



**Fit2
Fly**

Making Future Commercial UAS Fleet Operations Routine, Safe, and Boring

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A composite image of Earth from space. The top half shows a bright sun in the upper left, creating a lens flare, with the Earth's horizon and a thin greenish-yellow atmospheric glow. The bottom half shows a night view of Earth with city lights glowing in yellow and orange, and a bright blue-white light source on the right. The text is overlaid on the night view.

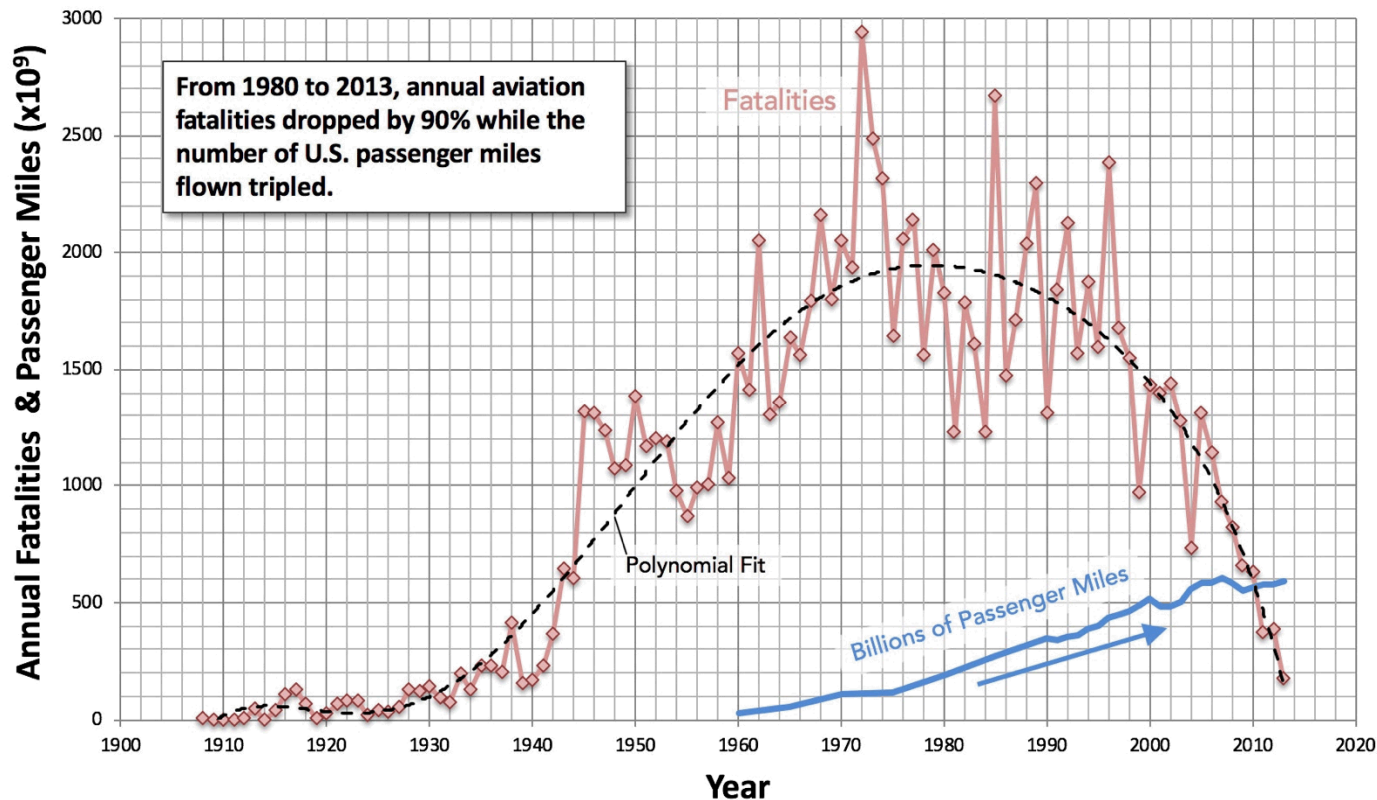
***We get more starlight during
the day than we do at night.***

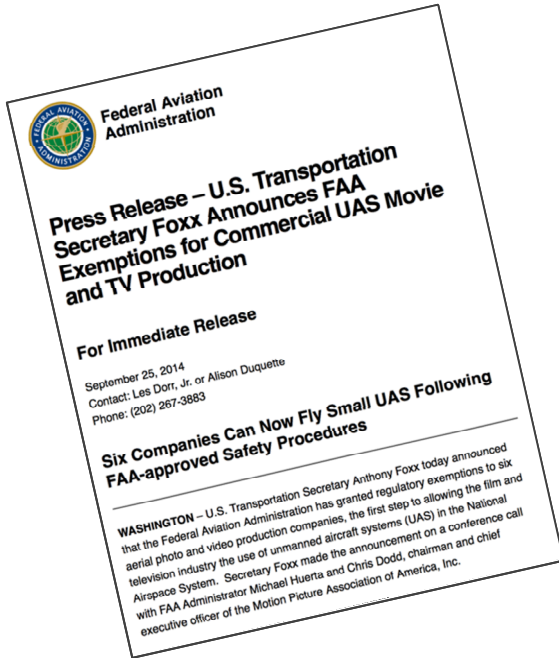
Much, much more...



