George T. Dodd
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What is the Commercial Future of Drones?

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Drone: unmanned aerial vehicle (UAV), unmanned aerial system (UAS), remotely piloted vehicle (RPV) all refer to the same thing: an aircraft that is not flown and/or controlled by an onboard pilot. For our purposes today I will use "drone", UAS, and UAV interchangeably as the term to describe all of those aerial vehicles. Some slight differences may appear as we go along.

This paper will feature the future of commercial drones in the main although commercial activities regarding UAVs will indeed include recreational or hobby drones. Military drones figure in overall commerce; but I will not give any special treatment to that UAS segment except perhaps at my closing in dealing with commercial growth predictions in the drone industry.

The drone industry has morphed and grown in this decade at an incredibly rapid pace. What was thought to be years away in 2014 happened routinely in 2018. Therefore, to get to the likely future, what's happening now will be covered as a base for a report on future developments to be expected.

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The array of drone types in usage and foreseeable usage for the multitude of commercial activities I will shortly identify have built-in limitations and sensors such as altitude and geo maps, limits on weight including payload not to exceed 55 pounds, speeds up to 30-40 miles per hour, noise problems, and flight times maxed out at about 30 minutes in most cases on battery power carrying an 8-pound payload.

Relatively small in size, drones are now performing a myriad of commercial tasks and also providing joy for hobbyists with some types of drones.

Here is by no means a complete list of drone activities presently:

Agriculture; real estate; photography; cinematography; insurance claim inspections; entertainment displays; deliveries from supplies to various products; power line and wind power inspection; geomatics – the science of land surveyors, construction engineers, mappers and planners -- forest fires and hurricanes; SWAT team and police surveillance activities; building fire assistance; criminal; public safety; and thermal imaging in connection with more and more of the foregoing.

Drone delivery may well be the most interesting function for drones to most of the public; but the barriers for drone usage in that regard are the same, if not more as for drone usage generally.

A principal barrier is the acronym BVLOS – meaning Beyond Visual Line of Sight (sometimes BLOS). Truly autonomous BVLOS will involve flight by a drone, on its own, without intervention by a remote pilot. An autonomous flight may be technically feasible and achievable, yet lacking now are legal and regulatory guidelines in aid of safe implementation especially over populated areas. More on what's being accomplished later.

There are strict limits on drone flights – by various federal, state, and local laws: "no fly" areas over or near airports and national monuments, and flights over people (such as cities or urban neighborhoods). All of these limits relate to safety, privacy, and how high and far UAVs may be flown.

The federal laws and regulations are established by Congressional legislation and the regulatory rules promulgated by The Federal Aviation Administration – FAA – as part of the Department of Transportation – DOT – and are most encompassing.

After years of legislative debate the FAA Reorganization Act of 2018 was signed October 5, 2018 by the President. The Act has more complexity and provisions for promulgation of new regulations than there is time for in this report. Helpfully, a number of sections point toward aiding the future growth of drone commerce such as provisions for tracking and identification, privacy, enforcement, and testing.

In particular the Act makes provisions regarding Unmanned Aircraft Traffic Management – UATM – telling the FAA to "initiate a rule making to establish procedures for issuing air navigation facility certificates…for unmanned aircraft management systems."

Good news was published in January 2019 by DOT Commissioner Elaine Chao announcing that the FAA has proposed new drone regulations to allow drones to fly at night and over people without separate waivers under certain conditions. Chao also announced that three Unmanned Aircraft Management Systems Pilot Project (UTM) sites have been granted contracts for development in the United States. UTM will be distinct, but complementary to, the traditional FAA's air traffic management system in USA airspace

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Drone operators – pilots – will continue to be subject to registration and various limits coming forward from past legislation and the new such as total weight with payload and airport and other "no fly" zones. Pilot registration and increased training have become more important to the FAA. Experts predict there may well be over 300,000 drone pilots by 2022. Certainly a part of expected commercial development.

So what can be expected for drone commercial development as against the limitations and boundaries?

To varying degrees there are important continuing developments to get past problems of BVLOS, privacy, value to business, and even noise. In particular, technical efforts including AI,

cloud computing of data, machine learning, business planning and Federal, industry, and university testing are answering problems and providing better and better drone platforms.

