

DROPPES

IN GOVERNMENT WORK



**Drones in Government Work:
Build Your Drone Program with Lessons from
North Carolina's Statewide Drone Collaboration**

A DJI White Paper
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THE OFFICE OF NCDOT DIVISION OF AVIATION IN RALEIGH



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PART ONE

INTRODUCTION





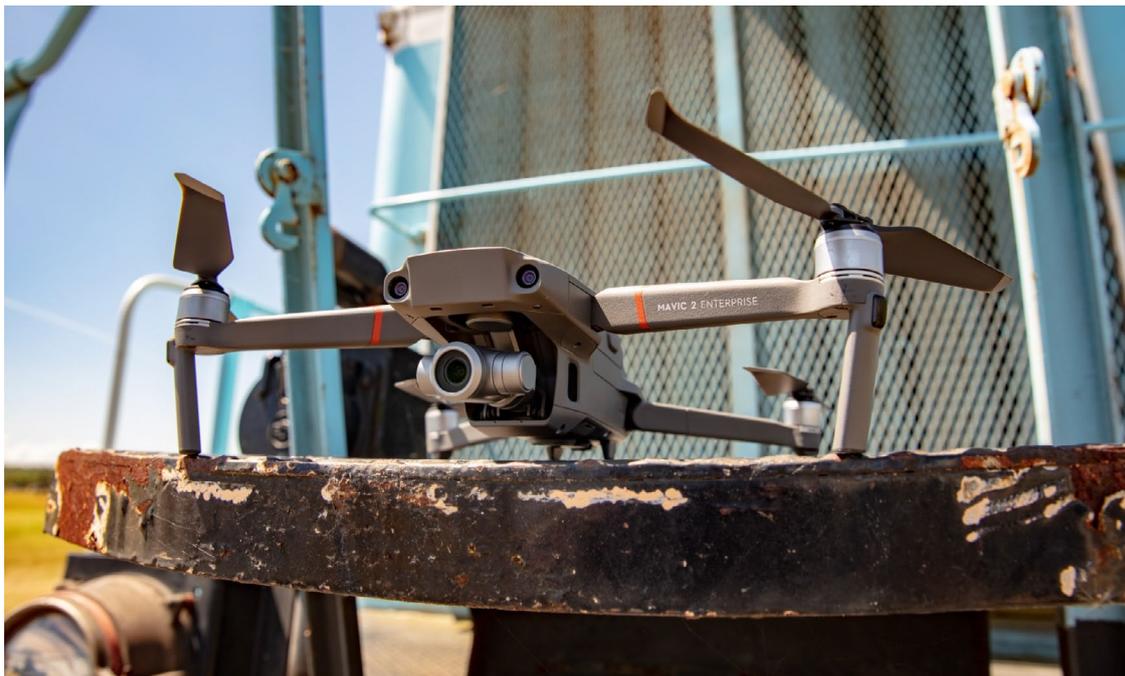
Drones are changing how state and local governments serve the public in big ways and small. While drones have gained an early foothold in public safety, enterprising government agencies and departments are exploring their use in other areas, from transportation and public works to planning and environmental services. Government use of drones is increasing rapidly in both the number of departments that have drone programs and the type of drone applications.

Drone programs are scattered across many different departments, including state, municipal, and local governments. Public safety and emergency preparation dominate present-day public-sector use cases for drone adoption (As seen in Graph One on page 7)¹, enterprising government agencies and departments are exploring their use in other areas, from transportation and public works to planning and environmental services. Because of the various use cases and the multiple layers of regulation involved in drone usage, public sector leaders must

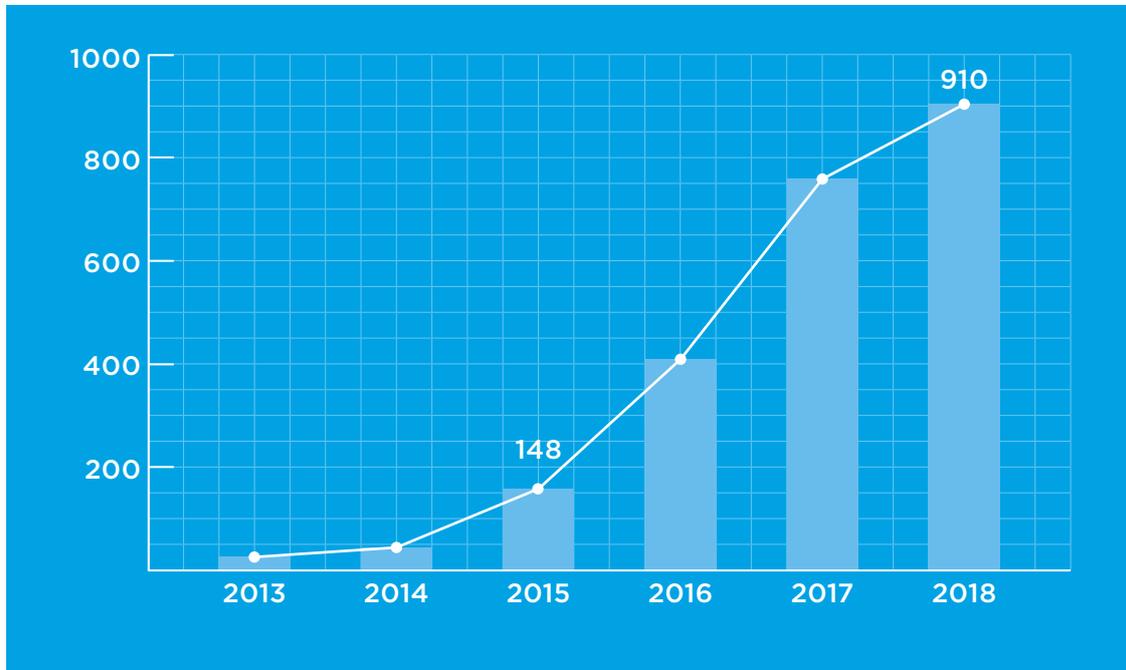
think carefully about how to build strategies to structure and manage government drone programs.