Progress in Aviation Safety

Data includes >100,000 fatalities from all kinds of aviation, including military aviation, zeppelins, etc.





FAA granted its 1st commercial UAS exemptions to six aerial photo and video production companies under Section 333. Grantees had these similarities:

- ***Operate only over an access-controlled movie sets***
- ***Everyone on set has signed waivers***
- ***Clearly documented procedures for maintenance, concepts of operation, and emergency response***
- ***No flying after dark***
- ***Operators self-certify airworthiness of their UAS***

No FAA-certified parts, no certified aircraft, no certified mechanics, etc.

Target Use Case for Fit2Fly:

- A commercial UAS operator,
- Managing a fleet of vehicles,
- To conduct routine flight operations,
- Beyond visual line-of-sight,
- In public airspace,
- With many vehicles in the air simultaneously,
- Being operated by a small operations crew



Big Challenges:

Every flight effectively breaks chain of custody
Manual inspection by humans does not scale
Vehicle uptime & sortie rate drive profitability
Low part cost means few parts will be certified
Vehicles are complex cyber-physical systems
Data leaks can be more costly than crashes
Telemetry data cannot be trusted implicitly

This is a new paradigm in commercial aviation.

Thin-haul



Cargo Transport



Urban Aerial Mobility

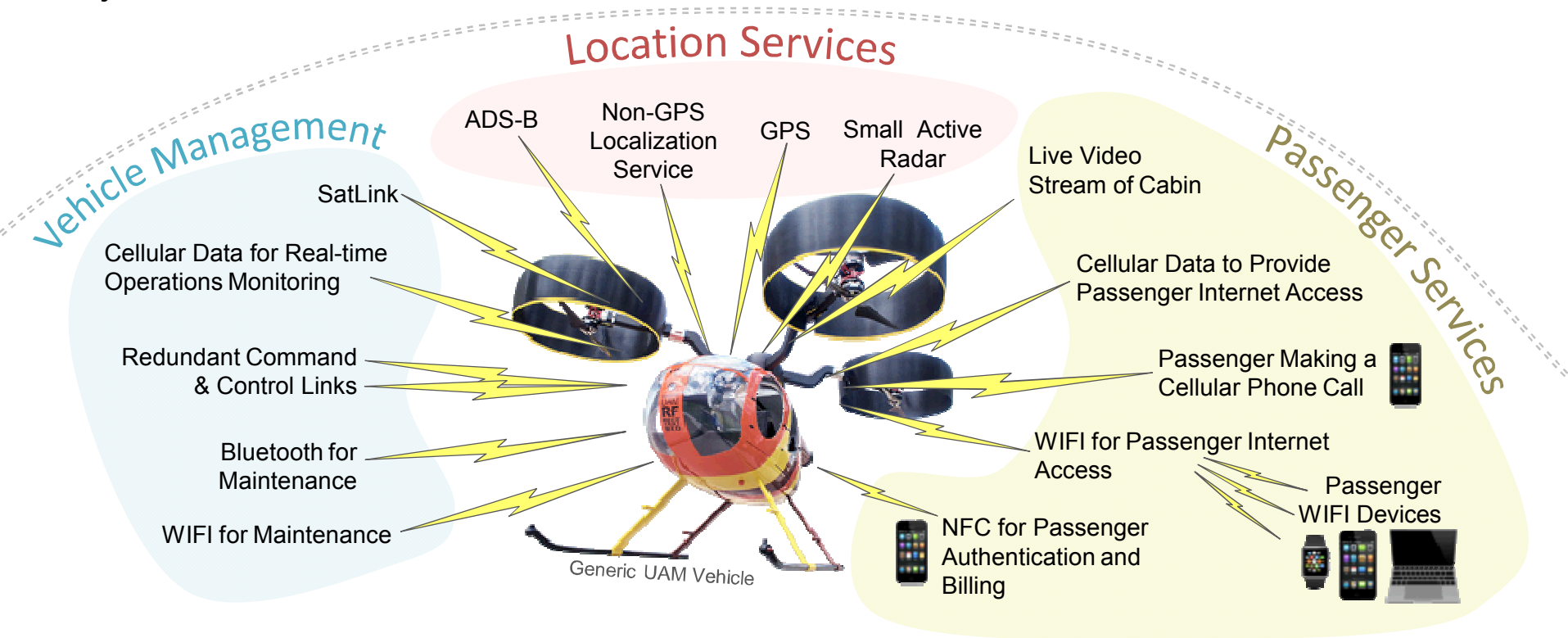


Home Delivery



The Fit2Fly Generic UAM Testbed vehicle will include all the types of RF equipment expected to be on future Urban Air Mobility vehicles.

Onboard and off-board RF equipment will need to operate as at would during a typical flight to create a realistic environment for the F2F RF Environment Monitor.



Fit2Fly at DEFCON 27 Aviation Village:



Fit2Fly participated in the inaugural Aviation Village at DEFCON 27, one of the world's largest hacker conventions, in Las Vegas, Nevada, August 9-11, 2019.

- The intent of the Aviation Village was to create a platform to bridge the gap between the security research community and the aviation community.
- Its goals were to build connections, trust, and understanding among all Village participants, to develop aviation security skills among DEFCON attendees through workshops and hands-on activities, and to promote constructive dialog.



