USDA Forest Service
U.S. DEPARTMENT OF AGRICULTURE

Wildfire Management Technologies

Background

The Department of the Interior, Environment, and Related Agencies Appropriations Bill, 2023 (House Report 117-400), included the following language:

Recognizing that the Forest Service is continually researching and implementing new tools, technologies, and creative solutions for fighting wildfires, within 180 days of enactment of this Act, the Committee directs the Forest Service to provide a report that assesses the feasibility of working with the National Interagency Aviation Committee and the International Airtanker Board to conduct an evaluation of innovative new technologies, such as the Container Aerial Fire Fighting System, as appropriate and whether any new technologies which may meet the Service's standards of water and retardant delivery systems including retardant delivery standards for safety, airworthiness, coverage level, consistent delivery, delivery time, precision delivery, and ground firefighter safety. As part of this report, the Forest Service should consider whether updates are appropriate to its procedures and deployment protocols to include innovative wildfire technologies now available in the United States. The Committee also notes that the Forest Service can utilize ground-based, long-term fire retardants as a wildfire prevention tool when conducting prescribed burns, and other mitigation and fuel reduction efforts.

The U.S. Department of Agriculture (USDA), Forest Service continues to research technology to improve the effectiveness and safety of aerial firefighting including, but not limited to, fire imaging, use of uncrewed aircraft systems, wildfire detection cameras, modern aircraft, aerial firefighting simulators using virtual reality, and aerial delivered retardant and water. The agency employs the most advanced and capable equipment available to meet the interagency firefighting mission.

The Forest Service, in partnership with other Federal and State Partners, is investing in key areas of Information Technology. Pilot projects for this year include the following:

- FirstNet[1] deployment for last mile connectivity in partnership with the Federal Aviation Administration. Initial pilot events schedule for mid-summer with expanded proof of concept to follow shortly.
- Stratospheric balloon deployments for improved Incident Management coverage in partnership with National Aeronautics and Space Administration (NASA). This project will provide valuable feedback on the potential of supporting incident communications from a solar-powered balloon platform.
- High Altitude Long Endurance (HALE) Platform[2]. This is a potential platform to enhance our ability to support critical communications in the field for the duration of an incident.

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[1] FirstNet -https://www.firstnet.com/
[2] https://www.fs.usda.gov/science-technology/fire/technology/HALE

This list highlights the critical nature of last mile connectivity.[3] This is foundational to additional projects and capabilities that we are also pursuing including:

- Telematics and other vehicle tracking technology as well as real-time personnel tracking technology.
- Deployment of Edge Computing to provide increased technical capabilities designed around firefighter safety and efficiency of operations.

Other technology of note:

- Unmanned Ariel System (UAS)/ Incident Support: Demand for UAS on incidents is high. UAS can help reduce burn severity, improve safety, and reduce traditional air crew exposure during low-level flight. Current focus is on training more pilots and making more UAS available.
- Satellite / Early Detection: Forest Service continues to partner with FireGuard [4]for early detection/incident support. We are also engaged with other partners such as the NASA and the Canadian Space Agency to incorporate data from new satellite launches.

While we are not currently seeking additional capabilities in retardant deliveries, we are continuously evaluating the needs for aerial assets in support of interagency wildland fire response and are moving to contract vehicles that allow us to modernize our fleet and response capabilities.

In recent years, several companies with Container Aerial Firefighting Systems have approached the Forest Service. This technology is also referred to as Precision Containerized Aerial Delivery Systems. These systems deliver retardant or water in large containers, such as large cardboard boxes that are dropped by aircraft to provide a concentrated amount of retardant or water along the fireline. Testing, evaluation, and approval of retardant delivery systems are conducted under the authority of the National Interagency Aviation Committee, in accordance with methods and standards established by the Interagency Airtanker Board.

The Forest Service evaluated the Container Aerial Delivery System and documented its observations in the San Dimas Technology and Development Center's[5] *2011 Precision Containerized Aerial Delivery Systems Forest Service Report.* The evaluation occurred in 2010 during a U.S. Army test of the technical feasibility of Precision Container Aerial Delivery Systems at the Yuma Proving Grounds. Through this evaluation, the agency determined that this delivery system does not meet retardant delivery standards for coverage level, consistent delivery, delivery time, ground firefighter safety or environmental impacts. It also has an inconsistent, non-continuous drop pattern which would allow fire to burn through fuels with thin or no retardant coverage, unlike conventional airtankers that can provide consistent coverage.

Specifically, the evaluation stated that "using containerized delivery systems as a method of firefighting is a safety concern for firefighters and the public in the wildland-urban interface where we fight many of our fires." Additional concerns were raised regarding the extensive debris that is scattered over a large area upon impact. Leaving this material on the ground anywhere is an environmental issue. The debris would

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[3] Last mile connectivity- refers to the final portion of a telecommunication network that deliveries to the end user.
[4] https://www.fireguardusa.com/
[5] https://www.fs.usda.gov/eng/techdev/sdtdc.htm

be combustible and would add fuel to the fire environment. The debris is not natural to the landscape; removal would create additional cost, time, and personnel exposure concerns; debris may not be removed due to inaccessible locations; and debris may raise public and environmental lobby concerns. There is also a high risk of severe injury and/or damage to the public, firefighters, facilities and vehicles due to falling debris.

Our current system of retardant loading and delivery has a very efficient and operationally effective infrastructure. Introducing a completely new system and process would add to cost, complexity, logistics, and possibly disrupt the synchronous operational tempo, both from the air, and for firefighters on the ground, which is critical to protecting lives, property, and valuable resources. At this time, our current capabilities align very well with our requirements and modernization strategy.