vision algorithm for a drone to detect humans and provide temporary internet services for them. Current solutions are too expensive or not robust enough for disaster zones. We generate revenue through government contracts serving local, state, and federal agencies. We test our software on GRASP lab video footage of humans in a natural disaster-like area.

Problem Statement

A combination of population growth and development along with the influence of human-caused climate change have resulted in an increase in the quantity and severity of billion-dollar natural disasters. These disasters leave thousands of people stranded and disconnected from the internet, making their rescue difficult and chances of survival slim. There have been 25 disasters year to date in the US alone and approximately 45,000 casualties globally every year.

The prevalence of climate change creates the need for surveying landscapes, locating humans, and providing internet access after these natural disasters to save lives and reduce the number of casualties in the aftermath. However, there is limited drone technology being developed for this use case, and InternetSOS plans to address this pain point.



*This map denotes the approximate location for each of the **28 separate billion-dollar weather and climate disasters that impacted the United States in 2023.***

https://www.ncei.noaa.gov/access/billions/#:~:text=The%20U.S.%20has%20sustained%20377,377%20events%20exceeds%20%242.670%20trillion

Value Proposition

InternetSOS will utilize drone technology and connections to Starlink satellites to find people during natural disasters and put them on the grid in order to increase their chances of survival. The product will also triage victims and generate reports that indicate highest priority locations in an attempt to optimize rescue operations.

InternetSOS will be marketed to federal, state, and municipal governments depending on the scale of the natural disaster to help them locate and save residents. The government will be able to streamline their rescue operations and respond more quickly, and individuals that were harmed during the disaster will benefit from internet connection and receiving help quickly.
The product will incorporate a YOLOv3 real time object detection algorithm and OpenCV human image detection to locate humans using computer vision. The drone will survey a region and run these algorithms to do live video processing. There will also be a triage and drone placement algorithm function that can identify the highest priority areas based on the concentration of injured individuals across the area. This will help rescue teams optimize their operations. In addition, the product will have a router to connect humans with Starlink internet access. This will allow individuals in distress to be placed back on the grid and allow first responders to more easily find and help them.

Stakeholders

The stakeholders include governments, emergency response teams, disaster victims, regulatory authorities, and NGOs.

Federal, state, and local governments play a large role in disaster management depending on the scale of the disaster. The federal government would be interested in this product for larger disasters that scale several states and require federal funding to repair the aftermath. This would help them spend their aid money effectively and save as many lives as possible during the disaster without waiting until people have been stranded for excessive periods of time. State governments deal with more local disasters and this can be an efficient method for them to maximize their resources, especially if they have limited disaster relief funds or smaller teams that are equipped with less technology. Local governments can also use this to make better decisions about resource allocation and strategically helping injured individuals.

Emergency response teams would use this product to more effectively find people in harm. They can limit injuries to their own team by avoiding surveying areas where individuals do not require assistance. They can also have a quicker and more targeted response to the highest priority individuals. Providing them access and putting them on the grid allows for these response teams to assess where help is needed most and monitor the health of these individuals throughout the recovery process.

Disaster victims are affected by the natural disaster and will require assistance. This product will especially benefit the victims who have no internet access or are in abandoned regions that might not be as easy to find without drone technology. Since the placement of these victims is random

and unforeseeable during these disasters, they would like more advanced technologies to be in the hands of authorities so they can react quickly and effectively as needed.
Regulatory authorities will be stakeholders since drones are subject to laws and regulations that limit their use. They will need to make sure that the InternetSOS drone satisfies safety and legal guidelines during deployment. There will also be regulatory bodies that scrutinize the fairness in access to this technology and fairness in helping victims which will be an important consideration.

Many NGOs are focused on climate change and natural disaster relief. In addition to helping fight climate change, they are interested in mitigating damage and working on initiatives to treat and save victims. This will be an important product for them to consider and it would align with their mission statement.

Customer Segments

Our primary customer segment is the United States government DoD and FEMA. Over the past three decades, FEMA has spent $347 billion dollars on disaster relief and management and is actively seeking solutions to cheaper and more efficient disaster relief practices. Our product aligns exactly with their goals to reduce natural disaster mortality rates in a more cost efficient way using ML and CV technologies. In addition, FEMA just recently put out an RFI (Request for Information) about small unmanned vehicles that they can use for natural disaster relief, indicating to us that they are actively seeking solutions and willing to spend money and give out grants for drone specific technology advancements.

Market Opportunity

The market opportunity is proportional to the frequency of natural disasters worldwide and income levels of potential markets. The highest death tolls due to natural disasters tend to occur in low- to middle-income countries, underscoring the need for an affordable product that can be purchased in emerging markets. While the number of deaths worldwide due to natural disasters has decreased precipitously from 500,000 per year in 1920 to 41,000 in 2020, in the past 10 years, the number of deaths per year has been roughly flat worldwide. At the same time, the frequency of natural disasters has increased due to climate change. These trends suggest the market is ripe for a disruptive technology to help humanity achieve a much lower death toll.

Estimate of Size and Growth of Market Segment

In 2021, the market size for global disaster preparedness systems was $155 billion. It is projected to grow to $300 billion by 2030 with a CAGR of 7.7% from 2022 to 2030.