Additional Barriers:

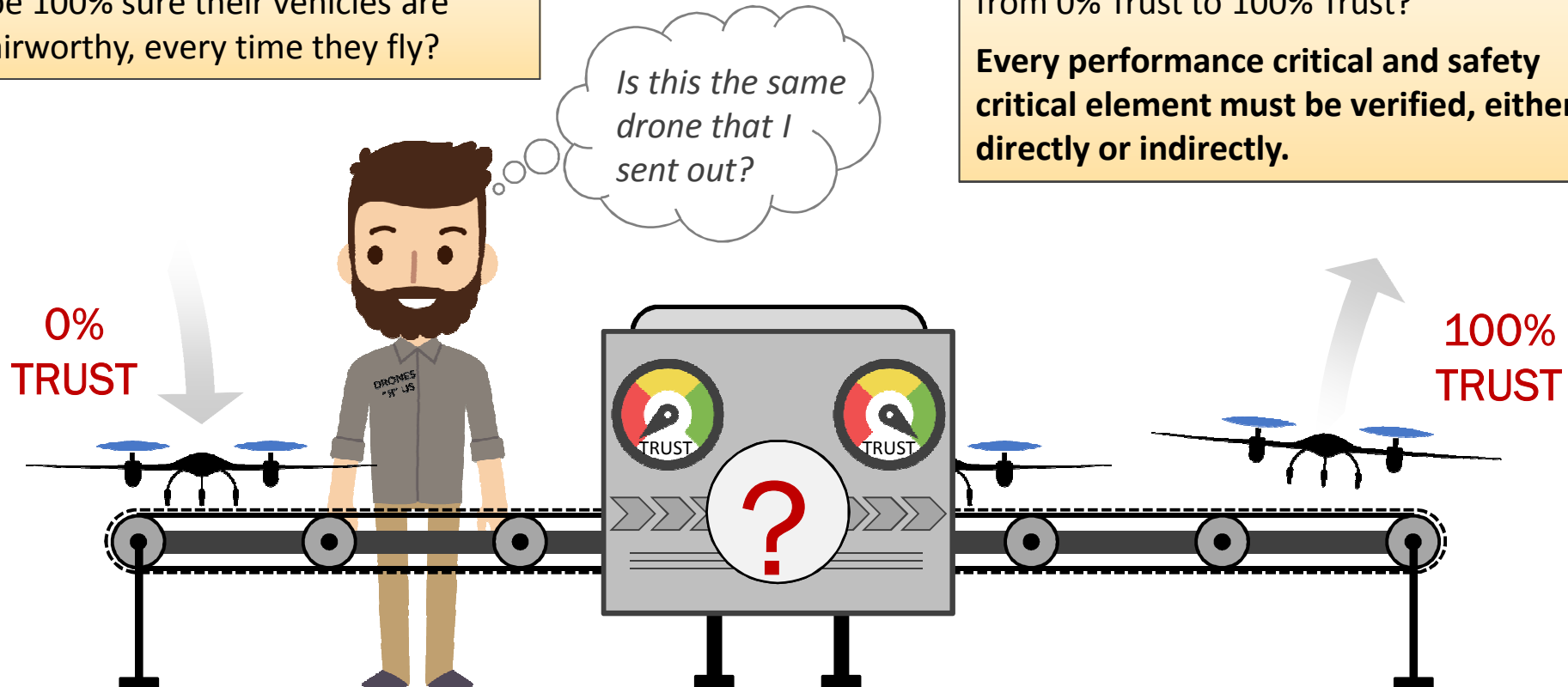
- Supreme Court: United States v. Causby (1946)
 - “Flights of aircraft over private land which are so low and frequent as to be a direct and immediate interference with the enjoyment and use of the land are as much an appropriation of the use of the land as a more conventional entry upon it.”
- Remote Pilot as “Pilot in Command” for BVLOS flight
- Certification of low-cost, highly-autonomous systems
- Pushing advanced technologies to “the edge” of society
- Removal of people from many jobs considered critical to the establishment of safe aviation
- No one knows who to trust (commerce)
- Public paranoia and perception of safety

Trust is Built

How can commercial UAS operators be 100% sure their vehicles are airworthy, every time they fly?

What has to happen for a UAS to go from 0% Trust to 100% Trust?

Every performance critical and safety critical element must be verified, either directly or indirectly.



Airworthiness begins with some basic questions and these are questions we know how to answer.

The problem for commercial UAS fleets is how to answer them in a way that scales well.

Questions:

- Is it made of the correct parts?
- Are there missing or extra parts?
- Is everything assembled correctly?
- Is everything calibrated correctly?
- Is everything configured correctly?
- Is everything operating correctly?
- Is anything damaged?
- Is anything worn out?
- Has anything been tampered with?

