# An ethical drone:

## Developing a commercial drone based on philosophical, social, and technological considerations


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## Background

Imagine no longer having to risk your life working as a crop-duster pilot, never having to leave your house for shopping, and working fewer hours. These scenarios could soon become reality, facilitated by commercial drone technology; drones may be part of 'the good life', but there are risks.

## The Problem

There are significant philosophical and social risks that must be addressed in order to design and technologically embody an ethical drone:

| Philosophical | Social | Technological |
|---|---|---|
| Definition of '**the good life**' | | Incorporate **ethics** into design |
| **Reactive** integration of technology | | **Proactive** integration of technology |
| | **Physical safety** | **Structural** design: kinetic energy, sharpness<br>**Materials**: stiffness/hardness |
| | **Psychological safety** | Noise/silence<br>**Appearance**/ identification |
| | **Privacy** | **Appearance**/ identification |

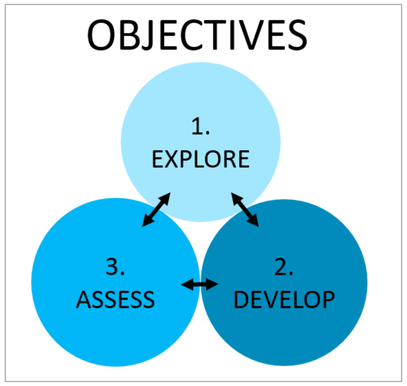
## Research Gaps

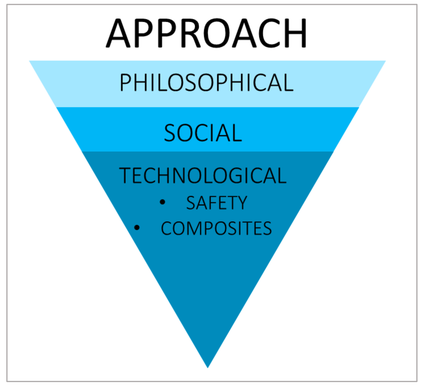
There are possible gaps within academic research:

1. Insufficient consideration of **ethics** within engineering and **collaboration** between ethics and engineering
2. Insufficiently **holistic** consideration of benefits and risks of drone technology
3. Insufficient tools for **designing ethical drones**

## Scope

- One specific, **commercial** drone (no military, public sector, hobby)
- **Near-future** implementation (next 5-10 years)
- **Development** (not adoption)




## Objectives

The goal of this work is to:

1. **Explore**, holistically, the benefits and risks of drone technology, framed from **philosophical**, **social**, and **technological** perspectives
2. **Develop** tools to **design an ethical drone** based on these inputs, with a focus on safety and use of composite structures
3. **Assess** and test the impact of these tools

## Research questions

1. *What are the benefits and risks of drone technology, including philosophical, social, and technological considerations?*
2. *What tools can be developed so philosophical and social considerations are embodied in drone design?*
3. *What impact will these tools have on drone design?*

## Research Methods

1. Literature survey, stakeholder mapping, expert interviews (mostly secondary data)
2. Prototyping, product development, triple bottom line analysis, lab and field experiments (mostly primary data)
3. Lab experiments, interviews (mostly primary data)

## Approach

The approach will be to start wide and progressively assume more focused perspectives, ultimately ending with technological embodiment: tools to **design an ethical drone**. This will require an interdisciplinary approach; around half time will be spent on technological development and half on philosophical/social elements. A constructivist world view will be utilized as the philosophical and social elements depend on social constructs, but elements of the work may assume a positivist approach, f.x. when a working theory exists and should be tested, or during quantitative analysis.

The overall approach will be inductive (rather than deductive); the **explore** phase will be used to **develop** theories and then **assess** their validity (rather than starting with theories and then assessing their validity).

## Results/Impact

1. Facilitate '**the good life**' through ethical application of technology
2. Facilitate **proactive** integration of new technology
3. Increase **collaboration** between engineers, social scientists, and stakeholders
4. More **holistic** consideration of benefits and risks
5. Create validated tools that help stakeholders **design an ethical drone** (f.x. design standards, guidelines)
6. A prototype 'ethical drone'
7. Development of drone **safety** and **composite** drone structures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