North Carolina has been a pioneer in unmanned aviation, advising national standards and rules and driving innovation in public sector drone usage. The state has established an effective statewide drone collaboration program spearheaded by the N.C. Department of Transportation's Division of Aviation (DoA). The DoA has a special working group that leads, supports and trains the various drone programs in other departments. The state's drone networks have successfully fulfilled many state-level operations including Hurricane Florence disaster response, relief and reconstruction in 2018.

This white paper will address how drones function in the many public-sector areas and how to build collaboration for maximized efficiency based on the lessons of North Carolina's statewide drone collaboration program.



1. Public Safety Drones. Report. Center for the Study of the Drone at Bard College. 2018.

Graph One. Number of Public Safety Agencies with Drones²**Chart One. Top 6 Reasons Public Sector Agencies Adopt Drones, Based on Multiple Choice Survey³**

59%
Increasing public safety

50%
More effective than legacy methods

55%
Preparing for an emergency

47%
Safer for employees

54%
Performing tasks more quickly

35%
Lower cost

2. Public Safety Drones. Report. Center for the Study of the Drone at Bard College. 2018.

3. The Day of the Drone is Here: Effectively Deploying Unmanned Aerial Technology in State and Local Government. Report. Government Technology. 2019.

PART TWO

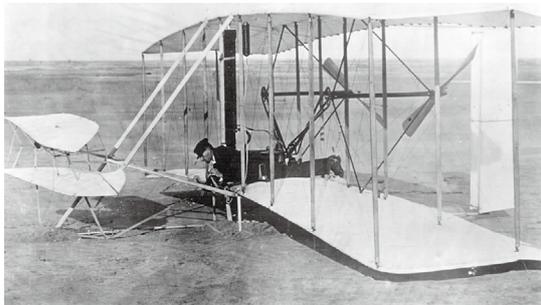
THE NORTH CAROLINA FRAMEWORK





HOW A STATEWIDE DRONE NETWORK IS STRUCTURED AND MANAGED ACROSS DIFFERENT DEPARTMENTS

North Carolina has been at the forefront of aviation ever since the Wright Brothers' first flight took off in Kitty Hawk, NC, in 1903. The state has stepped into the aviation history book again by leading in unmanned aviation, advising national standards and



The Wright brothers' first flight took place in North Carolina in 1903
National Archives / Getty Images

rules and driving innovation in public sector drone usage.

In 2018, dramatic imagery captured by drones from various North Carolina public agencies showed the world the devastation occurring in North Carolina from Hurricane Florence and provided valuable intelligence that guided response and recovery efforts. Fifteen drone teams from seven agencies flew over the affected areas and captured more than 8,000 videos and images of flooded roadways and towns, road and bridge washouts, eroded beaches, ferry terminals, and more.

The state has an extensive public drone program network. The department types vary from small local police and fire departments to state-level departments, such as the N.C. Department of Transportation (NCDOT) and State Highway Patrol, to educational and research institutions, including North Carolina State University, the North Carolina



The Wright Brothers Memorial in Kitty Hawk, North Carolina

Public Safety Drone Academy, and environmental research institutions.

