

Drones and Cultural Lag

By Ric Stephens

Cultural Lag

Technology is outpacing society's ability to assimilate and regulate it. This has always been the case and this separation is expanding at an exponential rate. Cultural lag refers to the idea that culture takes time to catch up with technological innovation resulting in social problems caused by this lag. Few technologies embody this concept as strongly as *unmanned aircraft systems* (UAS) or drones.

Drone Technology

The first powered unmanned aerial vehicle (UAV) was designed and launched by John Stringfellow of Chard. The *Aerial Steam Carriage* or *Ariel* flew about 30 yards in 1848. By the late 20th century, model aircraft had become highly sophisticated, and in 1981 the Federal Aviation Administration issued an Advisory Circular that provided *Model Aircraft Operating Standards*. By this time, model airplane performance had already surpassed the performance limitations of 400 feet altitude above ground, extreme-distance flights, and the first model jet engine in 1980. Model helicopters were also advancing rapidly, and Yamaha developed a remote-controlled helicopter for precision agriculture in 1996. In 2003, *the Spirit of Butt's Farm* model aircraft crossed the Atlantic. Commercial UAVs become widespread after the introduction of the French *Parrot quadcopter* at the 2010 Consumer Electronic Show. There are now drones in sizes from micro-drones as small as insects to large-scale advanced air mobility (AAM) vehicles. Today we have the technology to convert any plane or helicopter to a drone (optionally piloted vehicle OPV), and these are being developed by the government (DARPA) and many private sector organizations.

“According to sociologist William F. Ogburn, cultural lag is a common societal phenomenon due to the tendency of material culture to evolve and change rapidly and voluminously while non-material culture tends to resist change and remain fixed for a far longer period of time. This is due to the fact that ideals and values are much harder to change than physical things are. Due to the opposing nature of these two aspects of culture, adaptation of new technology becomes rather difficult. This can cause a disconnect between people and their society or culture.”

Regulatory Disconnect

Despite the numerous aviation innovations in UAS, the FAA only *marginally* revised the *Model Aircraft Operating Standards* in 2015. In 2016 the government adopted the Code of Federal Regulations, Title 14 Aeronautics and Space, Part 107 Small Unmanned Aircraft Systems (14 CFR, Part 107). Part 107 which regulates sUAS and prohibits a wide range of operations. Below are some of these restrictions along with the applications that are impacted by the regulatory 'lag.'

- Operation from a moving vehicle or aircraft (§ 107.25). **Mobile operations** are essential for some types of emergency services, necessary for operations over water, and many others.
- Night operation (§ 107.29). **Forward-looking infrared** (FLIR) provides the ability to find missing persons, detect fire hot-spots, and many other night-time applications.

- Beyond visual line of sight (BVLOS) aircraft operation (§ 107.31). **Beyond visual line of sight** (BVLOS) flying is critical for commercial delivery, search and rescue, and many applications.
- Operation of multiple small unmanned aircraft systems (§ 107.35). **Swarm technology** using dozens or hundreds of drones is necessary for light displays, studying weather phenomena, and more.
- Operation over people (§ 107.39). **Overhead flight** is critical for situational awareness in disaster operations, public event security and safety monitoring, and media coverage.
- Operation in certain airspace (§ 107.41). **400 feet maximum altitude** is a constraint to mapping, long-range operations, and other applications.

Social Disconnect

Part 107 regulations focus on safety, so cultural issues such as privacy, private property, and nuisance are relegated to state and local laws. The concept of rational expectation of privacy has already been challenged by high-altitude and satellite imagery which can capture detailed photos of people in places that were formerly considered private such as backyards and rooftops. High-definition and infrared drone cameras can record not only facial features but physiological data such as body temperature, respiration, pulse, and body gestures that algorithms can associate with COVID-19 (coughing) or aggressive behavior. Even relatively inexpensive drones may have high-definition cameras that can take 20-megapixel photos and 4K video. When commercial aerial delivery becomes common, drones will also have the ability to harvest data during these flights. Public acceptance of these potential impacts on personal privacy may become exacerbated by unclear and random legislation. Private property as related to airspace is also unclear and non-standard with many recent state and local laws in conflict with the Federal Aviation Administration's exclusive authority over the national airspace. Drone traffic may increase significantly when delivery services can fly beyond visual line of sight (BVLOS), and the public's acceptance of overflights may be similar to community protests against helicopter operations. The advent of BVLOS may be followed by a proliferation of drones which may create visual "sky clutter" and noise pollution. For many years the public will be sensitized to these nuisance issues. After time the public may become attenuated (as was common with cell towers), or more sensitized if conditions are not mitigated by, for example, restricting flights to corridors and quieter propellers and motors.

The cultural lag of regulations and public acceptance with advances in aviation technology must close to realize the economic, environmental, and social potential of aerial applications. It may be that rapid technological changes cannot be slowed or even controlled. This was the premise of Alvin Toffler's work which describes *Future Shock* as the state of distress or disorientation due to rapid social or technological change—"too much change in too short a period of time."

Drones are inevitable. If we are to avoid the negative impacts of cultural lag, we will need to find a new equilibrium that balances technological benefits and cultural values. This new equilibrium cannot be based on legislation but will need strategies to create new social and personal regulators.

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