How Drones Can Be Used to combat COVID-19

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Context and Purpose of this Guidance Note
In the face of the global COVID-19 pandemic, there have been reported attempts to utilize drone technology in different scenarios, albeit, mainly sporadically and not at scale. This brief guidance note provides the analysis of publicly available information on the use of drones in response to COVID-19 and shares some considerations on whether and how drones could be of an assistance in the given pandemic situation.

Drones Use Cases
The reports from the media and other available sources have identified three key use cases of drones in response to COVID-19. These include:
1. **lab sample pick-up and delivery and transportation of medical supplies** in order to reduce the transportation times and minimize the exposure to infection
2. **aerial spraying** of public areas in order to disinfect potentially contaminated places;
3. **public space monitoring and guidance** during lockdown and quarantine.

1. Transportation
So far, eighteen countries have deployed drones for delivery and transportation purposes during COVID-19 pandemic. Some of them did it as a part of experimentation and tests, while others maintained their regular drone delivery operations. Three countries in Sub-Saharan Africa, namely Rwanda, Ghana and Malawi reported the use of drones to deliver regular medical commodities, COVID-19 supplies and medical samples since the beginning of the pandemic. All the three countries already had drone operations prior to the COVID-19 pandemic, therefore, drone operations were adapted in all three countries in order to respond to the increased demand of medical commodities and COVID-19 supplies.

There is limited public information about the increased demand and quantities of various medical commodities delivered during the pandemic period, therefore, the cost-effectiveness of drone delivery operations has to be considered separately in comparison with other established means of transport. The benefits that drones could offer in the context of COVID-19, are the speed of delivery, extended transportation network reach to the last-mile, limited physical contact and reduced risk of transmission during the delivery.

2. Aerial spraying
There have been several media reports on the use of drones for aerial spraying of disinfectants in public outdoor spaces to contain the spread of the virus. Attempts took place in China, UAE, Spain, South Korea, and other countries. Some companies claim that they managed to cover 3 km^2 of an area with spraying. However, scientific evidence suggests that this application has little to no evidence for efficiency and effectiveness.

3. Public Space Monitoring
A number of different public safety and law enforcement agencies or organizations (Sierra Leone, Rwanda, China, United States, Spain, Italy, France, UK, India, and others) across the world have deployed drones to surveil the public spaces by gaining a better situational awareness, and enforce quarantine by sending messages over a loudspeaker and tracking non-compliant citizens. The video surveillance and broadcasting of voice message with a drone is expected to reduce the possibility of responders having a direct contact with potentially infected people. Additionally, some academic groups started experimenting with drones to conduct symptom tracing that is enabled by thermal imagery and artificial intelligence. While the use case of crowd monitoring remains the most-widespread during the COVID-19 response, number of human rights activists criticize such use due to potential abuse of civil rights and some of these drone programs even were suspended.

Considerations

Countries which had the foundations of the drone-conducive environment were able to instantly mobilize the technology from the onset of the pandemic. Those include

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Ghana, Rwanda, Malawi, Sierra Leone, and several others. While there is still a lack of evidence of the systematic drone impact on health and related outcomes, these countries were able to add drones into the response's toolbox because of the enabling factors such as regulation, capacity, skills, resources, social and political acceptance.

Having these components in place can ensure that the use of technology is available when it is needed. However, it is also essential to connect the solution with the actual demand and a problem, in order to provide a transformational value in terms of benefits, cost-saving, time-savings, etc., and evidence for this is still limited.

As seen from media coverage, there is a trending systematic law enforcement's use of drones for monitoring, as well as at least three countries in African continent (Ghana, Rwanda and Malawi) have functional drone delivery operations, which are either directly or indirectly related to COVID-19 response. In the meantime, aerial spraying use-cases rather present with one-off efforts than the drone technology's deployment at scale due to the application's questionable effectiveness and scientific critique.

The decision framework (upper right corner of this page) suggested by UNICEF Supply Division serves as a step-by-step guidance for Country Offices and partners to determine the pathway for the utilization of drones during the pandemic and, in general, for programming purposes. This decision tool provides a framework for implementers to be able to identify whether 1) there is a problem/context that drones can help solve, whether 2) there is an (conditions for) appropriate enabling environment, and whether 3) there is a right solution (product or service).

UNICEF Supply Division is also working on creating a detailed checklist and implementation framework to help guide country offices, governments and implementing partners through drone delivery program implementation. The framework is based on the decision tree, that outlines

key steps and components of the drone delivery integration into supply chain.

Drone Delivery Decision and Solution Tree
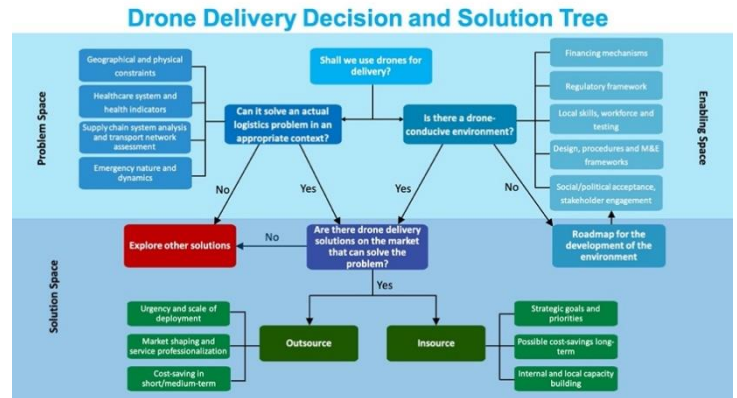
Observing the current situation, there are a few reasons that hinder the wide-spread, scalable and efficient drone deployment during the pandemic:

