

Proposal for an Emergency Alert Radio Signal to Notify Unmanned Aerial System Users of Airspace

Violations

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Federal Aviation Administration jurisdictions and regulations prohibit the flying of drones in certain airspace but leave the adherence to such regulations primarily up to the operator of aircraft and UAS (Unmanned Aerial Systems), which can lead to trouble. While if you are definitively caught in the act of violating these restrictions and regulations you can be subjected to fines and other penalties, with the ease of procurement and ability to illegally operate unlicensed drones, some form of alert system may be beneficial to, at the minimum, keep operators of such aircraft aware of, and away from restricted airspace and other sensitive zones. Since many drones, especially privately owned, are controlled by an operator's phone and connected to them to video and flight controls, an alert message targeting the specific radio or GPS (global position system) frequencies commonly used by such UAS systems would alert those who partake in the hobby or the commercial use of such devices to prevent accidental airspace violations, and if possible, could also be utilized to jam the device to prevent accidental collisions with aircraft or structures in certain vicinities.

According to the FAA (Federal Aviation Administration) regulations, Part 107 drones or UAS under the weight of 55 pounds are regulated both commercially, governmentally, and for private use. Some of these restrictions are keeping the UAS within the line of sight, only operating a single UAS at a time, and using a visual observer if flying with First Person View through a camera or operating device. During low visibility weather, an operator can only fly if there is 3 miles of clear sight from the control station, and a UAS may only be flown during daylight or twilight with appropriate anti-collision lighting. Another restriction is a maximum speed of 100mph or 87 knots. As far as altitude, a drone may fly no higher than 400 feet AGL (Above Ground Level), though one can fly higher if flying near a structure. Another limitation is not flying overhead of people, unless they're both aware and part of the operation being flown. While most commercial operators are likely to obey these rules, due to it being a financial situation if they do not, not all those who purchase drones are likely to either become licensed, or to

obey all of the rules set forth by the FAA, but if they are warned or jammed in certain airspace, even those UAS systems could be deterred from causing harm.

The FAA website shows that flyers of recreational UAS aircraft can be "liable for criminal and/or civil penalties." These penalties are not laid out but would likely result in further restrictions and fines of some sort. The caveat to that statement is the FAA also says it must be "intentional." With some pilots of UAS not bothering to register their aircraft or flying in unsafe manners, could they avoid any legal or civil recourse if they just claimed negligence or lack of awareness? Some operators shun the idea of needing to register their drone with the FAA, let alone to seek the knowledge and training that comes with the Part 107 Licensing for UAS operators. Fines are infrequently imposed, even when irresponsible drone usage nearly caused millions of dollars in damage and potentially many lives lost. In May of 2020, a potentially dangerous situation occurred, in which a possibly unlicensed and supposedly unknown UAS pilot hovered a drone to videotape a pass of the United States Navy Blue Angels demonstration team, which could have caused a catastrophic disaster if one of the aircraft struck the offending drone. Embry Riddle Aeronautics also did multiple tests showing that only a few, "three out of 22", motionless drones could be spotted by aircraft when flying by, which means the drones are essentially invisible to other pilots in the area.

Drone detection systems and software already exist, like the DJI Aeroscope, which Embry Riddle used in the previously mentioned testing, but the DJI Aeroscope and other similar hardware tend to only seek out the most common brands of drones, whether by radar, radio wave frequencies, or GPS frequencies. Knowing which frequencies are commonly used allows for the majority of UAS systems to be detected, tracked, and in some cases jammed using either radio or GPS jamming. My proposed theory is to not only detect, track, and possibly jam an offending UAS if necessary, but to also be able to spam the operator's phone or control device with a message, probably audio and visual, that alerts the

operator to the restrictions of the area. For instance, if a drone is approaching an airport, the detection and alert system could attempt to wave off the approaching aircraft in a peaceful non-destructive way.

This alert system could freeze the controls of the UAS, allowing the display to be flooded with an alert warning of airspace violation or ideally also including a jamming system, with possibly different radius. At a certain distance, you could receive just a warning. As you encroach further into the airspace or cross a certain phase line, it could continuously alert, and at a last resort begin jamming the system to prevent a strike or crash between aircraft.

While larger detection and jamming systems may interfere with other systems in the region being jammed, if you were careful to use it just long enough to end the rogue drone threat, you could protect aviation assets and other sensitive sites. With advances in technology, smaller personal sized alert systems could also be used to protect personal property from violations of their security. Portable systems could be used at events such as air shows or other areas where people may need protection from unauthorized drone usage, even a vehicle-mounted system could be used to alert UAS operators, legal and illegal, to avoid areas such as during emergency response actions, car wrecks and the like.

Works Cited

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