Andrew T. Sage et al. ,Testing the delivery of human organ transportation with drones in the

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* The article highlights the successful use of drones to transport human donor lungs in an urban environment, addressing the critical need for convenient organ delivery.
* Special changes to the drone technology, including a lightweight carbon fiber transport box and safety features, were crucial in ensuring the safe and effective transportation of fragile human organs.
* The article foresees a future where drone technology could revolutionize organ transportation, not only in densely populated urban areas but also on a global scale, offering a faster, more efficient, and environmentally friendly alternative to traditional methods.

The article explores the practical use of drones in the transportation of human donor lungs within populated urban environments. Organs begin to worsen rapidly once removed from the human body. Traditional methods of organ transport, whether by ground or air, are risky, inefficient, and costly, with delays often occurring due to road traffic and transportation availability issues in urban areas.

To address these challenges, the article details a successful experiment conducted in September 2021, where the authors validated the process of transporting donor lungs using remotely piloted aircraft systems (RPAS) over downtown Toronto, Canada. Several key points were highlighted:

The base RPAS technology utilized was the M600 Pro drone by DJI, which was modified for transplant-specific purposes. These modifications included removing the landing gear and payload rack to accommodate a specialized lung transport box. Additional enhancements to the electronic systems were made to improve digital communication and connectivity in the urban environment. Safety features such as an ASTM-qualified parachute recovery system, multiple cameras, lights, and GPS trackers were also incorporated into the drone. The entire system, including the transport box and organ, was designed to weigh no more than 25 kg at takeoff.

Lung Transport Box: A lightweight carbon fiber transport box was designed to accommodate lungs of various sizes and weights. It maintained an internal temperature of approximately 4°C with cooling materials and kept a strength of ≥200 pound-force. Extensive testing was conducted in both flight and laboratory settings to verify its performance features. This transport box's adaptability to different organ sizes and temperatures was considered a significant feature.

Flight Operations and Safety Protocols: The authors conducted over 400 test flights and 50 flight hours to ensure the system's reliability. RPAS takeoff and landing took place on hospital rooftops in Toronto, with customized landing pads providing consistent positioning and elevation. The drone was remotely piloted using specialized software with manual backup systems. Safety measures included visual observers along the flight path, a ground safety vehicle on standby, and the ability to deploy a parachute system in case of a failure.