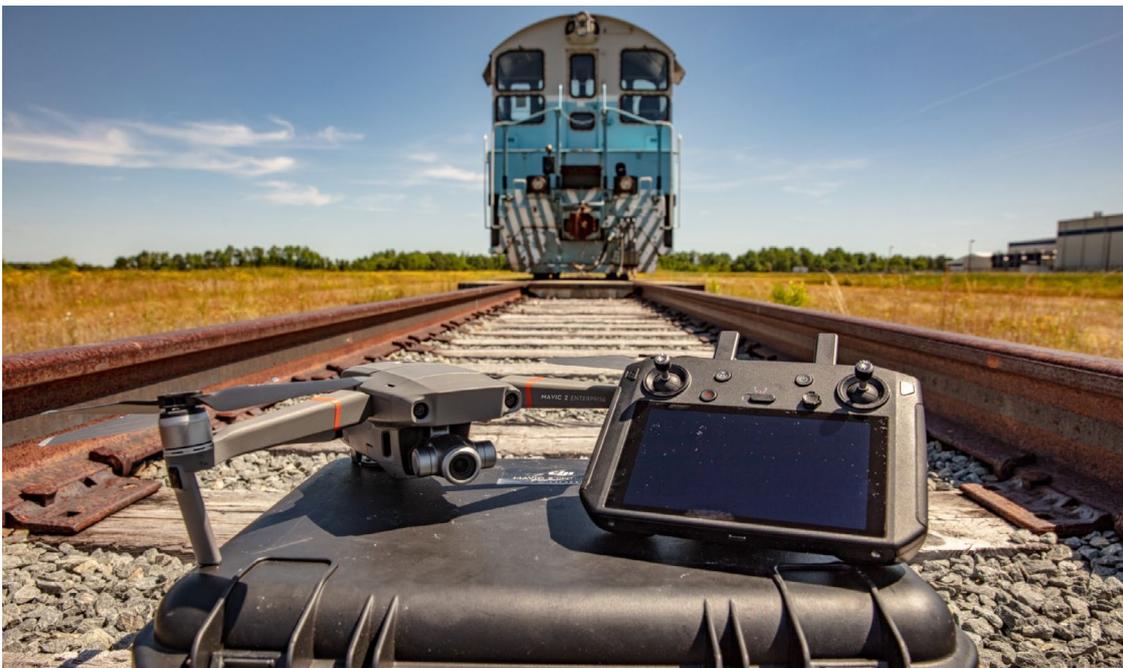
North Carolina implements its robust program of layered drone deployment, public education and outreach under an effectively structured and supported UAS management program. In this white paper, it is referred to as the “North Carolina Framework.”

It is DJI’s opinion – gained from interfacing with government and private-industry organizations – that the North Carolina Framework is an ideal structure for other public-sector entities to follow.

A CENTRALIZED MANAGEMENT PROGRAM

The North Carolina Framework is built around a centralized structure led by NCDOT in drone program management, funding and support. The N.C. General Assembly sets regulations to protect safety and privacy, while funding the NCDOT Division of Aviation’s UAS Program Office to expand safe, beneficial drone use.

NCDOT, as one of the earliest drone technology adopters in the U.S. public sector, started its drone program initially in 2015. Its experience in exploring use cases, regulations, and safety operation guidelines soon influenced other departments that were looking to start their drone programs. When North Carolina decided to standardize the management of the many drone programs across the state, it was natural that the leading role went to NCDOT. With NCDOT’s consultancy and training services, local



Mavic 2 Enterprise drones used for railway inspection

and state-level government departments in North Carolina began building drone programs under a centralized framework.

The department's leadership and consulting role expanded to cross-state and federal levels as well. In 2018, NCDOT was selected by the Federal Aviation Administration as one of ten teams for its three-year UAS Integration Pilot Program to test and inform national regulations and systems for drone use across the country. The department also participated in two NASA-sponsored market analyses of urban air mobility components.

While NCDOT has been an early leader in building a central management system to support cross-organizational drone deployments, DJI has seen an increasing number of leading adopters use a similar model to scale out their operations. Most notably at the federal level is the Department of Interior, whose Office of Aviation Services has been charged with overseeing drone operations at a scale of 10,000 flights and 400 FAA certified pilots in 2018. This structure is similarly being used by leading enterprises such as Southern Company and Union Pacific, suggesting learnings from NCDOT are relevant to all large organizations deploying drones.

THE ROLE OF NCDOT DIVISION OF AVIATION

The Division of Aviation's (DoA) mission is to promote the economic wellbeing of North Carolina through air transportation system development, safety initiatives, and education. As the state's aviation authority, its role is to promote aviation and aerospace development, manage state and federal airport development grants and programs, manage the state's unmanned aircraft systems program, conduct aviation safety and education programs, and provide air transportation that advances state agency missions. Within NCDOT, the Division of Avi-



ation is the lead in drone integration. Its role is to lead North Carolina's work in these key areas:

- UAS Innovation – Creating knowledge and integration of UAS technologies for public and private use and benefit.
- UAS Safety – Providing the safest possible environment for drone operations.
- UAS Government Integration – Maximizing state and local agency use of UAS technology to improve public services and operations.
- UAS Economic Development – Developing a world-leading UAS economy.

The UAS Program has racked up a series of firsts in just a few years. Among them:

- North Carolina's first coordinated drone response to a disaster.
- First U.S. medical package drone delivery demonstration, including flights over people.
- Launch of nation's first routine and for-revenue drone flights to deliver products.
- Nation's first and only permitting system for commercial and government drone operators (permitting 2,110 commercial and 782 government operators by the end of 2018).
- North Carolina's first Drone Summit and Flight Expo convening UAS leaders from business, government and academic focused on drone innovation.

DoA is leading the way to help government agencies in North Carolina maximize the use of drones to improve public services and operations and save tax dollars.

The strategy is to first focus primarily on fully integrating drone use at NCDOT, then replicating the NCDOT integration strategy across other state and local agencies.

The three-year NCDOT drone integration program, now in its second year, calls for DoA to:

- Administer NCDOT drone integration, including planning, implementing, and reporting progress and results to leadership.
- Advise and approve all UAS procurement at NCDOT.
- Educate NCDOT personnel about the UAS policy, training opportunities, and fleet requirements.
- Train and certify NCDOT personnel as UAS operators.
- Develop and implement a fleet management system for NCDOT UAS operations, including registration, compliance, and tracking protocols.

