Everything Old is New Again: From Amateur Rockets to Drones

Long before the FAA faced the challenge of integrating drones into the national airspace system (NAS), it had to cope with a similar problem – keeping the NAS safe from amateur rockets.

On October 4, 1957, a Soviet R-7 intercontinental ballistic missile launched Sputnik, the first artificial satellite and the first manmade object placed in the Earth's orbit. In November of the same year, the Soviets launched Sputnik II. On January 31, 1958, nearly four months after the launch of Sputnik I, the United States successfully launched its first satellite on a four-stage Juno I rocket at Cape Canaveral in Florida. The space race had begun.

Adults and children alike became enamored with rockets and rocketry. They quickly formed amateur rocket clubs in schools, universities, and communities around the country. According to *Time*, "All over the U.S., homemade rockets are fizzling, exploding, and – on rare occasions – soaring into the sky." Amateur rocketry proved a dangerous hobby since the rocket builders used explosive chemicals to fuel their home-built rockets. Reports of injuries became common. In fact, the National Fire Protection Association deemed the hobby "extremely dangerous" and recommended its prohibition in the interest of public safety "until safe launching sites are established . . . and supervised by thoroughly competent personnel." Because of the dangers, many cities and towns banned the firing of homemade rockets.

While local fire departments, insurance companies, and even the American Rocket Society worried about injuries to people, FAA's predecessor agency, the Civil Aeronautics Administration (CAA), expressed concern about the safety of the NAS. On February 10, 1958, the CAA decried amateur rocketry as a new hazard to air travel. The agency pointed out if an amateur rocket was launched anywhere along the airways or near an airport, it fell under the purview of the CAA. Because of the potential hazard involved, CAA Administrator James Pyle issued a warning that, before any rocket launch, the launcher should discuss the operation in advance with CAA safety inspectors and local police and fire department officials. Pyle wanted the public to know that if a rocket struck an aircraft, the person who launched the rocket would be legally liable.

Administrator Pyle made it clear the CAA had no intention of discouraging or interfering with rocket or missile experiments. The agency's only interest was the safety of the flying public. As a result, the CAA issued a safety bulletin advising rocket launchers:

- Not to fire rockets within three miles of the center of an airport or within 10-mile-wide airways;
- To check with the CAA before launching a rocket;
- Not fire rockets without full approval of the local police and fire department;
- To launch rockets only during good weather; and
- To place observers around the launch area to certify the area was clear of aircraft.

The CAA, however, did not have the power to regulate the rockets. Aviation safety regulation at that time resided with the Civil Aeronautics Board (CAB). On December 2, 1958, the CAB proposed rules regulating amateur rocketry. The proposal would ban rocket and missile firings within 5 miles of an airport and entirely in areas of controlled air space such as civil airways and airport traffic patterns. The rule would also prohibit firings higher than 500 feet unless the CAA Administrator approved the launch. The CAB never issued a final rule, and on December 31, 1958, the new Federal Aviation Agency (FAA) took over responsibility for aviation rulemaking.

By the early 1960s, more than 5,000 amateur rocket clubs with more than 40,000 active members operated in the United States. As the rocket builders became more sophisticated, some built rockets that weighed up to 75 pounds and could reach an altitude of over five miles. With a distinct threat to aviation, the FAA began studying how to increase the safety of rockets fired into the airspace.

On February 25, 1961, the FAA proposed regulations to increase the safety of rockets and missiles. Rocket enthusiasts largely opposed the proposal while civil aviation interests supported the need for regulation. With the opponents very vocal, a FAA spokesperson explained: "Well-meaning youngsters could launch a rocket into controlled airspace and hit a plane carrying a hundred or more people" He continued, "We have said it before and we'll say it again – if they want to experiment with rockets, let them go to a military base and work under the technical supervision of people who know what they're doing."

Once the agency realized that it would need to write an entirely new rule based on the public comments it received, the FAA withdrew the proposal. On June 7, 1962, the agency issued a second proposal. That proposal made a distinction between model rockets and amateur rockets. The FAA determined model rockets, made of paper, wood, or light plastic, within "reasonable weights," which used a premixed propellant and weighed one pound or less, posed no real hazard to the NAS. The proposed regulation pertained only to amateur rockets. The FAA defined those types of rockets as "metallic rockets which have a far great thrust due to the use of more powerful homemade fuels; utilized rocket systems which require extensive safety precautions and expert supervision, and requires a greater amount of land and airspace to contain the operation."

After evaluating public comments, the FAA issued a new rule, which affected Title 14 of the Code of Federal Regulations (CFR), Parts 48 and 60, that became effective on March 14, 1963. The FAA prohibited the operation of rockets:

- In a manner that creates a collision hazard with aircraft;
- In controlled airspace;
- Within five miles of the boundary of any airport;
- At any altitude where clouds or obscuring phenomena of more than five tenths coverage prevail;
- Into any cloud;
- At any altitude where the horizontal visibility is less than five miles;
- Within 1,500 feet of any person or property not associated with the operation; or
- At night.

In addition, the FAA required the launcher to notify the nearest FAA air traffic control facility at least 24 hours, but not more than 48 hours, prior to the launch.

Early in the 21st century, the FAA faced a new potential threat to the safety of the NAS – unmanned aircraft systems (UAS) or drones. Model airplanes and rocket technology became so sophisticated that one could now buy a drone in a big box store, unpack it, and begin flying it. Like amateur rockets, drones fell under the purview of the FAA. As former Administrator Michael Huerta explained in 2016, safely integrating all UASs "into our National Airspace System is one of the FAA's top priorities – to protect manned aircraft, to protect people on the ground, and to protect innovation."

Similar to rockets, the FAA categorized UAS into two distinct categories – small and micro. The FAA defined a small UAS as weighing less than 55 pounds and conducting non-recreational operations. A micro UAS weighs under 4.4 pounds and is composed of materials that break or yield on impact. Although more extensive than the 1963 rule on amateur rockets, a 2016 rule on the operation of UAS, 14 CFR Part 107, contained some elements similar to earlier regulations for amateur rockets. For example, small unmanned aircraft must:

- Remain close enough to the remote pilot in command and the person manipulating the flight controls of the small UAS for those people to be capable of seeing the aircraft with vision unaided by any device other than corrective lenses;
- Not operate over any persons not directly participating in the operation, not under a covered structure, and not inside a covered stationary vehicle;
- Fly in daylight-only operations;
- Maintain a maximum altitude of 400 feet above ground level (AGL) or, if higher than 400 feet AGL, remain within 400 feet of a structure;
- Maintain minimum weather visibility of 3 miles from a control station;
- Obtain air traffic control permission for operations in Class B, C, D, and E airspace.

Since its inception, the FAA has made significant efforts to keep pace with innovation without compromising safety. With the increasing rate of technology, the agency will continue to monitor and regulate new entrants to keep the NAS safe. As Acting Administrator Dan Elwell pointed out in January, integrating new technologies into the NAS always poses some challenges. "We have obstacles, but none of them are insurmountable. And in truth, I think the best is yet to come."