

Unmanned Aircraft Use in North Carolina



**Report to the
Joint Legislative Oversight Committee on Information Technology
Joint Legislative Transportation Oversight Committee
Fiscal Research Division**

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1. Legislative Request

SECTION 7.16.(e) Until July 1, 2015, no State or local governmental entity or officer may procure or operate an unmanned aircraft system or disclose personal information about any person acquired through the operation of an unmanned aircraft system unless the State CIO approves an exception specifically granting disclosure, use, or purchase. Any exceptions to the prohibition in this subsection shall be reported immediately to the Joint Legislative Oversight Committee on Information Technology and the Fiscal Research Division. The following definitions apply in this section:

- (1) "Unmanned aircraft" means an aircraft that is operated without the possibility of human intervention from within or on the aircraft.
- (2) "Unmanned aircraft system" means an unmanned aircraft and associated elements, including communication links and components that control the unmanned aircraft that are required for the pilot in command to operate safely and efficiently in the national airspace system.

SECTION 7.16.(f) If the State Chief Information Officer determines that there is a requirement for unmanned aircraft systems for use by State or local agencies, planning may begin for the possible development, implementation, and operation of an unmanned aircraft system program within the State of North Carolina. This planning effort shall be accomplished in coordination with the Chief Information Officer for the Department of Transportation and the DOT Aviation Division Director. If the State CIO decides to plan for an unmanned aircraft system program, a proposal for the implementation of the program shall be provided by March 1, 2014, to the Joint Legislative Oversight Committee on Information Technology, the Joint Transportation Legislative Oversight Committee, and the Fiscal Research Division. At a minimum, the proposal shall include the following:

- (1) Governance structure to include the appropriate use at each level of government.
- (2) Guidelines for program implementation to include limitations on unmanned aircraft system use.
- (3) Potential participants.
- (4) Costs associated with establishing a program.
- (5) Potential sources of funding.
- (6) Issues associated with establishing a program to include limitations on entities that may already have purchased unmanned aircraft systems.
- (7) Recommendations for legislative proposals.

Report Focus

1. Introduction
2. Data Protection and Personal Privacy Considerations
3. Benefits of UAS to Government Agencies (7.16.(f) (1))
4. Benefits of Commercial UAS to North Carolina
5. Potential Participants (7.16.(f) (3))
6. Operational Considerations
7. Governance Structure (7.16.(f) (1))
8. Guidelines and Limitations (7.16.(f) (2), (6))



9. Estimated Costs Associated with Establishing a Program (7.16.(f) (4))
10. Potential Sources of Funding (7.16.(f) (5))
11. Recommendations for Further Legislation (7.16.(f) (7))

2. Introduction

More than a century after the Wright Brothers' first flight at Kitty Hawk in 1903, the emerging technology of Unmanned Aircraft Systems (UAS)¹ can establish North Carolina as a leader in the future of aviation. A test program established at the Next Generation Air Transport (NGAT) Center at NC State University in 2013 has demonstrated potential benefits of integrating UAS into the government sector and educational and economic development opportunities offered by future civilian and commercial use. The considerations presented in this report intend to balance those opportunities against the important considerations of safety, data protection, and citizen privacy.

Domestic use of UAS is strictly controlled by the Federal Aviation Administration (FAA). Currently, operations in the United States are limited to government use and research opportunities. Commercial use of UAS is not permitted. The FAA has indicated they will establish commercial policies in 2015. Most domestic government and research UAS today are "small UAS" solutions, weighing less than 55 pounds (with the majority weighing less than 15 pounds), and they are flown in areas that usually cover less than five square miles. All civilian operations must be flown within "Line-of-Sight" of flight crews either on the ground or in manned chase planes to maintain safety within the airspace.

In North Carolina, the procurement and use of UAS by government agencies is prohibited unless a special exemption is granted by the State Chief Information Officer (CIO) as provided for in the budget passed by the General Assembly in 2013. UAS operations can provide capabilities similar to those of manned flights that are currently operated by state and local government agencies. However, UAS are so versatile that the use of data collected by this technology for these and other purposes presents novel questions that must be addressed.