More than 30 drones are currently in use across NCDOT, supporting a variety of functions in the DoA, including the communications office, highway divisions and geotechnical, photogrammetry, roadside environmental, and safety and risk management units.

Uses range from transportation infrastructure inspection and project documentation to disaster response and special missions to project and event photography, spraying of invasive species, jobsite erosion control monitoring and worksite safety assessment. In its final year, DoA will reach out to all NCDOT units to assess opportunities for using drones and begin a three-level certification training program for operators.

DoA UAS subject matter experts are regularly called upon by other transportation and drone organizations as well as publications statewide to share their experiences, best practices and recommendations on developing drone technologies and programs. Many other of the state's public departments set up their drone programs under DoA's consultancy and advice.



OVERVIEW OF NORTH CAROLINA'S LOCAL AND STATE AGENCIES WITH DRONE PROGRAMS

Departments of various jurisdiction levels, sizes and functions in North Carolina have drone programs in-house, supported by external service providers or a mix of both. In this Chapter, we will look at a few examples of different organizations to shed some light on North Carolina's multi-layer public sector drone program network.

1 Wake Forest Fire Department

Wake Forest Fire Department (WFFD) is a mid-sized local fire department located in the suburbs of Raleigh. The department has five stations with 125 firefighters, protecting a wide range of residential, commercial, and rural/agricultural areas.

The WFFD drone program is small with one drone and one pilot in active service, equipped with a thermal camera to help locate missing persons and a zoom visual camera. The program's primary role is to assist in search and rescue, structure and commercial building firefighting, hazardous material situations, wildfires and documenting natural disasters.

WFFD started researching and testing drone technology in 2014 and officially started their program in 2017 when they acquired an all-weather drone platform that meets the tough service demands of a fire department.

The WFFD drone has assisted departments and agencies around the state with mutual aid requests, from search and rescue missions to assisting with largely populated events to help keep people safe.. It has also assisted departments across the country with tips, tools, and techniques for making Unmanned Aircraft Systems (UAS) a valuable asset for a modern fire department. WFFD's Chief Pilot, Steve Rhode, has been active as a drone flight instructor across the state and as a national author on the subject of drones in the fire service.

2

North Carolina State Highway Patrol

The North Carolina State Highway Patrol (NCSHP) started its drone program in 2017 mainly for its Collision Reconstruction Unit and later expanded to the SWAT team. The Collision Reconstruction Unit investigates major vehicle crashes and prepares detailed reports on such events. The initial objective of the NCSHP's drone program was to save time investigating collision scenes and reduce secondary collisions.

During the earlier stages of the program's development, NCSHP worked closely with NCDOT to define key applications, prove concepts, and compare manufacturers.

In 2017, NCDOT conducted a research study with the NCSHP Collision Reconstruction Unit. The experiment involved a simulated two-car crash in a

controlled environment. NCSHP's traditional methods took one hour and 51 minutes to collect its data. Pilots using three different drones took just 25 minutes on average to complete the mission. The study proved drones save substantial investigation time and money at crash scenes compared with legacy methods.⁴ In more recent studies in 2018, RTI and UNC Charlotte collaborated, with the support of NCDOT and NCSHP, found key benefits of drone technology in low-light collision scene reconstruction.⁵

Today, NCSHP has over 27 drones in active deployment. The 21 members on the NCSHP Collision Reconstruction Unit all are FAA Part 107 certified pilots. Each member is issued a DJI Phantom 4 Pro drone primarily used for mapping and aerial photography.

Traditional vs. Drone Cost Comparison

Joint Research Study of Accident Reconstruction Investigation



4. N.C. Department of Transportation. Division of Aviation | UAS Program Office. COLLISION SCENE RECONSTRUCTION & INVESTIGATION USING UNMANNED AIRCRAFT SYSTEMS. 2017. <https://www.ncdot.gov/divisions/aviation/Documents/ncshp-uas-mapping-study.pdf>

5. Eyerman, J., Mooring, B., Catlow, M., Datta, S., & Akella, S. (2018). Low-light collision scene reconstruction using unmanned aerial systems. Research Triangle Park, NC: RTI International; Charlotte, NC: University of North Carolina at Charlotte. <https://www.rti.org/publication/low-light-collision-scene-reconstruction-using-unmanned-aerial-systems>



3

North Carolina Public Safety Drone Academy

The North Carolina Public Safety Drone Academy is a full-fledged drone education provider operating under Montgomery Community College and the North Carolina Community College System. The academy's purpose is to teach future drone operators in local and state emergency services the proper safety measures required to use drones safely and effectively. Many of North Carolina's firefighters, law enforcement officers, and emergency management personnel are trained and licensed in piloting drones at the academy.

Montgomery Community College began providing students with a drone education program that taught important basics in 2016. Later in 2017, the drone program partnered with NCDOT's Division of Aviation, the N.C. Department of Public Safety, and several local and state municipalities to create the academy.