1. **Lack of understanding of the use cases and scenarios, as well as not sufficient understanding of a problem and context where drone technology can add value during a pandemic**

As experience has shown, each and every use case is context and problem-specific, and therefore, potential benefits and impact of using drones in logistics, especially in development and humanitarian context, cannot be generalized, and requires thorough understanding of a system and a problem in any given country. For example, 70 % decrease in transportation time (from 20 minutes to 6 minutes) was reported by the implementers of the drone delivery pilot project in China, and this demonstrates only an incremental improvement, which is relative and does not provide sufficient evidence for impact. For example, the current turnaround time for a laboratory COVID-19 test is 12-72 hours, and rapid tests remain of a limited use and effectiveness.

The drone operation in Ghana, although offers some advantages to reduce the turnaround time of samples, it is still unclear how it contributes to the entire supply chain in the scale of all rural health facilities, as drones are unable to provide bi-directional transportation i.e. pick-up

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diagnostic samples from remote rural areas and traditional transport modalities still need to be utilized in the major part of the last-mile supply chain.

Therefore, the benefits of using drones in such context really depend whether it can significantly shorten the turnaround time for diagnostics by serving a hard-to-reach area, which does not have good access to the main laboratory, or whether the drones can bring timely critical medical supplies where reaching communities is impossible or very hard, and there're no functioning cost-effective alternatives. To conclude, the use of drones would maximize the benefit if they can significantly increase timely access to health services (medicines, diagnostics) and have a significant impact on reducing the people's exposure to infection.

2. No sufficient support systems that would enable drone deployments at scale in such situations

The very limited number of the cases when drone technology has been used for deliveries during the COVID-19 response suggests that this application still is mainly limited to pilot projects and short-term initiatives. When the time is of an essence, responders and agencies focus on traditional solutions in handling the situation, rather than experimenting with new technologies or outsourcing the use of it. Besides identifying the use cases, the relevance and availability of the drone technology depends on whether the regulatory environment enables the safe use of drones for long-range (BVLOS) flights, whether there is trained personnel and whether there are mechanisms to activate the use of drones immediately.

This depends on existing procurement and contracting mechanisms, training and operational deployment plans that quickly enable the use of drones in emergencies for various applications, including transport, mapping and aerial spraying. As experiences from Rwanda, Ghana, Malawi and Sierra Leone have shown, investments into enabling environment and appropriate governmental support resulted in this technology being utilized even during this time.

Conclusions

Thorough problem and context understanding, coupled with the right drone solution could really offer a breakthrough for the use of this technology, however, it also needs to be supported by appropriate regulatory framework, local skills and sustainability plan. Seeing the full picture is essential to enable supply chain managers make cost-efficient and impactful decisions as part of their COVID-19 response.

The instances of drone use in transportation of lab samples or medical supplies still need time to demonstrate impact or transformational value, however number of countries managed to deploy drones quickly due to the regulation and other foundations which served as enabling factors.

For drones to be considered a viable solution to COVID-19 pandemic, the specific problem must be clearly defined, and a context analysis for using drones must be prioritized that would ultimately help design better drone solutions and use cases, demonstrating an actual impact on health (and related) outcomes.

A proper understanding of the design of the existing health supply chain system must be done to inform the most potent use cases, locations, routes, commodities and transportation modalities, and will provide a strategy for (cost-)effective and efficient supply chain's optimization by drones.

The effective use of technology cannot be scaled without building an appropriate support system and enabling environment. In order to operationalize the use of drones for pandemics or, in general, health supply chain work, enabling environment becomes crucial. Finally, technology sourcing and service provider selection needs to be guided through a rigorous, well defined procurement process and quality assurance.

Building a support system and an enabling environment requires focus on a few different, but essential aspects:

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1. Appropriate financial and human resources need to be in place in order to have drone technology that is available when needed - either through service contracts, or by having local organizational capacity to run drone operations. It also needs to take international movement, health and supply restrictions into consideration;

2. Establishing procurement algorithms that are built on selecting most cost-efficient service that offers quality (service and technology), agility, sustainability, compliance and other key elements;

3. Drone program implementation cannot be done without local skills and capacity therefore, local education and knowledge transfer is the key enabler. This does not only apply to people who can run drone operations, but also to governmental entities and health sector that are the ultimate end-users of this technology;

4. Drone utilization is not possible unless there is a local regulation enabling safe drone operations;

5. Local sensitization of communities and stakeholders needs to be done before and during the drone program implementation, in order to inform the public and raise awareness about the technology, ultimately ensuring local social and political acceptance;

6. Drone integration into the health supply chain has to be shaped and determined by the design of the existing health supply chain system, taking into consideration the problem that drones are solving, the purpose of the use of this technology, as well as clarifying whether drones is the cost-effective alternative to existing transport modalities.

Resources

1. UAS Product Profiles and Guidance - https://www.unicef.org/supply/reports/unmanned-aircraft-systems-product-profiles-and-guidance

contacts for support in UNICEF

Supply Chain Strengthening Centre
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UNICEF Supply Division