*Commercial UAS
Fleet Operator*



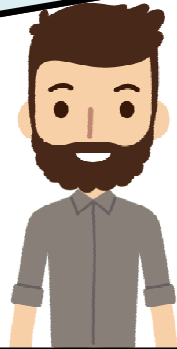
Answers:

- Configuration Control
- Inspection
- Performance verification of components
- Software/Firmware testing and verification
- Fail Safe verification
- Maintenance
- Subsystem and system functional testing
- Independent Monitoring of environment
- Independent Monitoring of system behavior

Continuing Airworthiness

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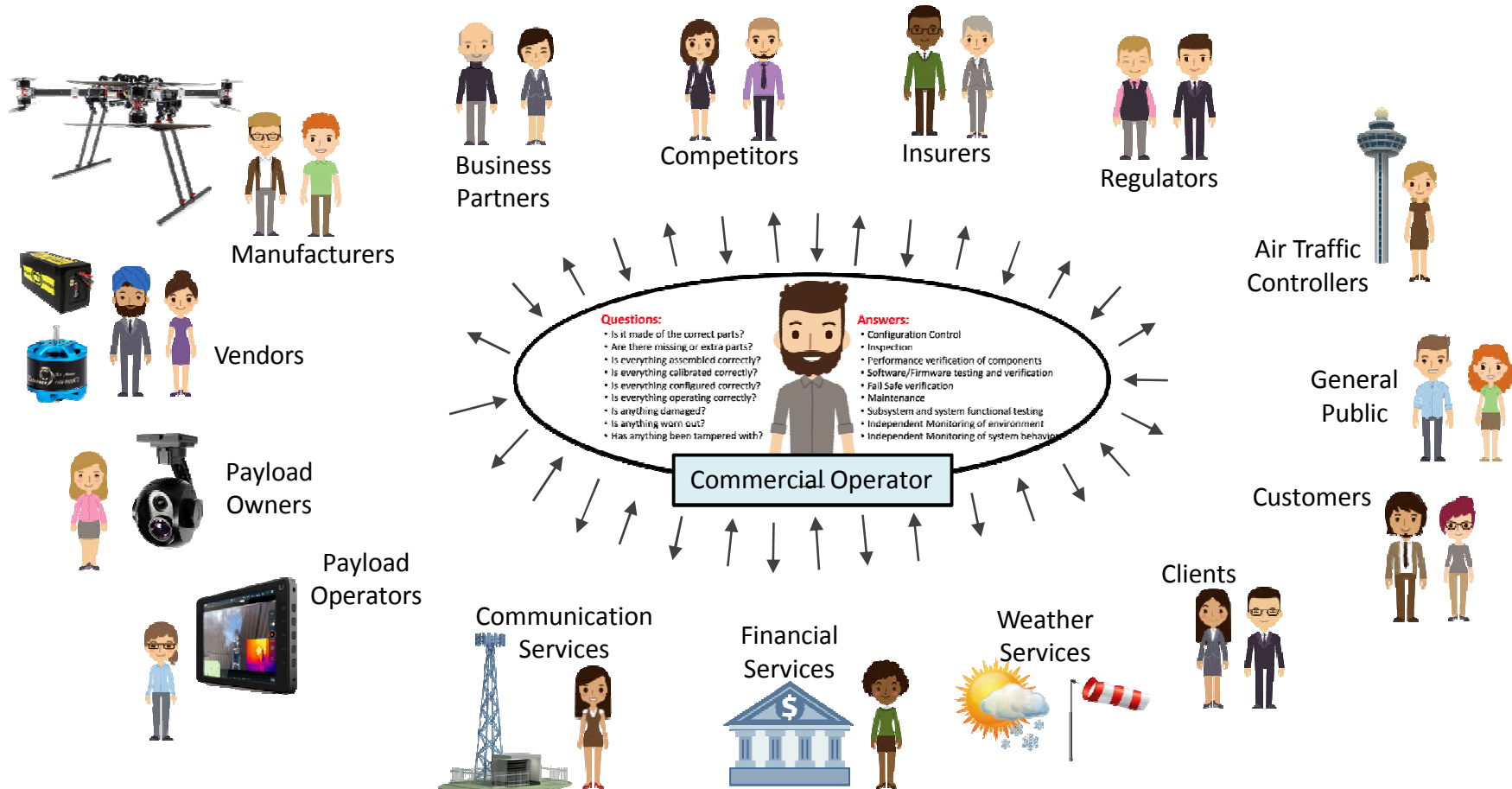
Commercial Operator

On top of managing fleet airworthiness, commercial operators have to do everything else it takes to succeed in the business of aviation:

- Flight Planning
- Ops Coordination
- Logistics
- Partner Communication
- Contract Negotiation
- Billing & Payments
- Advertising
- Customer Relations
- Paperwork

Fit2Fly's solutions are focused on succeeding in this larger business ecosystem.