Its current curriculum consists of numerous high-level scenario-based courses ranging from manned and unmanned communications, search and rescue, hazmat operations, multi-agency operations, to wild-land fire monitoring and response. The academy is also known for its new year-long course divided among the legal aspects of operating drones, the hands-on component with the physical skill of maneuvering them properly and safely within live scenarios, and field trips to meet industry leaders and companies. Impressively, the North Carolina Public Safety Drone Academy offers all courses, seminars, and workshops completely tuition free through a tuition waiver for all public safety and emergency service professionals.

The free tuition is a powerful incentive for emergency and public safety workers like firefighters, police officers, EMTs, and others. As drone usage becomes more appealing to the corporate and public sectors, and thus, a valued skill in dozens of job categories, free courses and training to bolster those skills makes the North Carolina Public Safety Drone Academy a true asset to the state.

CASE STUDY: STATE-WIDE COLLABORATION FOR HURRICANE FLORENCE

Hurricane Florence, a large and slow-moving storm, made landfall during the morning of September 14, 2018. After the eye crossed Wrightsville Beach, NC at 7:15 a.m. the storm spent the next two days producing record-breaking rainfall across eastern North Carolina and a portion of northeastern South Carolina. Over 30 inches of rain were measured in a few North Carolina locations, exceeding the highest single-storm rainfall amounts ever seen in those places.

In the face of Hurricane Florence, NCDOT Division of Aviation launched a massive drone deployment to support emergency response and recovery efforts. The slow-moving storm afforded DoA the chance to start planning more than a week before

landfall. The DoA team had to prepare for the worst, mobilizing their network of public safety, infrastructure, and UAS experts to support the state's emergency response.

They established a command center staffed with NCDOT employees, NCSHP troopers, emergency management staff and private contractors.

All of them served as key partners in what was a coordinated effort to respond to Hurricane Florence.

The NCDOT formed 15 drone teams and deployed them prior to the start of the storm near areas expected to be hit the hardest. The teams were ready to conduct all flight operations under Part 107 and



Fifteen drone teams from seven agencies flew over the affected areas and captured more than 8,000 videos and images.

15 drone teams

260+ missions

8,000+ videos and images

Live streaming of data

7 supporting agencies:

N.C. Department of Transportation

N.C. Department of Public Safety

N.C. Department of Environmental Quality

N.C. National Guard

U.S. Coast Guard

Federal Emergency Management Agency

Federal Aviation Administration

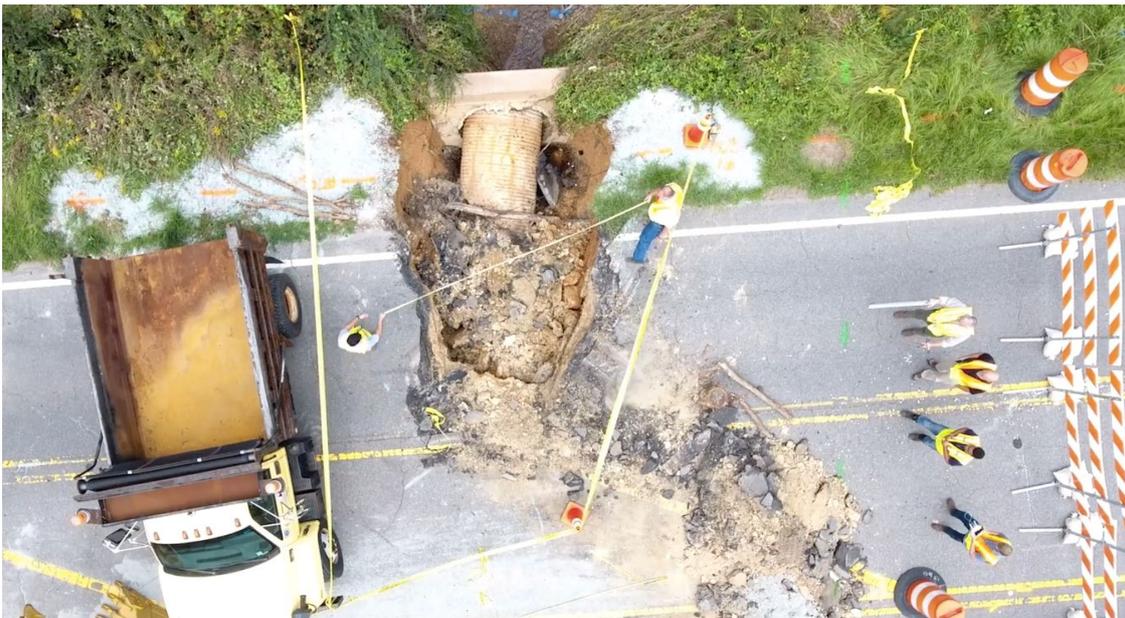
their COA, aiming to complement the state's traditional manned aviation response with a focus on inspecting and monitoring the state's transportation infrastructure. That included the roads, highways, bridges, airports, ferry terminals, waterways and dams that are spread across the region.

The teams also conducted the first BVLOS operations during emergency response in N.C. Drone pictures and footage clearly showed how some roads became washed out and unusable days after the storm as floodwaters rose. Public mobility, a critical issue as the storm progressed, was enhanced by UAS flights that monitored road conditions and traffic backups, enabling the Department of Public Safety to reroute traffic to support evacuations and alleviate congestion.

