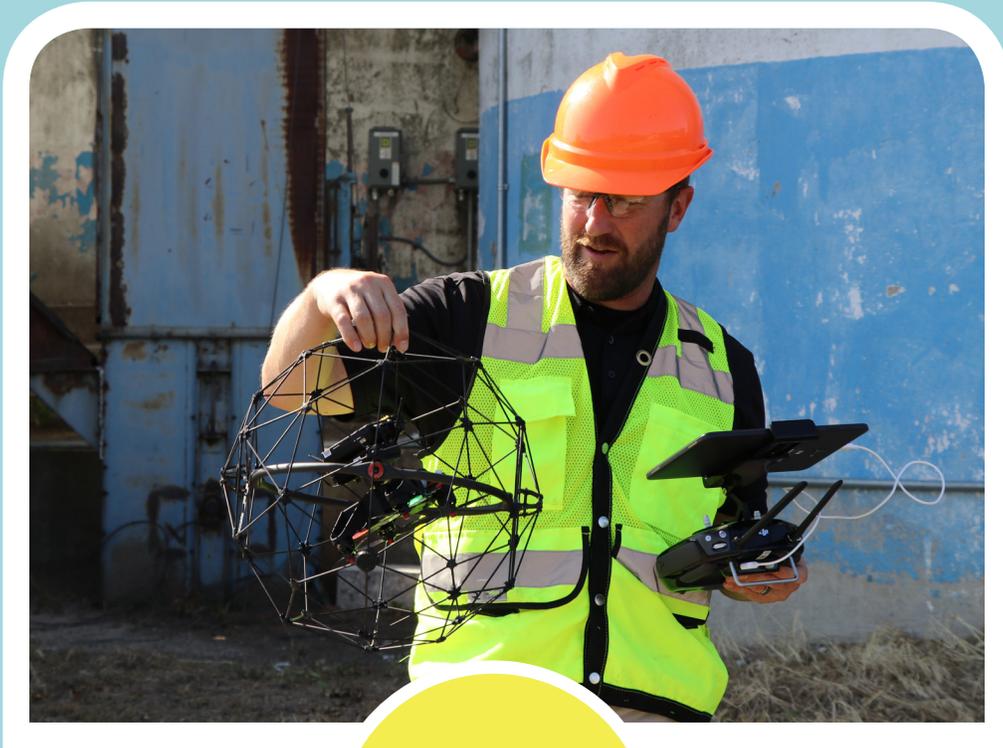


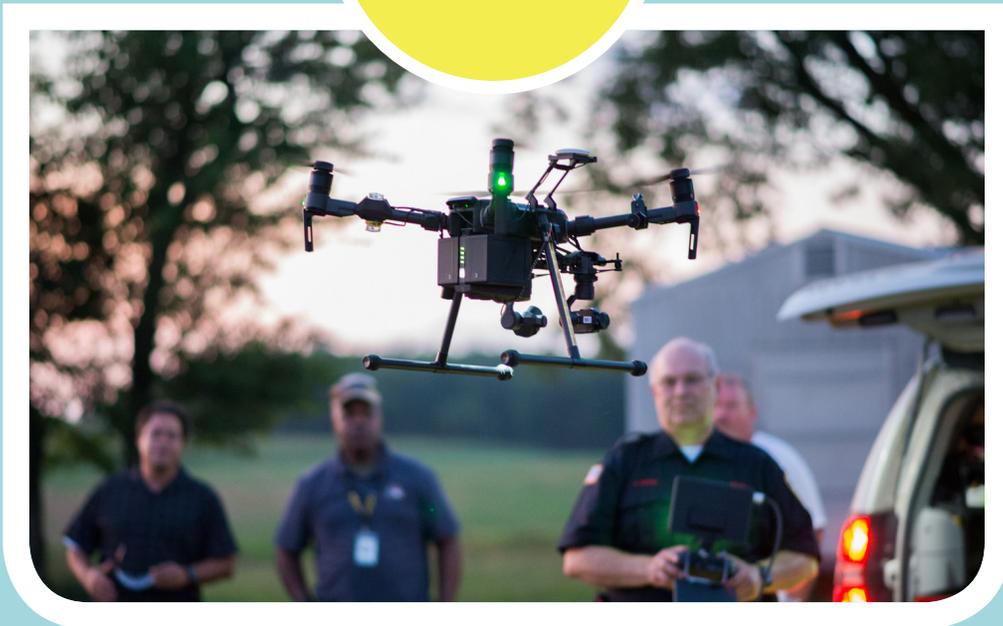
2019 AASHTO UAS/Drone Survey of All 50 State DOTs