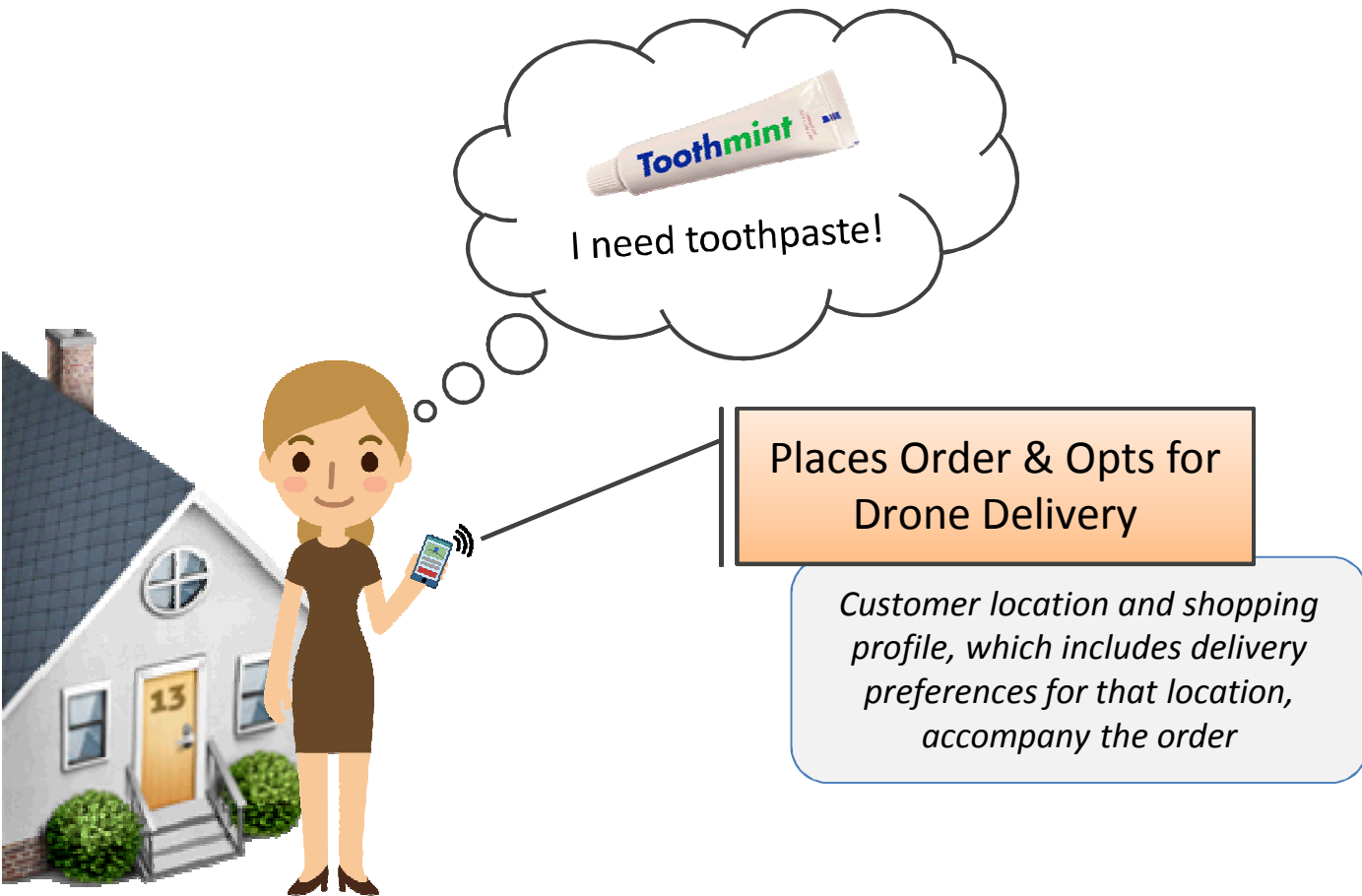
Commercial UAS Operator Ecosystem



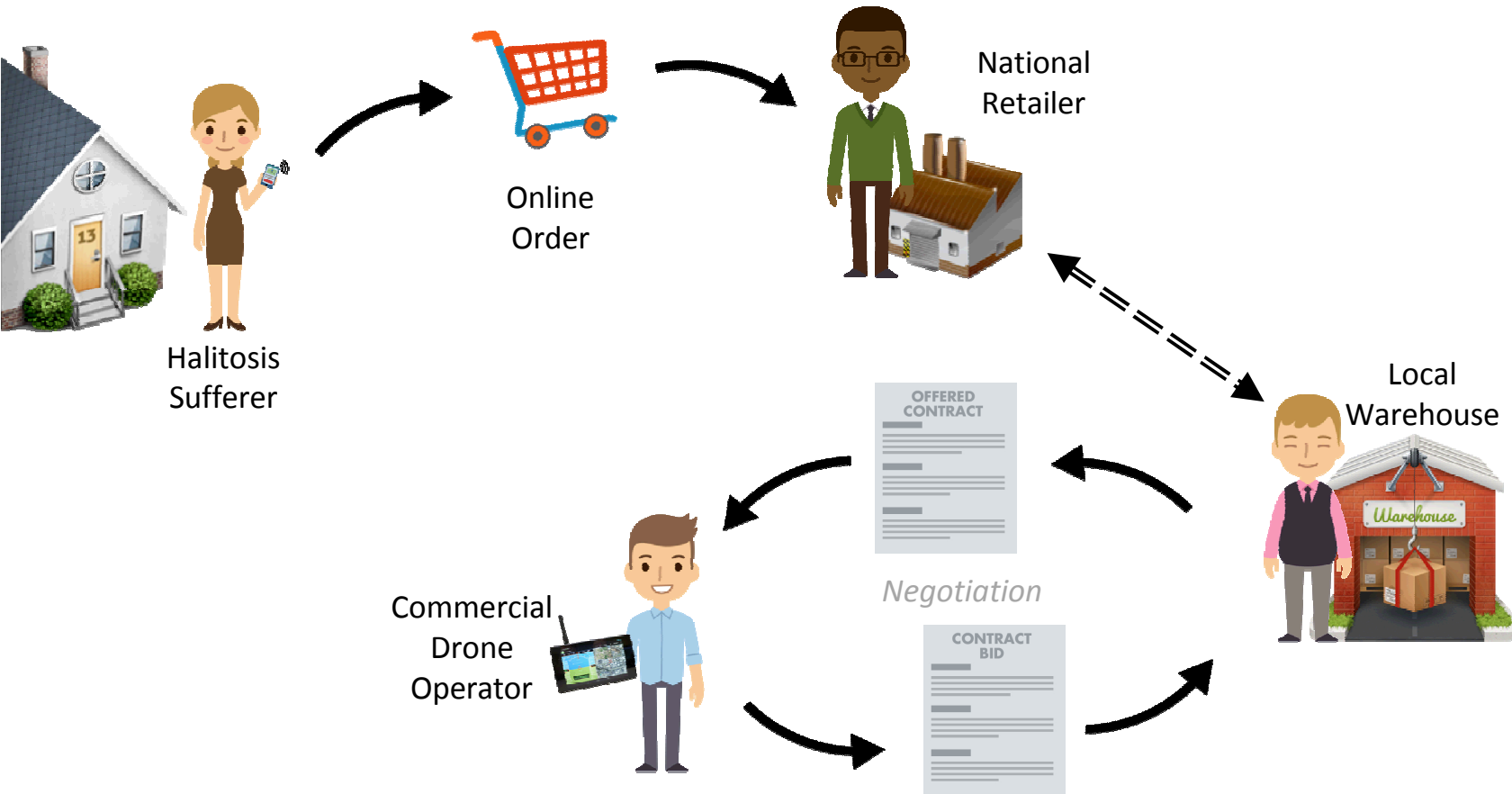
Use Case: Simple Package Delivery