The 15 teams flew more than 260 damage assessment missions and captured over 8000 pictures and videos of affected areas.

Flooding from Hurricane Florence created numerous critical issues for the region. Once the storm ended, the team's focus was to assess areas that might be flooded and dams that could breach. The 15 teams flew more than 260 damage assessment missions over one third of the state. Teams captured 8000 pictures and videos of flooded roadways and towns, road and bridge washouts, eroded beaches, ferry terminals and more. Data gathered via drone was provided to emergency responders and news channels in order to tell people to avoid using I-40 and similar roads because of flooding.

As part of their post-hurricane assessment, their team used drones to live stream areas affected to NCDOT traffic management, division engineers and maintenance staff. This made a big difference as it helped plan recovery and response sooner. They were able to share live conditions with their leadership and emergency personnel, which has changed expectations around how information can be gathered and utilized to make key decisions during disaster response.



Teams using drones to assess damage in hurricane affected areas

PART THREE

POTENTIAL OF DRONES





This section features an overview of the more mature applications of drone use by a government entity, as well as applications that are just beginning but have immense potentials in the future.

PUBLIC SAFETY

According to a 2018 study by the Center for the Study of the Drone at Bard College, at least 910 U.S. state and local public safety agencies have acquired drones, up 82 percent from 2017. Public safety is one of the earliest adopters and the most mature market for commercial drones.

County and municipal law enforcement represents more than two-thirds of these agencies, followed by fire/EMS and emergency management departments. There are now more than twice as many

public safety agencies with drones than there are operating manned aircrafts, the study notes.

Drones can be used in most major types of public safety missions, including search and rescue, fire-fighting, hazmat situations, law enforcement, and disaster response.

The agility and data acquisition capability of drones make them important force multipliers on all stages of a public safety incident: pre, during and post.

Drones provide first responders in public safety missions with aerial intelligence that enables situational awareness that would otherwise be impossible to obtain, or too costly, in aircraft and personnel deployment. These unmanned aircrafts with more



agility and lower flight height limits also help close the intelligence gap between helicopter teams and ground teams, making their cooperation more efficient and informed.

In the example of the North Carolina Framework, NCDOT, as the core coordinator of the statewide drone network, supported the N.C. Department of Public Safety's creation of an emergency management working group to coordinate drone response during disasters. NCDOT also acts as a consultant and training partner to most public safety departments during the initial starting phase of their drone programs.

INFRASTRUCTURE CONSTRUCTION & MAINTENANCE

Government departments take large responsibility in the building and maintaining critical infrastructure such as transportation networks, water supply, and emergency medical facilities. Such infrastructure inspection, planning, and documentation have traditionally been limited to manual, "from the ground" methods. While aircraft like helicopters could be used in order to get an aerial vantage point, doing so is often too costly to be feasible, and it is often impossible or impractical for large manned aircraft to fly in the areas that inspection professionals need to access. For this reason, drones are a highly useful tool.

The United States has more than 616,087 bridges. 47,052 of these bridges are rated "structurally deficient" and need urgent repairs. The American Road and Transportation Builders Association estimates the cost to make the identified repairs for all 235,000 bridges is nearly \$171 billion, based on average cost data published by the Federal Highway Administration. Inspection of such bridges requires a crew of inspection professionals, heavy machin-

ery with lifts, and people rappelling from dangerous heights, meaning each inspection takes a few days.⁶

NCDOT is responsible for the safety of more than 18,000 bridges, pipes and culverts along North Carolina's highways. The department has had to take extensive measures to conduct bridge inspections, and traditional ways of inspecting bridges have proven to be costly and dangerous.

Drones are nimble enough to scan bridge spans and fly into hard-to-reach and hard-to-see crevices that humans find difficult to navigate. As they hover close to aging trusses, piers, and other structures, drones take high-resolution images and/or video enabling inspectors to collect and analyze data from the ground. Software assembles the information into 3-D models, which engineers can examine on computers.

In October 2018, North Carolina Agricultural and Technical State University (NCA&T) helped NCDOT on the "Developing a Safe and Cost-effective Flight Control Methodology for a UAV-enabled Bridge Inspection" project and delivered research results that proved drones to be agile, affordable tools for bridge inspection.

ENVIRONMENTAL WORK

A lot of environment-related work is the responsibility of government entities. State governments must make environmental rules and regulations, and have departments focused on natural resources, environmental protection, forestry, marine protection, and more. Furthermore, there are plenty of other departments, units, or other institutions that conduct work directly or indirectly related to the environment. For example, when infrastructure construction takes place near the habitat of an en-

6. 2019 US Bridge Report. Report. American Road and Transportation Builders Association. <https://artbabridgereport.org/reports/2019-ARTBA-Bridge-Report.pdf>

dangered species, all parties involved must take measures not to invade or jeopardize that habitat.

A state of natural beauty, North Carolina is home to national parks, 1.1 million acres of national forest, and the highest mountains east of the Mississippi. The NCDOT Division of Aviation (DoA) helped the Environmental Analysis Unit use drones to spray an invasive grass species on the Cape Hatteras National Seashore.

