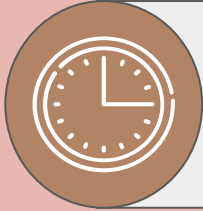# Proposal to Address Response Time of First-Responders in NYC with Crime and Medical Drones

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Problem Being Addressed

In New York City, traffic conditions and the location of nearby facilities impact the response time for first-responders to respond to an emergency.
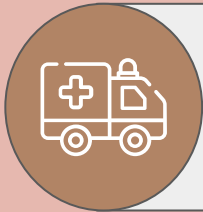
With every passing minute of certain medical emergencies, such as heart attacks, survival rate decreases along with an increase in permanent damage to the body.

The longer it takes for police to arrive at a crime scene, the greater the chance of criminals being able to escape from the scene without being apprehended.

Performance Indicators	Actual			Target		4-Month Actual	
	FY20	FY21	FY22	FY23	FY24	FY22	FY23
End-to-end average response time to all crimes in progress (minutes:seconds)	10:56	11:40	12:44	*	*	13:14	14:21
End-to-end average response time to critical crimes in progress (minutes:seconds)	7:38	7:52	8:26	*	*	8:34	8:58
End-to-end average response time to serious crimes in progress (minutes:seconds)	9:47	10:52	11:47	*	*	12:15	13:26
End-to-end average response time to non-critical crimes in progress (minutes:seconds)	19:01	19:28	22:02	*	*	23:02	25:41
Average response time to all crimes in progress (dispatch and travel time only) (minutes)	8.9	9.3	10.4	*	*	10.9	12.0
★ Average response time to critical crimes in progress (dispatch and travel time only) (minutes)	5.7	5.6	6.1	⇩	⇩	6.3	6.7
Average response time to serious crimes in progress (dispatch and travel time only) (minutes)	7.9	8.6	9.6	*	*	10.1	11.3
Average response time to non-critical crimes in progress (dispatch and travel time only) (minutes)	16.5	16.6	19.2	*	*	20.2	22.8
Crime in progress calls	264,246	255,362	280,489	*	*	95,160	106,572

★ Critical Indicator   ⬢ Equity Indicator   "NA" Not Available   ⇧⇩ Directional Target   * None

Figure 1 - Average response time for crimes in NYC. Note that the end-to-end average response time increased by 1 minute and 4 seconds from 2021 to 2022.
From https://www.nyc.gov/assets/operations/downloads/pdf/pmmr2023/2023_pmmr.pdf.

Performance Indicators	Actual			Target		4-Month Actual	
	FY20	FY21	FY22	FY23	FY24	FY22	FY23
End-to-end combined average response time to life-threatening medical emergencies by ambulances & fire companies (minutes:seconds)	9:31	8:44	9:30	*	*	9:23	9:43
End-to-end average response time to life-threatening medical emergencies by ambulances (minutes:seconds)	10:19	9:34	10:17	*	*	10:09	10:40
End-to-end average response time to life-threatening medical emergencies by fire companies (minutes:seconds)	8:25	8:29	9:01	*	*	8:54	9:08
★ Combined average response time to life-threatening medical emergencies by ambulances & fire companies (FDNY dispatch and travel time only) (minutes:seconds)	6:43	5:53	6:31	6:00	6:00	6:23	6:54
★ Average response time to life-threatening medical emergencies by ambulances (FDNY dispatch and travel time only) (minutes:seconds)	7:37	6:46	7:26	6:55	6:55	7:20	7:55
★ Average response time to life-threatening medical emergencies by fire companies (FDNY dispatch and travel time only) (minutes:seconds)	4:58	5:13	5:35	4:38	4:38	5:26	5:42
Life-threatening medical emergency incidents	564,827	515,598	564,412	*	*	189,933	209,502

★ Critical Indicator   ● Equity Indicator   "NA" Not Available   ⇧⇩ Directional Target   * None

Figure 2 - Average response time to life-threatening medical emergencies. Note the 43 second increase from 2021 to 2022 of the average response time to life-threatening medical emergencies by ambulances. From https://www.nyc.gov/assets/operations/downloads/pdf/pmmr2023/2023_pmmr.pdf.

To Account for the Response Times of First-Responders, We Propose:

1 Medical Drones

- Equipped with a storage unit for insertion of first-aid supplies applicable to the emergency, such as tourniquets, wound-cleaning solutions, defibrillators, medicine, etc.
- Equipped with a live camera and speaker monitored by medical professionals.
  - Medical professionals communicate with the victim or people nearby to provide medical assistance as needed.
- Returns to drone station once an ambulance unit arrives.