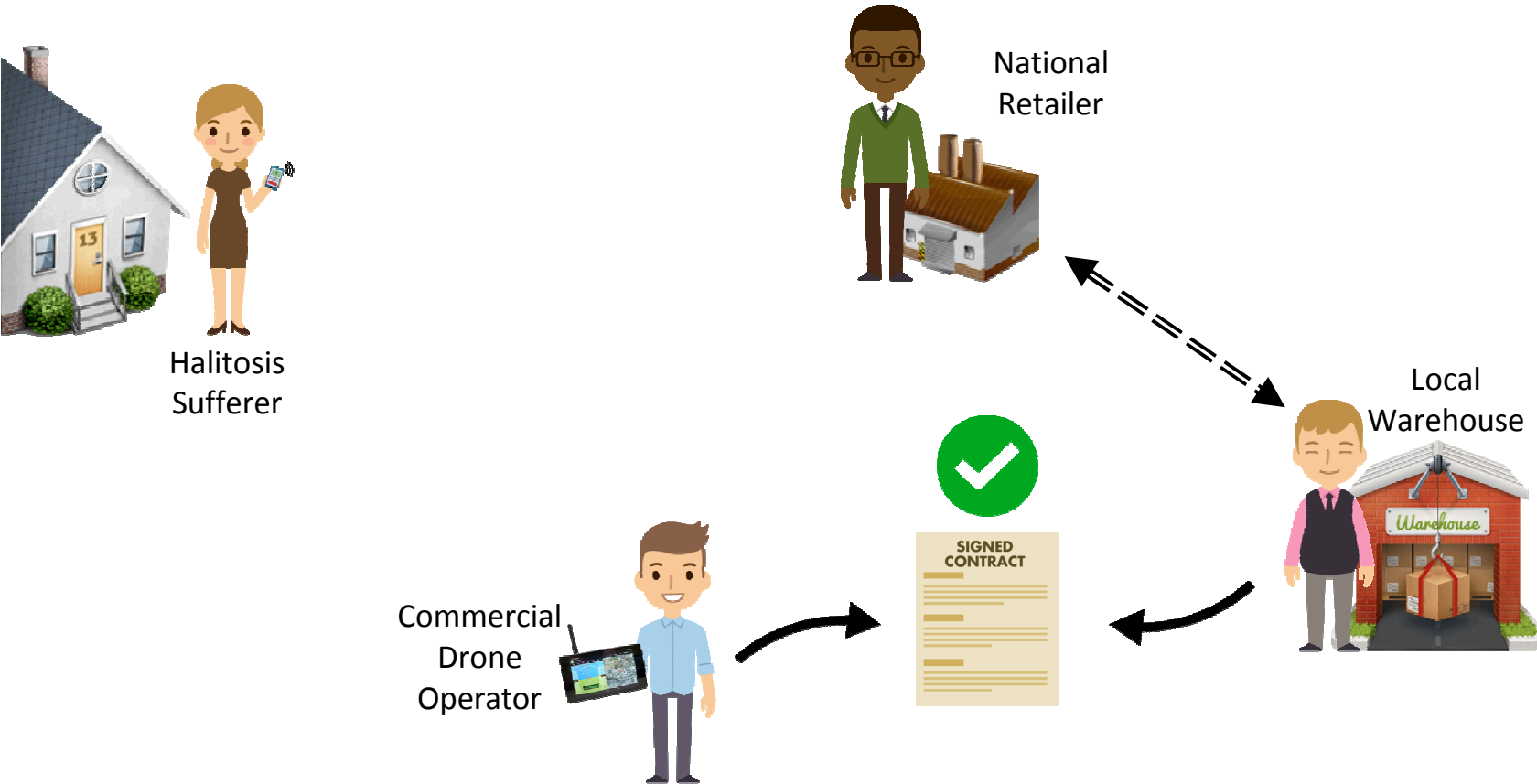
A Commercial UAS Operator provides a delivery service for their Client, transporting things from the Client's Local Warehouse to the Client's Customers.