The drone accurately targeted and sprayed the invading species while keeping the environmentally sensitive area undisturbed by foot traffic.

DoA's UAS team also helps in the mapping and monitoring of Submerged Aquatic Vegetation (SAV). SAV species supporting valuable fisheries depend upon the nursery provided by the Albemarle-Pamlico

estuarine system. Much of this important habitat exists as vast expanses of underwater. North Carolina has more SAV acreage than any other Atlantic coast state except Florida, 99% of that coverage being within the Albemarle-Pamlico region.

Since 2018, the DoA UAS team has helped the Environmental Analysis Unit build its own drone program with a mix of in-house support from DoA and external service providers. The data captured with drones and the resulting analysis will serve as an important tool in the permit review processes across multiple agencies.

MEDICAL PACKAGE DELIVERY

Providing communities with essential health care access is one of the toughest challenges faced in much of the country today. Medical professionals from emergency responders and first aid workers





to time-stressed staffers in large hospitals face a host of challenges every day—challenges that UAS can help overcome.

Drones make it possible to deliver vaccines, blood and other lab samples, medications, and supplies to remote areas and to reach victims who require immediate medical attention within minutes, which could mean the difference between life and death. They can transport medicine within hospital walls and carry blood between hospital buildings, as well as give elderly patients tools to support them as they age in place. UAS offer a variety of exciting possibilities to healthcare.

NCDOT's Division of Aviation completed the nation's first medical package delivery over people using a drone in August 2018 as part of a national initiative that is informing drone use, policy and regulation. There is bright future for drone delivery in healthcare, but not without challenges:

- Drones will eventually need the equivalent of transponders to integrate them into the national air control systems.
- Ground-to-drone communications must be protected to prevent hackers from hijacking drones or using their data for nefarious purposes.
- Allowing drones to travel beyond the operator's line of sight significantly increases the com-

plexity and cost of pilot-to-drone communications.

- Medical drones must be especially robust and capable of fulfilling missions far beyond off-the-shelf capabilities.

Besides the common applications listed above, there are many other areas where drones have helped improve safety, efficiency, and productivity. NCDOT is one of the earliest adopters in the United States and has explored the various applications that may be relevant to any organization.

Current NCDOT Drone Uses

- Transportation infrastructure inspection
- 3D visualization for project design and public engagement
- Project assessment and documentation
- Coastal shoreline mapping
- Disaster response management and monitoring
- Threatened and endangered species monitoring
- Herbicide spraying
- Bridge inspection
- Subaquatic vegetation mapping
- Traffic count and monitoring
- Wetland delineation
- Worksite safety analysis
- Airport infrastructure inspection
- Bus terminal assessments
- Ferry route assessment
- Pedestrian walkway project documentation
- Port stockpile assessment and documentation
- Rail corridor mapping

PART FOUR

GETTING STARTED





LESSONS FROM NCDOT FOR DEPARTMENTS THAT ARE SETTING UP DRONE PROGRAMS

For government departments to start a drone program, there are many aspects to consider, such as funding, policy and regulations, manufacturer selection, and technical know-how. Many public officials also mention that convincing leadership and shaping positive public perception of drones can be major challenges when they build a drone program for their department.

What challenges will departments face? And, how can these challenges be overcome to start a successful government drone program? What follows is the advice from the NCDOT Division of Aviation's UAS team who have gone through intensive research and testing before setting up their own UAS program and have helped many other units and departments build drone programs from the scratch. There are a few things that departments need to consider before diving into starting a drone program.

Consideration #1

Identify needs, key applications, and benefits

It is important for a department to do preliminary research and reflection on what drones are capable of and how those capabilities fit into their routine work. For the most part, commercial drones are used for the dirty, tedious, and dangerous work. A department should be able to identify the areas where they need a safer, more comfortable working environment for their employees as well as more efficient or effective outcomes.

Drone technology has progressed exponentially from five years ago when drones were mostly toys and the pilots mostly hobbyists. The hardware improvements have enabled drones to be used in more advanced, data-intensive ways. This has made

the current commercial drone market broadly diverse with many different levels of available hardware and software, as well as service solution choices.

It is critical for a department to know their key needs, applications, and benefits they are looking for in order to make the most suitable and cost-effective choice of drone solutions.

Consideration #2

Decide the most suitable type of program

Not all departments need an in-house drone program, even if they determine that drones will substantially improve safety and efficiency in their key areas of work. If funding, staffing, or other possible challenges are holding an agency back from setting up an in-house drone program, there are many service provider companies in the commercial drone ecosystem.

Taking these aspects into consideration, departments should decide for themselves which is the best way for them to structure their programs in the initial phase. And when factors such as funding, resources, or internal skepticism change, departments can always reconsider the situation and let their drone programs evolve naturally.

Many departments in North Carolina did not have their own in-house program at the beginning, relying heavily on NCDOT for drone operation support when certain tasks required. When drone operations proved beneficial and affordable, these departments gradually shifted to setting up their own programs. Some had enough funding and human resources to set up in-house programs with several pilots in active service. Some seek help from external service providers. There are departments that have a mix of both, depending on the mission types and staff a mission needs.