MISSION



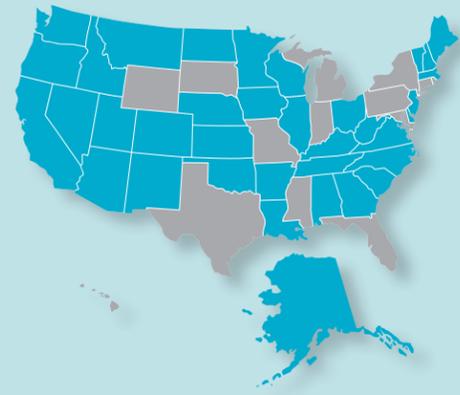
CONTROL



State DOTs are deploying drones to improve safety and collect data faster and better.

Survey Shows State DOTs Hiring Next-Gen Workforce to Run Drone Operations. Highly-Skilled Workers Deploying Drones to Save Lives, Time, and Money

A May 2019 survey by the American Association of State Highway and Transportation Officials shows the rapid deployment of new Unmanned Aerial Systems (UAS) or drone technologies. More than 7 out of 10 state departments of transportation have hired hundreds of staff, including highly-skilled personnel and pilots to manage drone operations.



States Conducting Cutting-Edge Research

Three state DOTs—Kansas, North Dakota, and North Carolina—are in the Federal Aviation Administration Integration Pilot Program, which allows them to fly missions beyond line of sight, at night, and above people. Those three states are testing drone applications for plant growth and irrigation, emergency response, and commercial package delivery. The Ohio DOT, through DriveOhio's UAS Center, in partnership with the Air Force Research Laboratory and other partners, is developing SkyVision: a ground-based detect-and-avoid system that is being used to track drones for beyond-line-of-sight operations.



KDOT IPP Crop Research



KDOT IPP Crop Research

State DOT Mission Control

Top 5 Drone Missions

1. Photo/Video
2. Surveying
3. Infrastructure Inspections
4. Emergency Response/Natural Disasters
5. Public Education and Outreach

“The survey is just one example of how state DOTs are investing in the next-generation workforce. Five years ago, you’d be hard pressed to find any state DOT looking to hire a drone pilot or set up a UAS program—but we’re doing both in a big way.”

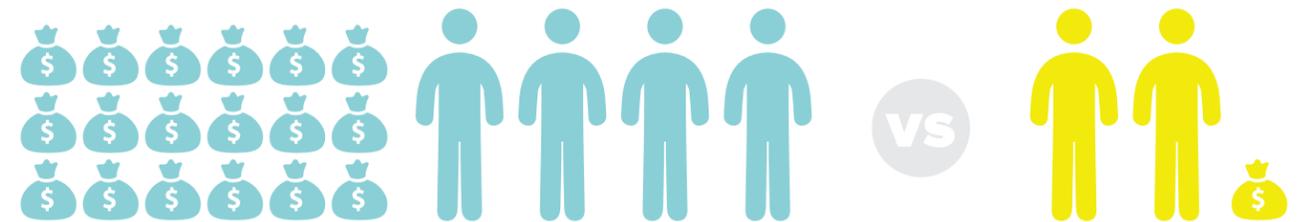
Carlos Bracerias, AASHTO President and Utah DOT Executive Director

“Imagine highways in the sky. Invisible lanes of travel for low-altitude drones and other small unmanned aircraft. Package deliveries will be just one of the many missions drones will be flying in that airspace. Just as the FAA tracks jetliners on the ground and in the air—SkyVision will do the same thing for drones.”

Fred Judson, Acting Director, Ohio UAS Center

Manual vs UAS Cost Comparisons

of a Bridge Deck Inspection



Manual Estimated Cost \$4,600

2 people for 8 hours, average cost \$100/hr. = \$1,600
 2 lane closures, average cost \$1,500/lane = \$3,000
 Total average cost for a typical freeway bridge = \$4,600

UAS Estimated Cost \$1,200

2 people (pilot and spotter) for 1 hour \$600/hr. = \$1,200
 Includes data collection and back-end processing
 Inspection uses high-resolution photos or infrared



Bridge Inspection



Disaster Response



Surveying

States Lead the Way

- 29 DOTs say drones help save money
- 24 DOTs working with colleges on research
- 10 DOTs working with colleges to train pilots

“In three short years, we have gone from zero to 36 state DOTs executing drone missions internally. This giant leap is helping states work safer, smarter, and faster than ever before and that adds up to big savings for taxpayers and improved safety for motorists.”