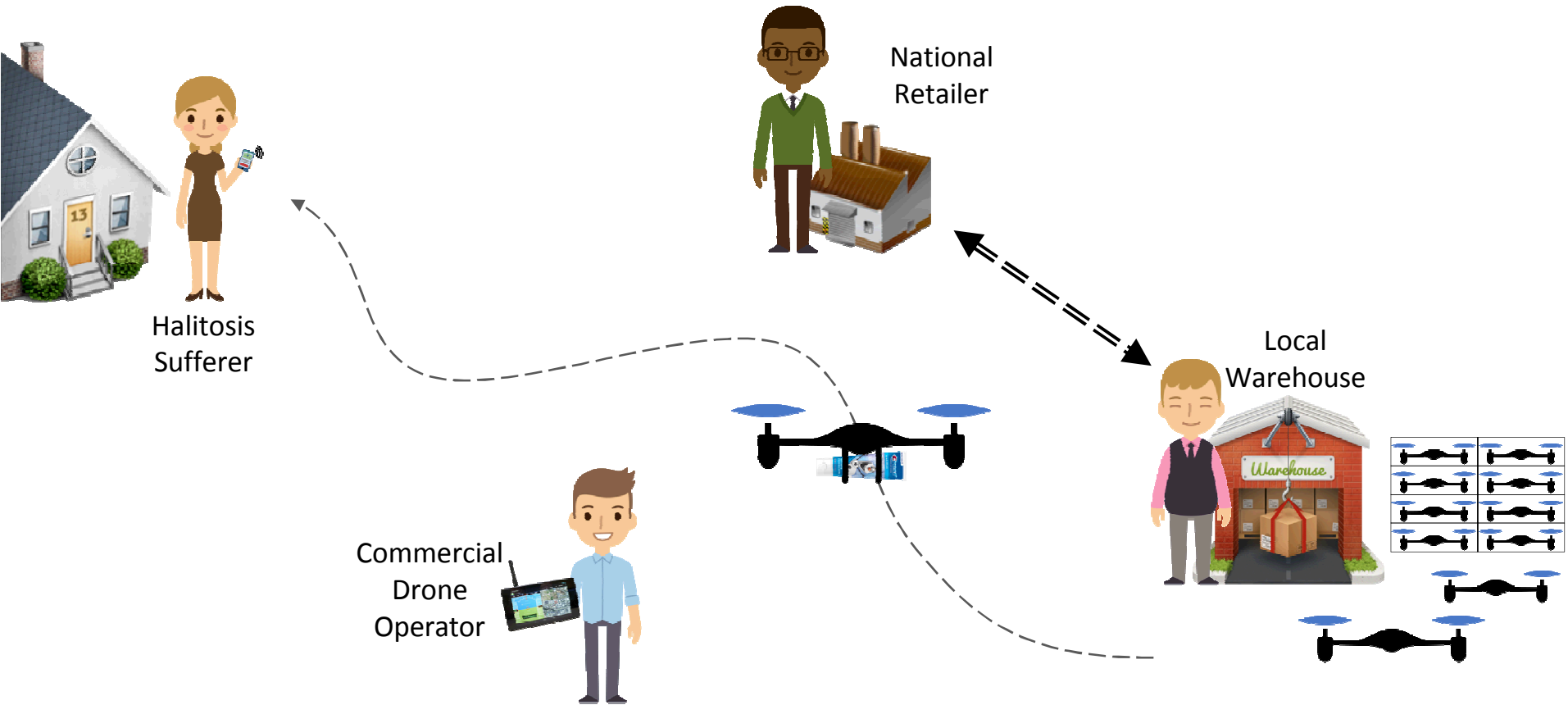


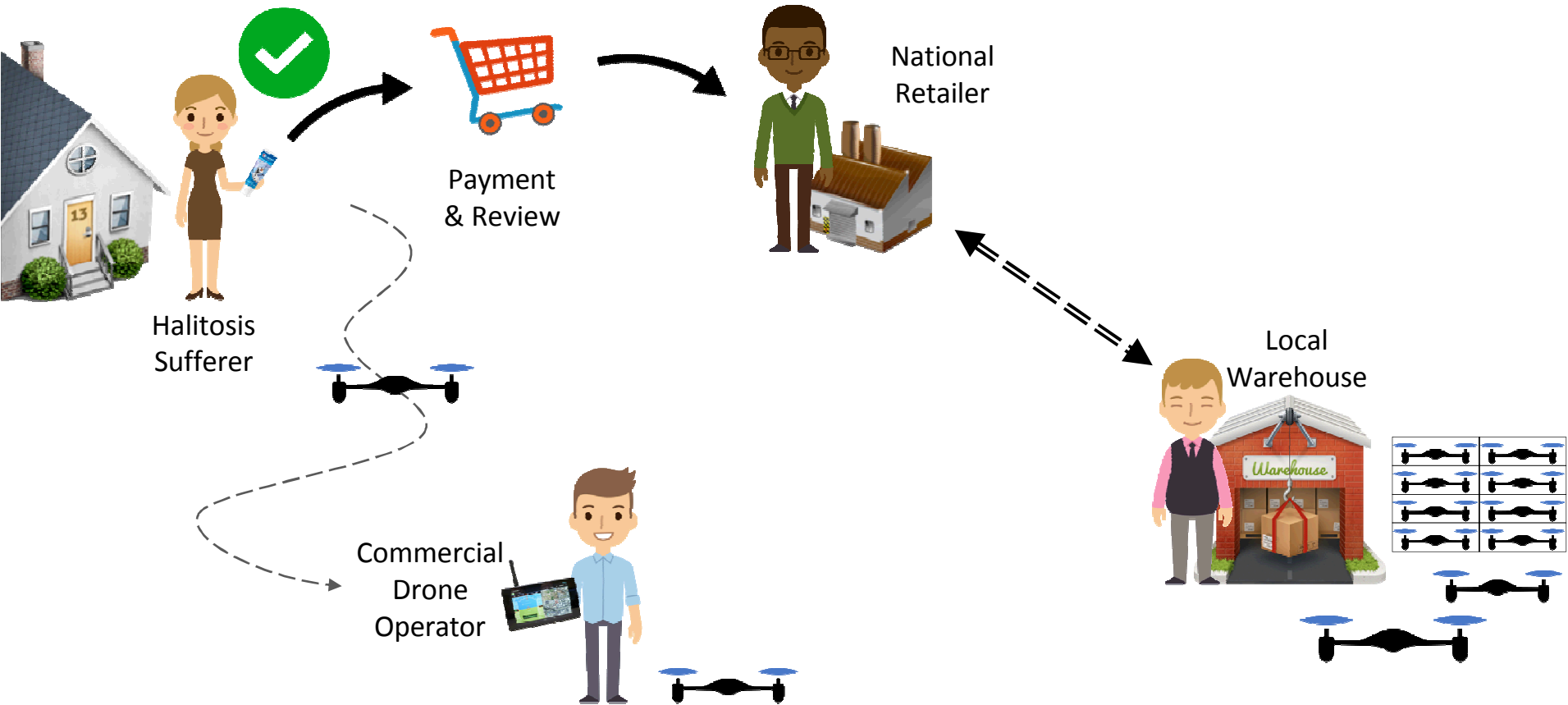


Things Get Rolling...









People Who Need Insight Into Operations



Commercial
UAS Operator



National
Retailer



Local
Retailer



Commercial UAS
Competitor



Police Chief



Fire Chief



EMT's



Local News
Copter



Federal
Regulator



Local
Regulator



Retail
Customer



Member of
General Public



Local FAA
Control Tower



Harbor
Pilot #1



Harbor
Pilot #2



Private
Pilot

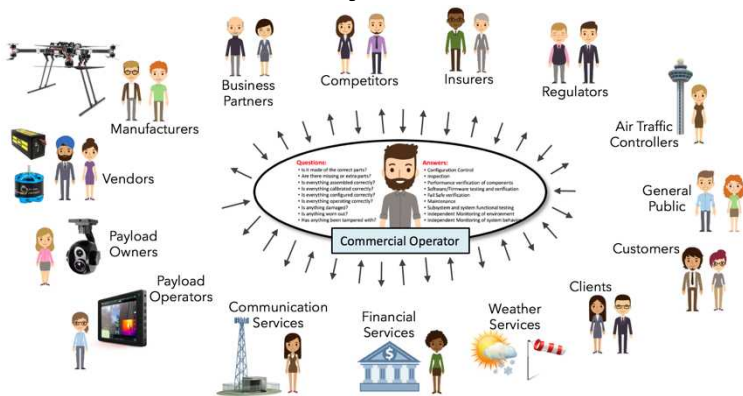
To create a system that allows fully automated airworthiness assessment for commercial fleet operations, Fit2Fly is developing these solutions for future commercial UAS operators:

- Digital Airworthiness Certificate based on a permissioned Blockchain, using Smart Contracts
- Digital Commercial Flight Release composed of interlinked, dynamically-generated legal contracts
- Harbor Pilot System for managing commercial UAS that minimizes the need for onboard autonomy
- A definition of the requirements UAS should meet to be considered “Commercial Grade”
- Onboard monitoring systems that support automated post-flight security and performance audits
- Smart infrastructure that can fill the safety & operational roles currently performed by humans
- Automated visual, physical, and electronic inspection

Fit2Fly is integrating these technologies to create a feasible approach to automated airworthiness assessment:

- Automotive component certification standards (ISO 26262)
- Cloud-based microservices (e.g., Apache NiFi)
- Advanced radio spectrum monitoring
- Blockchain-based self-certification
- Dynamic generation of legal contracts (OpenLaw)
- Chaos Engineering/DevOps/DevSecOps

Business Ecosystem Simulation



Generic UAM RF Testbed Vehicles



Outreach to Industry and Government



Commercial Fleet Testbed Vehicles



Fit2Fly

MAKING COMMERCIAL DRONE
FLEET OPERATIONS SAFE
ROUTINE AND BORING