To Account for the Response Times of First-Responders, We Propose:

2 — Crime Drones

- Equipped with high-resolution cameras capable of thermal-imaging, night vision and tracking.
- Capable of communication to and from other drone stations and law-enforcement.
- Two crime drones are released at minimum.
  - One stays at the crime scene to take photographs.
  - The other engages in pursuit if needed. Descriptions from emergency dispatchers and the police are used to determine if visuals are gained on the perpetrator or anything associated with the perpetrator (such as an escape vehicle).
- Returns to the drone station once it is no longer needed.

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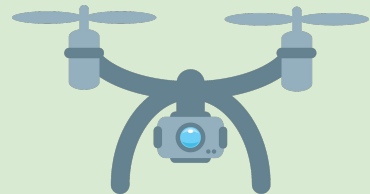
To Account for the Response Times of First-Responders, We Propose:

3 Drone Docking Stations

- Equipped with locations for storage and charging of drones.
- Exist at strategically chosen FDNY Stations to account for the range of the drones.
- Each station equipped with two medical drones and crime drones (may increase after initial testing phase).
- Plan to have medical professionals stationed at the FDNY stations to equip the medical drones with the appropriate medical supplies.
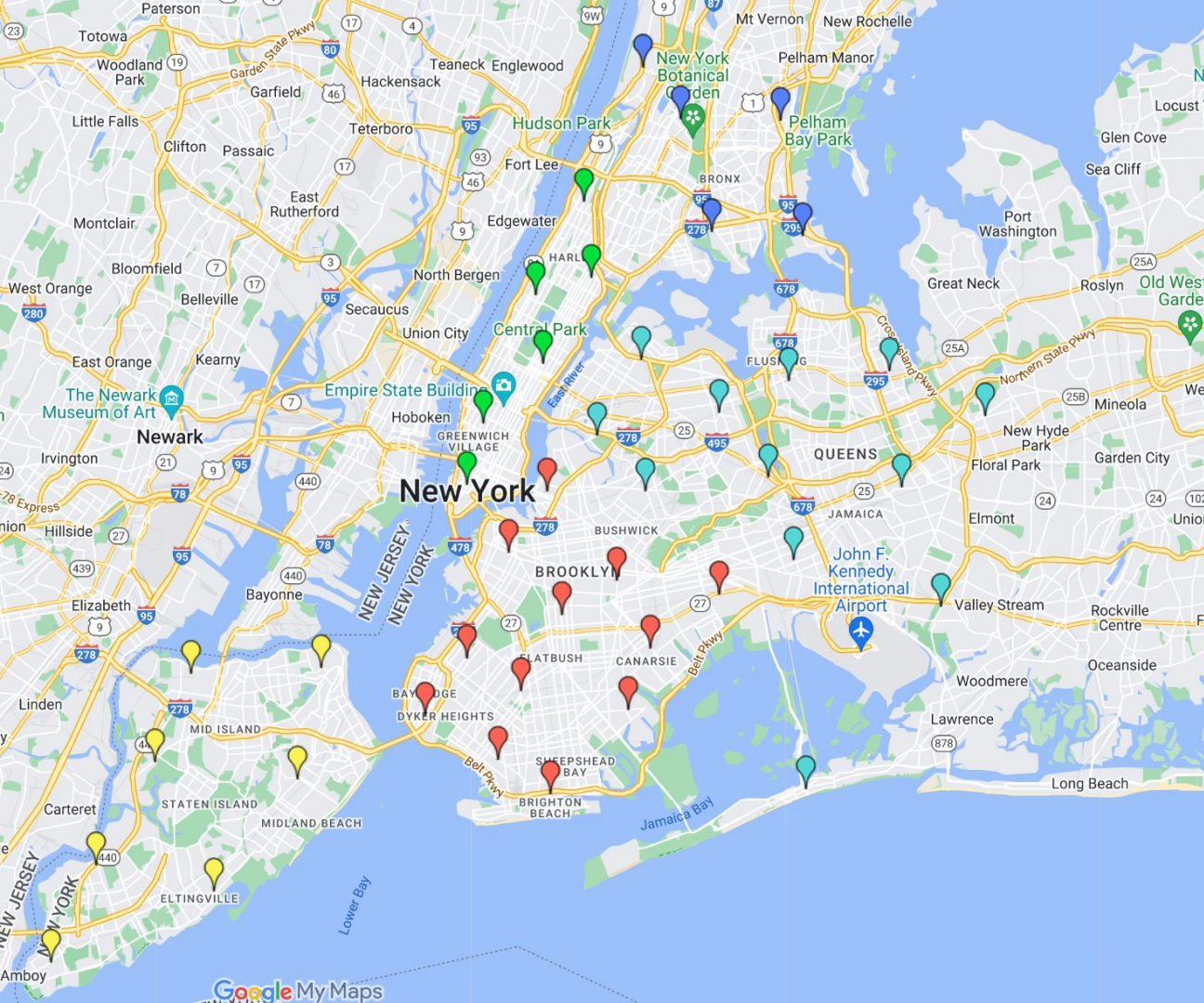
Figure 3 - Planned [FDNY station](#) locations chosen to contain the drone docking stations.