Additionally, since our primary customer is the US Government agencies, we are aware that their budget is in the trillions of dollars. Government agencies like the Department of Defense regularly contract to companies building emerging technologies with multi-million dollar contracts. Thus, our scope and possibility for impact is larger in this market than in any other.

Competition

Our competitors include other drone companies with computer vision algorithm capabilities that have similar use cases. One such company is called Vocus, an Australian company that owns and operates a fiber network that is managed for business and government. They utilize drone technology with internet connectivity for disaster relief using high-speed low-earth orbit satellite connectivity (Starlink). They also have an Australian-made drone that acts as a mobile tower in the sky, providing connectivity across an area up to 28 square kilometers. Vocus does not, however, have a fully integrated system that utilizes ML and CV to predict the location of people stranded and identify them using radar or thermal imaging techniques. Our product will use the pre-existing fiber optic network and internet routing system set up through Starlink, and our competitive edge lies in ML and CV algorithms, as well as our specific use case and location of interest.

We also know that SpaceX, the owner of the Starlink satellite capabilities, has started to impose controls and restrictions on drone usage in Ukraine. In this sense, they are taking control of the drone and internet connection market, but do not pose as large a threat to our business endeavors since they are targeting the Ukrainian government to fit their own social agenda. Our use case is for the US Government and federal agency usage.

	InternetSOS	WiscLift	Firmatek	DraganFly	Skydio
Natural Disaster Response	✔		✔	✔	✔
WiFi Access	✔	✔			
Human Detection CV	✔				✔
Algorithmic Positioning	✔		✔	✔	
Autonomous Drones	✔			✔	✔
No Operator Training	✔				

As you can see in the competitor analysis table above, top competitors have certain elements that InternetSOS offers but they do not have the full functionality of our product. For example, WiscLift provides WiFi access with drones, but they have to be manually monitored by a human and they do not support autonomous flying or algorithmic positioning. Other companies that

have algorithmic positioning like Firmatek and DraganFly do not include WiFi access and they are not optimized for natural disaster response specifically. Skydio, the main competitor that targets natural disasters, also does not provide WiFi access and only focuses on localizing humans. InternetSOS integrates all these elements in order to provide a one-stop solution for identifying humans during natural disasters, algorithmically positioning drones in the highest coverage locations, and providing internet access so that injured individuals can receive help as soon as possible from disaster relief teams.

Cost

Engineering	# Units	Unit Cost	Total
CV Software Engineer	10	$100,000	$1,000,000
Electrical Engineer	5	$100,000	$500,000
Mechanical Engineer	5	$100,000	$500,000
UI Engineer	5	$100,000	$500,000
Data Scientist	5	$100,000	$500,000
Maintenance Cost			
Cloud services	-	$500,000	$500,000
Technology Infrastructure			
Bwine F7 GPS Camera Drone	1000	$500	$500,000
Freefly Alta X	100	$15,000	$1,500,000
Sensors	1100	$500	$550,000
Cameras	1100	$500	$550,000
Routers	500	$2,500	$1,250,000
Regulatory Compliance			
Licenses and permits	-	$10,000	$10,000
Lobbyist/Government Affairs	5	$100,000	$500,000
Legal Analyst	5	$100,000	$500,000
Total ($)			**$8,860,000**

Our costs can be broken down into engineering, maintenance, technology infrastructure, and regulatory compliance. We estimate we will need a total of 30 engineers to continually improve the CV and drone positioning algorithms and work on drone repairs as needed, totaling to $3 million. Cloud services will be about $500,000 and the drone and router costs will be around $4.35 million where we plan to have 10 large drones and 100 smaller drones per location in 10

total locations around the United States. Regulatory compliance costs will total around $1 million for lobbyists and drone licenses. The total cost is just under $9 million.

Revenue Model

Our primary customers are US Government agencies that award contracts related to defense, emergency response, public safety, and emerging technologies. This includes the Department of Defense (DOD), General Services Administration (GSA), and the Department of Homeland Security (DHS), which all have annual budgets in the trillions of dollars - just the DOD alone is authorized to spend $1,550,233,843,684 every year. It is because of the prospect of large-scale, national impact and the clear need in government for new technologies that our revenue model is a transaction-based model, where we sell our drones through government contracting.

Our product is a fleet of drones with a UI component to help visualize the optimal drone placement, as well as a dashboard to monitor the internet connections from each drone, live video feed captured, and people detected from this video. Depending on the size of the contract, the number of drones we sell per contract varies. All variable expenses related to the creation of the product is from the number of drones - the technology to create the UI dashboard and all other features are applicable no matter the size of business transaction. This is beneficial as it reduces cost and only has the possibility of maximizing profits.

We plan to use a Cost-Plus model which is very common for government contracts. Our costs are about $8.86 million, and we would like a 15% margin target, resulting in $1.6 million in fees and a total selling price of $10.5 million. 15% margin is in the median range for government contracts, and we are taking a conservative profit given that we are a technology company which can usually target higher margins. This equates to $1.05 million in revenue per region (10 total regions) annually, which is a small fraction of the amount of money the government allocates to disaster response. We plan to structure a medium length 5-year contract worth $52.5 million and then we will reassess costs and revenue model for the next contract.

Demo Link

We have attached demo videos in the folder below of our computer vision algorithm identifying people and objects from live video feed.

InternetSOS.mp4