Consideration #3

Get the proper consultancy and training

When a department is taking the possibility of starting a drone program into serious consideration, it is almost always more efficient to seek consultancy from either a more experienced department or from professional consultancy companies specialized in drones for enterprises.

Departments should be familiar with the basics of drones, what major types there are and what they are capable of under current technology and regulation context. These will help consultants provide the most feasible advice in the choices of program structure, hardware, and software selection. Having reliable and knowledgeable consultants will also help departments get through the complexity of policy and regulation process such as getting certain operation waivers and COA from the FAA.

Training is another critical aspect whether starting an in-house, hybrid, or entirely external program relying on service providers. Training a team to become certified and capable pilots is important. But it is equally important to train that team to be able to read, understand, and communicate the data captured by drones, turning data into actionable intelligence.

Consideration #4

Engage leadership and the public

Many departments report that when they first initiate a drone program, they quickly encounter skepticism from leadership or management. As a new technology with less than a decade of visibility in civilian industrial and government work, it can be hard to accept drones into a department's routine work without going through the initial proof of concept phase.

To many people, especially those with no previous experience working with drones, drones are still seen as toys for hobbyists. However, it usually does not take long to convince leadership or management of its possible value in operations. It is helpful to perform demos, and have a unit to showcase—these can be from donations, volunteer pilots in the community, or a loaned unit from a supplier.

Another source of skepticism will come from the public. Communities often relate drones to negative issues such as privacy violations or noise. Make sure the department and drone operation team maintain a constant conversation with local communities about how drones are deployed and what sort of data is captured for which purposes.

The general public is starting to have a more positive perception of drones as the industry matures. They respond especially well to incidents of drones saving lives in search and rescue missions, disaster response, emergency medical situations etc.



PART FIVE

DATA MANAGEMENT





TOOLS TO HELP MANAGE DRONE DATA

How does an agency translate drone data or imagery into actionable intelligence that helps complete mission tasks? There are plenty of software solutions, tools, and workflows that support drone data analysis of all complexity levels. For enterprises, not just in the public sector, it is important to properly store, archive, and present drone data. It is especially necessary for government entities to do so.

It is highly recommended that departments determine the workflow for their drone programs first, and align them with the procurement of corresponding software. Here are a few data management software types currently available on the market and suitable for public sector drone programs:

Flight planning and operations software:

It is important to find offerings that integrate with other software for seamless workflows and offer basic functionality and security features such as password unlock and local data mode or offline mode.

Photogrammetry/mapping software:

This tool is important for key applications like accident reconstruction, agriculture, surveying and more. For organizations using maps for internal or external communication and collaboration, they should look for a cloud based offering, while focused use for measuring and accuracy can use local based offerings depending on cost and time to process.



Data storage:

For operations focused on collecting data for a high-security site or other critical data (generally fixed fee), use a local based solution. For missions focused on streamlining, look for cloud based solutions (generally usage-based fee).

Fleet management:

As drones are more widely adopted by state agencies, users need to consider how they will maintain hardware, ensure efficient usage, and more. Some software suites will incorporate fleet management as a feature.

Virtual training software:

Simulation software can help train your teams and prepare them for operations in various scenarios.

ENSURING DATA SECURITY AND STEWARDSHIP IS PROPERLY MAINTAINED

Drones are not traditional Internet of Things (IoT) devices, as they do not connect directly to the internet, but instead are optionally connected to the internet via a user's mobile device. Additional vulnerabilities also exist due to the transmissions between the drone and remote controller and, in cases where a drone is lost and recovered, data stored on the drone's SD card.

When procuring a drone, it is important for an organization to identify their acceptance of risk and the nature of the data they are collecting with their drones, and to match these needs with a corresponding drone solution that puts control of the organization's data in their hands. Below are existing technical solutions that DJI has employed to address these three areas of concern.

1. Internet connectivity – offline mode
2. Transmission – AES 256 or equivalent encryption
3. Embedded storage with password protection

Drone Industry Data Security Recommendations

For agencies with the most stringent data concerns, below are four recommendations based on recent U.S. Department of Homeland Security recommendations, with an additional fifth recommended by DJI.

DHS Recommendation #1:

Deactivate Internet Connection from Devices Used to Operate the UAS

DHS Recommendation #2:

Take Precautionary Steps Before Installing Updated Software or Firmware

DHS Recommendation #3:

Remove the Secure Digital Card from the Main Flight Controller/Drone

DHS Recommendation #4:

If an SD Card is Required to Fly the Drone, Remove All Data from the Card After Every Flight

DJI Recommendation #5:

Encrypt Transmissions Between Remote Controller and Drone, and Password Protect Your Data

To learn more about the security of your data when flying DJI drones and how to implement these recommendations when flying DJI products, you can learn more here: <https://content.dji.com/your-data-is-not-our-business/>

PART SIX

Conclusion





Government entities are adopting drones for many work areas and the trend is growing.

It is important to develop ways for drone teams under different entities to collaborate, and to develop ways that help departments better build and manage their drone programs. The North Carolina drone framework proves the efficiency and effectiveness of setting up a centralized drone work team under one department that helps manage, give consultancy and training, and lead large collaboration operations.



To learn more about drones in government work,
visit <https://enterprise.dji.com/government>
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