



### DESIGNING AN AIRBORNE VEHICLE COMMUNICATION SYSTEM FOR TRAFFIC SURVEILLANCE- AN OVERVIEW

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#### Abstract

This paper analyses airborne vehicle communication systems from a design perspective looking at the practicality and possibilities of such a system. This research is important to give insights into whether such a system is viable or not. The research has found that an airborne vehicle communication system for traffic surveillance is in fact not very viable as a replacement for traffic surveillance but rather can be used as an accompaniment to other systems.

**Keywords:-** Design need: a problem which needs to be solved, UAV: Unmanned Aerial Vehicles, TMC: Traffic Management Centres

#### Introduction

At a brief glance an airborne vehicle communication system for vehicle surveillance seems to be a perfect solution to the problem of traffic surveillance. Basic design theory is necessary to understand some parts of this paper. The objective paper is to deep dive into communication systems and to evaluate them from a design perspective.

#### Theory

When looking at a certain object it is important to ascertain 8 things: the aesthetics, cost, customer, ergonomics, safety, security, function, and manufacture of a certain product. A well-designed product will have good properties of each area. For the aesthetics of an Airborne Vehicle Communication System for Traffic Surveillance, it is important that it not be visible to the normal person when it is operational. This is because there is a chance that some people may find it unnerving and may feel unsafe with such things around. But it is also important that the drone be visible to air space controllers and planes flying at low altitudes. There is an altitude restriction in place to avoid any collision but then the problem of effectiveness arises. Since the maximum height for small UAV's is so low the effectiveness of such a system would be greatly compromised in metropolitan areas and therefore it would only be functional in a very small number of places.

The cost to run drones is also not cheap at all, if they are to be run all day since tis drone will be surveying traffic it will need a very good camera and must be very fuel efficient. Most UAV's according to their manufacture most commercially available drones can only fly for about 25 minutes. And that is just not long enough for such a system. Since TMC's require nonstop surveillance the drones would have to be switched around periodically (every 15-20 minutes) which would drive the cost exponentially higher both for initial investment and for maintenance.



Drones are very fragile and can get damaged very easily, if an animal like a bird was to collide with such a system, It could prove to be hazardous to the drone. The maximum impact momentum commercial drones can take is around  $1\text{kgm}^2\text{s}^{-2}$ , which is very low. It also isn't possible to utilize larger UAV's in urban areas because of the lack of maneuverability and the fact that they need other infrastructure like runways to get into the air. This would mean that unmanned surveillance would be next to impossible.

However, such drones would be very functional; they would be incredibly easy to manoeuvre and would have no blind spots provided they are in the right location. This would be a huge advantage to security personnel and other staff on the ground. It would also be able to cover a very large area. But operation would be heavily affected by the climate, if the weather gets too windy or rainy the airborne system would not be able to cope or keep stable considering its relatively light mass.

Though such a system may not be viable to take the place of an already in-built infrastructure it is useful as an accompaniment to already in place infrastructures. It has a very quick response time and incredibly good maneuverability. It can send more data as compared to conventional systems and it doesn't require a driver. Using algorithms these systems can navigate themselves. There is also a large variety of vehicles available to use. For the city quadcopters can be used as they can lift off vertically and are incredibly manoeuvrable. For more plain and flat areas one can use UAVs as they are fast and can travel long distances without needing to worry about fuel.

research by Students and faculty at The State University Of New Jersey shows that many states in America like Florida have employed Such airborne vehicles to help them. They are mainly used to help the police, coastguard, fire department and other important facilities. Not only is this much more functional than using them in place of normal traffic surveillance systems, but it is also more cost effective, it also will not be necessary to manufacture such a large amount of drones.

In conclusion an airborne surveillance system isn't viable to replace traffic systems for many reasons such as fragility maintenance and function, but it is viable as an accompanying system to the main system. This allows for better costs, safety, and security. Also, an airborne vehicle communication system for traffic surveillance has an extremely fast deploying time is extremely versatile when used in support for already established systems.

### References

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