For example, for UAS users today the workload is often managed by software where only a short time ago much more hands on activity and tweaking were required for a pilot to get a drone to function effectively. By 2018 the primary task for most platform operators was to steer. Flights can be programmed by an "app" with which the operator can set the flight and watch in real time on an iPad or other electronic device. The UAS will fly and land automatically after the flight.

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Despite activity on many fronts commercial and governmental there has yet to be produced a central system – perhaps a transponder – which will be tamper-proof and result in identification of drones in fight. Airliners and civilian planes as well have a "squawk" system which tells all: here I am and who I am. To date only new numbering regulations by the FAA will identify a drone and not until on the ground.

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Just announced in November of 2018, NASA will engage in projects to integrate drones into airspace for anything from drone taxis to delivery drones. Use will be made of a Metropolitan Beacon System (MBS) proposed by developer NextNav as a part of a project titled CERTAIN (City Environment for Range Testing of Autonomous Integrated Navigation). CERTAIN also supports other programs such as Urban Air Mobility (UAM), a proposed transportation system with myriad applications from small package delivery drones to passenger carrying air taxis.

Yes, air taxis. Maybe or not overhyped, these technologies will be in the spotlight in 2019. The likely situation is that commercial unmanned taxis won't be up and running for at least a few years; but in 2019 many will be testing their prototypes.

Boeing and Aurora Flight Sciences and Uber Commercial Air Service, for example, will be testing prototypes in 2019. The Los Angeles area will be a test city for Audi and Airbus; and Dubai, Singapore, and the Swiss have given preliminary development approval.

An increase in BVLOS missions, although not their standardization, could also be seen in 2019. Aerobotics was the first company in the USA to receive a waiver from the FAA for flying BVLOS in fully automated drone operations over human beings. This waiver sets an important precedent in showing the FAA is open to allowing a high degree of automation which suggests other companies may be able to follow suit if their technology is sophisticated enough.

With all of this happening, where will the future go for drone commerce?

In October 2018 DroneLife online magazine reported on a number of predictions arising from a Fortune Technology Council article.

Drones can supplement but not replace truck delivery. Present safety requirements, together with weather and privacy of the urban population, limit drone use at present.

The most value from drone deliveries may come from the last mile, particularly in rural areas. Heavier loads will be a problem.

Barriers and limitations to drone travel overhead, both legal and technical, will limit use, especially the BVLOS limits. Drone-only delivery to crowded areas will not be likely until hardware technology has a semi-quantum leap.

As a wrap-up of 2018, Colin Snow, CEO of Skylogic Research LLC, looked back at three forces that shaped the drone industry in 2018. As posted in early 2019, those forces were:

Force 1. Business adoption of drone use has been vigorous. Select industries such as insurance, utilities, construction, and survey engineering are frequent drone users. Internal teams at businesses are growing rather than outsourcing.

Force 2. Vendor contraction and expansion have seen some failures and, on balance, good results. In particular, aid to the Force 1 mentioned businesses has come in BVLOS operations and testing.

Force 3. There has been a DJI effect. That China-based company increased its advantage over all others to about 74% of the various drone lines after being only at 50% in 2015. DJI has been out front with technical developments especially in sensors, detect and avoid, and collection and transmission of drone data.

Other reports on 2018 progress for drone commerce noted that the professional use of drones continues to show growth with almost three-quarters of drones weighing less than 55 pounds being purchased for professional purposes. The commercial market has shown as having a marked shift to more expensive drone aircraft. There was an upward trend in 2018 toward one-third of purchases for aircraft over $2,000, up from 2017.

As evidence of the monetary aspect of the commercial drone progress, a look at prior years discloses considerable advancement by 2018:

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A new forecast was posted January 28, 2019, by Strategy Analytics Advanced Defense Systems (ADS) service report "Commercial UAS Market Outlook 2017-2027." The report predicts agriculture, security and first responder sectors would drive 49% of demand for commercial drone platforms by 2027 to approximately $15 billion. Of the demand, 83% will come from Europe, Asia Pacific, and North America.

The report cautions, however, that the potential will be almost singularly contingent upon establishment of favorable regulatory frameworks.

You have now heard much about the present and some predictions for the future of drones in commerce. Some military has been included in recent reports and predictions; but I suggest it is all COMMERCE, and uses and systems are not entirely severable for some drone activity developments.

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