

Corvus: Urban Air Mobility Solutions for Package Delivery
(Technical Report)

Using Virtue Ethics to Examine the Uber's Fatal Self-Driving Crash
(STS Research Paper)

An Undergraduate Thesis Portfolio

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Socio-Technical Synthesis Assignment

For my Technical Report, I am writing a report on a proposed design of a safe, low-noise, profitable unmanned aerial system to deliver a five-pound package across short distances in participation of NASA's design challenge. The report was written in collaboration with twelve other Aerospace Engineering students for MAE 4650/4660 Aircraft Design I and II Capstone class. For my STS research, I am exploring the arguments for the ethically and morally responsible party of the fatal Autonomous Uber vehicle crash through using network-actor theory, as well as care ethics. There is a tight relationship between my technical report and STS research. Firstly, the drone that our capstone is designing will be autonomous in navigation through implementation of a sensor driven artificial intelligence to achieve remote package delivery network. In the STS research paper, I am exploring the crash of the Uber's autonomous vehicle that was driving on a sensor driven artificial intelligence to build an autonomous passenger delivery network.

The drone that we are designing will follow the rules and constraint of the NASA design challenge requirements. Firstly, it will takeoff and land in a 25 by 50 ft. area, climb to 400 ft within 1 mile of take off, land at sites up to 8000 ft. above sea level, fly in winds up to 20 knots, carry a 6 inch cube package weighing up to 5 lb, conduct 2 trips over 10 mile radius autonomously with each trip in under 20 minutes, integrate a detect and avoid system while relying on the FAA UTM system, a system of delivery with throughput of 1 package every 2 minutes, minimize fatal collisions with pedestrians, and operate at an acceptable noise levels. The proposed drone design will incorporate 8 forward facing rotors, incorporating 2 sets of

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rotating wings, vertically displaced from each other. The proposed wingspan is 100 inches, with a chord length of 16 and 12 for back and forward wings respectively. It will also incorporate multitude of sensors including ultrasonic, thermal, and visual sensors feeding into an artificial intelligence unit to provide autonomous decision making for guidance, navigation, and control.

In the STS Research Paper, through examination of Uber's Fatal Crash through the lens of care ethics framework, I will show that Uber can be held more morally responsible for causing the fatal collision that caused the death of Elaine Herzberg, instead of the individual safety driver that was operating the vehicle at the time of the accident. Within care ethics, I will explore how Uber failed at the four different stages of care ethics: Attentiveness, responsibility, competence, responsiveness. To connect the events that transpired to the ethical framework, I will use Actor Network Theory to show that the accident was not caused by a singular point of failure in an individual (carelessness of the safety driver), but rather from a collection of rogue actors within Uber, as well as a number of outside actors.

From working on both projects, I have gained an insight on autonomous vehicles, both in a technical aspect, as well as ethical aspect. As autonomous vehicle will further gain grounds in integration into our modern society, more frameworks and investigations will be needed to establish ethical framework in guidance of these artificial intelligent systems. Through my research in both areas, I have a better understanding in both the constraints, as well as limitations imposed by technical and ethical framework of building an autonomous network whether it be for package delivery or passenger transportation.