General Description of the Drones

Equipped with an Artificial-Intelligence Module that performs the pre-flight to ensure the drone satisfies the operational check requirement of Title 14 of the Code of Federal Regulations Part 107.

Contains various sensors that the computer interprets for whether the drone is safe for flight. Drone is released once operational check deems the drone for flight.

Drones travel automatically to their destination once data is received from emergency services (911). GPS and Inertial Navigation Systems assist the drone in navigating towards location of interest.

KEY IDEA: The drones <u>do not</u> replace conventional first-responders, rather they aim to provide any form of assistance during the time it takes for the first-responders to arrive.

Challenges

Federal Aviation Administration (FAA) approval needed to operate in drones in New York City's already busy airspace.

Adverse weather conditions may negatively impact drone operation. The impact of adverse weather is minimized with redundant systems and variable pitch rotor technology.

The FDNY stations will be stocked with medical supplies to be placed in the drones. Certain medication may expire if not used within a certain amount of time. Testing phase will help determine the quantity of supplies needed for the average day.

Approval needed to build drone docking stations at FDNY stations. Drone operation will not interfere with FDNY operation.

Feasibility and Remarks

Initial testing phase will begin once FAA and FDNY station approval is obtained. Each drone station will have two of each drone. Testing allows for the drones' computer to become more efficient in their tasks via machine learning algorithms.

After the testing phase, it will be determined whether four drones a station is enough, and how much medical stock is needed on average.
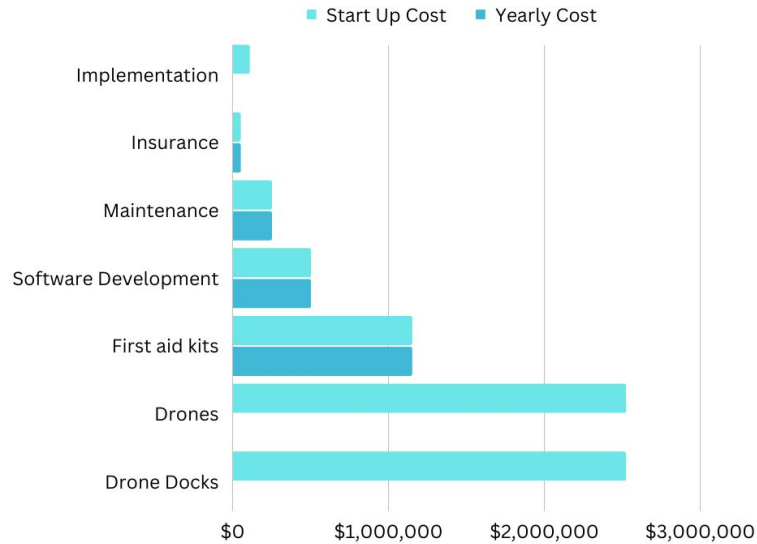
Regular maintenance of drones are necessary for continued usage. Technicians will be hired and trained to perform maintenance on the drones, and the docking stations.

Drone insurance is necessary in case bodily injury or property damage happens from a drone malfunction. Redundancy of features serve to limit drone malfunction.

Budget

Initial Start Up			
Materials	Cost (US Dollars)		
	Per Unit	Per Station (4 Drones + 4 Docks)	Total (42 Stations)
Drone	$15,000	$60,000	$2,520,000
Dock	$15,000	$60,000	$2,520,000
Labor		$2,500	$105,000
Software Development			$500,000
Initial Maintenance Cost			$1,950,000
Total Initial Start Up Cost			**$7,095,000**
Maintenance			
First Aid Kit Resupply	$150		$1,150,000 Per Year
Electricity			$250,000 Per Year
Insurance			$50,000 Per Year
Software Maintenance			$500,000 Per Year
Yearly Cost			**$1,950,000**

Conclusion

- Medical drones address the response time of ambulances by providing medical assistance during the response time itself.
  - The drones provide medical assistance via medical supplies and assistance from medical professionals communicating through the drone.
- Crime drones address the response time of the NYPD by obtaining visuals of crime scenes and potentially pursuing perpetrators during the response time.
- Drones can easily navigate the crowded streets of New York City and fly directly to the area where it is needed.
  - Additionally, drones are could help reduce risk of injury to first responders in high-risk situations such as armed robberies or hostage situations.
- Implementing this technology in NYC will certainly be challenging, but the advantages of this technology are evident.

Thank You for Viewing Our Presentation!

Stay Safe!