Medical commodities deliver by AAVs

Challenges & Opportunities

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Background

• Public health programs and supply chains face challenges that include high transport costs, chronic stock-outs, waste, and inefficiency

• AAVs may offer a last mile delivery system to address some of these challenges....but it was not clear which use cases, places and type of AAV can offer what advantage and at what cost

• Limited tools exist to help countries analyze and make informed decisions on how and when to integrate UAVs into public health programs and systems, as part of a holistic approach, to maximize health and logistics objectives

• JSI partnered with LLamasoft and Kameko Nichols to explore this question and develop a tool to empower countries in analyzing their options and highlight opportunities where AAVs can contribute in improving public health supply chain
Background

• What exactly is their potential?
• Where exactly do they provide a compelling advantage?

• It is not the question about “drones or no drones” rather - what specific niches in public health system can drones provide a benefit?

• We believe AAVs can be integrated into the public health system and can operate in parallel with and complement other forms of transportation
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Opportunities in AAV delivery

• AAV delivery can support overall **Health Objectives** (e.g. saving lives, increasing access, ensuring care and services) and **Logistics Objectives**

• There are select situations that UAVs offer advantage on, in which cost may be justified:
  – Multiple logistics objectives simultaneously
  – Large advantage on at least one of the logistics objectives – enough to be compelling in terms of achieving overarching health objectives

**Logistics Objectives**

• Cost

• Service Level: Availability of Product

• Service Time: Speed/Responsiveness

• Risk or Flexibility
  (accommodate unplanned events or risk e.g. unplanned demand variation, unplanned disruption of access to HFs)

• Quality
To identify niches of potential AAV advantage, we need to look across three dimensions.

**Geography**
- Health Facility Density
- Road network quality
  - Circuit factor – road distance/straight-line distance between two points
  - Average travel speed
- Health Facility Accessibility (% of facilities inaccessible by road * % of year inaccessible by road) e.g. low in watery regions

**Product/Demand**
- Weight
- Volume
- Financial Value
- Health Value
- Shelf-life/Difficulty to store
- Quantity of demand at individual facility
- Unpredictability of demand
- Current extent of stockouts

**AAV Characteristics**
- Payload Weight
- Payload Volume
- Range
- Reverse logistics capability
- Cost
  - Fixed (minimum annual costs)
  - Variable (per-km or per-delivery)
Decreasing costs through large number of flights

Although currently the fixed costs to fly AAVs are high, there is a potential to reduce cost through layering use cases to get large number of flights.
Multiple use cases across programs build flight numbers

- Roughly estimating the numbers of flights for different use cases in a region with the facility density of Morogoro and Pwani in Tanzania (not very dense, quite rural)
Product/Demand

Wide range of product categories can be considered with their importance of Objectives

- Safe Blood for Transfusion
- Vaccines
- Long-Tail Products
- Program and Essential Medicines
- Diagnostic Specimens
Overall factors that provide opportunity for a value-add use case for AAVs

Overall factors that are generally favorable and provide opportunity to use AAVs are:

- High density of facilities (within range of UAV)
- Difficult to access by road facilities (large proportion of year or time)
- High-financial-value, scarce, high-health-value (e.g. life-saving) products
- Unpredictable demand (at level of individual facility) products
- Products difficult/expensive to store at last-mile or products with short shelf-life
Analytical/simulation tool to help inform decision

- A first-pass screening tool for individual countries/ programs to:
  - consider their unique situations
  - rapidly prioritize potential use cases for AAV delivery
  - approximately estimate relative costs and potential benefits

What Should You Deliver by Autonomous Aerial Systems?
A costed simulation tool

This tool estimates last mile (service delivery-level) transport and inventory cost implications of introducing AAVs. The tool requires geographic, product, and transport inputs in order to make these estimations.

You can use the following sheets to enter required data:

1. Geographic inputs
2. Product inputs
3. Transport inputs

Once you have entered required data, you can view results here:

Results

Additional reference values can be viewed on these sheets:

AAV Assumptions
Land Transp Assumptions
Product Group Assumptions

Facility Density Assumptions

For any inquiries, please contact:
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Analytical/simulation tool to help inform decision

• It is an excel tool which allow variation of geography, product or demand and AAV characteristics to be compared with the land transport in terms of cost savings.

• Has different use modes to allow variations and answer different questions.
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Challenges

• Regulatory aspects:
  – Relatively new field so regulators take time to issue limited permits

• Operational aspects:
  – Delays in setting up (Custom clearance, equipment and operational set up, comms network installation, permits for expatriates)
  – Limited skilled pilots and overall lack of accrediting institutions
  – Lack of repair and maintenance facilities and engineers in country
  – Lack of standard M&E framework for measuring health and supply chain impact
Challenges

• Cost aspects:
  – In terms of cost, most AAVs are still 3+ years away from being transport cost-competitive with motorcycles. Case must be made on total system costs and benefits other than cost

• Research aspects:
  – Limited analysis, modelling and sustainable business models and frameworks especially for public health
Thank you!

The future looks promising and exciting!!