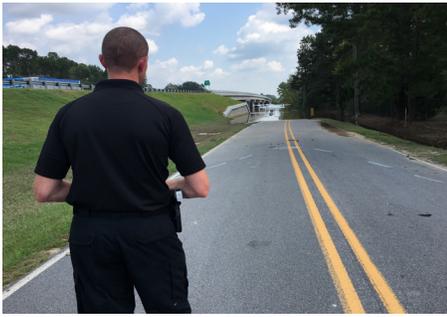
Jim Tymon, AASHTO Executive Director

User Delay Cost: \$14,600

- Bridge inspection
- Four lane divided highway bridge
- Located near metro area
- Bridge has two-way traffic
- Closure of one lane for 8 hours

Next Steps

Michigan DOT and its partner, the Michigan Technological Research Institute, are studying ways to use drones to conduct bridge inspections. Phase 3 of its research, which began this year, is developing new computer systems and algorithms to lessen the time it takes to process drone data. By speeding up the flow of information, state DOTs can make smarter and faster decisions, all while saving money.



NCDOT Disaster Response



FAA-Authorized Night Flight

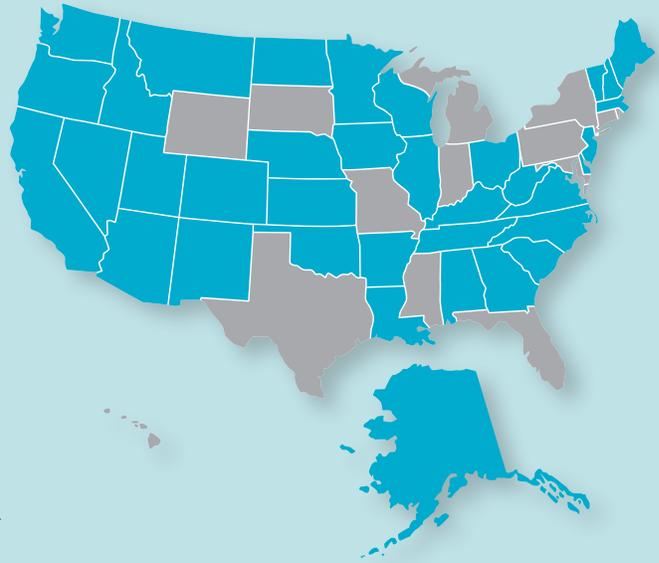


Next-Gen Workforce

In 2019, 36 out of 50 state DOTs (or 72 percent) funded centers or programs for drone operations:

Alabama, Alaska, Arizona, Arkansas, California, Colorado, Delaware, Georgia, Idaho, Illinois, Iowa, Kansas, Kentucky, Louisiana, Maine, Massachusetts, Minnesota, Montana, Nebraska, Nevada, New Hampshire, New Jersey, New Mexico, North Carolina, North Dakota, Ohio, Oklahoma, Oregon, South Carolina, Tennessee, Utah, Vermont, Virginia, Washington State, West Virginia, and Wisconsin.

In 2018, 20 of 44 state DOTs (or 45 percent) had such operations.



Learn Your Terms of Deployment

- **COA (Certificate of Authorization):** A permit/waiver issued by the FAA allowing a public operator to perform specific UAS or unmanned aerial vehicle (UAV) operations.
- **Commercial Drones:** A UAS designed for heavy use. These flying platforms have a specific purpose in mind, such as for infrared inspection or package delivery
- **Fixed-Wing Drones:** UAVs that consist of a rigid wing that generates lift via aero foil and typically a small push propeller. Fixed-wing drones can travel greater distances with less power due to such wings.
- **Collision/Obstacle Avoidance:** A vision system that allows UAVs to detect obstacles in its path and avoid collisions.
- **Geofencing:** Technology that uses global positioning system (GPS & GLONASS) to establish a virtual geographic boundary to prevent drones from flying into specific areas.
- **Infrared Drone/UAVL:** A UAV with an infrared imaging camera onboard. An infrared camera sees a region of the electromagnetic radiation spectrum where thermal or heat energy is emitted. Infrared imaging sensors detect incoming infrared energy and software interprets the signals into a digital infrared image or video.
- **LiDAR:** An acronym for Light Detection and Ranging. LiDAR is a method of detecting, measuring, and mapping using a laser. LiDAR is typically used in situations where standard survey techniques are difficult.



Watch the AASHTO Transportation TV Special Report on the many ways state DOTs are utilizing drones at www.TransportationTV.org