In August of 2013, the State CIO approved a test UAS program limited to research purposes under the direction of NGAT at North Carolina State University. Research operations are being conducted at the Hyde County airport, the NCSU Butner Beef Cattle Field Lab, known as the Butner Site, and a private airfield in Moyock, known as the Caratoke site. North Carolina's test UAS program, and any program developed in the future, will focus on job creation, education, and assessing the safe and responsible integration of UAS technologies by state and local government agencies. North Carolina presents the UAS industry and research community with diverse environments and natural resources for developing and evaluating UAS capabilities and products, and recent market analysis affirms that the industry, technologies, and opportunities will continue to grow.

¹ Unmanned Air Systems (UAS) typically includes the aircraft, sensor, flight controls, and other equipment that complete the end-to-end system. Other common terms include Unmanned Air Vehicle (UAV), which is the vehicle itself, Remotely Piloted Aircraft (RPA), and Drone, which in the military is used as a target for missile and gun tests.



The FY2014-15 North Carolina budget directs the CIO and the Department of Transportation (DOT) to evaluate whether there is a need for the use of UAS technology by state and local agencies, and to begin planning if a need for a UAS program is identified. A cross-agency and cross-functional UAS Working Group, led by the State CIO's office, NGAT, and DOT was established to assess policy, privacy, and governance issues, use cases, potential UAS users, data management, public and governmental outreach, and operational safety. For reasons outlined in this report, the working group concluded that the state should pursue UAS technology for use by state and local government entities. More information about the working group can be found in Appendix A.

It is important to note that the governance plan presented here would be executable until the FAA changes current rules regarding UAS operations. Although this governance plan would only apply to state agency and local government operations, additional analysis may be needed to craft state regulations regarding commercial operations in the future.

3. Safety, Data Protection, and Privacy Considerations

The working group recognizes the importance of establishing safety standards for UAS operations, protecting citizen privacy, and responsibly managing data collected by UAS. As North Carolina considers the integration of emerging UAS technology, priority should be placed on these considerations. Other states have proposed or enacted legislation regarding UAS operations. A summary of some of those measures is provided in Appendix B.

Safety

Unmanned aircraft can interfere with manned aircraft and place the pilot, crew, and passengers at risk. Additionally, UAS have the potential to injure people or damage property on the ground. The working group makes the following recommendations to support the safe integration of UAS flights:

1. The FAA has stated that "UAS must be integrated into the [National Airspace] without reducing existing capacity, decreasing safety, negatively impacting current operators, or increasing the risk to airspace users or person and property on the ground any more than the integration of comparable new and novel technologies."² The working group agrees this should remain a priority as operations and legislation are contemplated.
2. Manned flights conducted by state agencies or local government entities should be given consideration for priority and airspace.

² *Integration of Civil Unmanned Aircraft Systems (UAS) in the National Airspace System Roadmap*, US Department of Transportation Federal Aviation Administration, First Edition 2013



Data Protection

Data gained from UAS operations could be used in a variety of beneficial ways as discussed in this report; however, management and protection of data must be given careful consideration. The working group believes that UAS policies related to privacy and data collection should align with existing policies regarding manned flights or other established data collection technologies, and offers the following guidance:

1. Management and costs of data collected by government-operated UAS operations, regardless of format (Ex. - still images, video, infrared video, sound tracks, GPS coordinates), will be the responsibility of the state agency or local government entity sponsoring the mission. The UAS Governance Board (see Governance section of this report) should develop a plan and identify funding to coordinate and centralize data where appropriate.
2. The working group believes that the North Carolina Public Records Law definition of “public record” is broad enough to include records created during agency UAS operations. However, there are many exceptions, and novel legal issues are expected.
3. Agencies contracting with vendors for UAS operations must ensure that data collected through the use of UAS is the property of the State and shall not be used, nor be made available, for any purpose by the vendor.
4. State agencies will need to work with the Department of Cultural Resources on the retention, preservation, and disposal of data collected during UAS operations.

Personal Protection and Privacy

In addition to current FAA regulations, there are existing laws in North Carolina that may apply to issues of personal protection and privacy. These include, but are not limited to:

1. Lawfulness of Flight (NC Gen. Stat. § 63-13). Flight in aircraft over the lands and waters of this State is lawful, unless at such a low altitude as to interfere with the then existing use to which the land or water, or the space over the land or water, is put by the owner, or unless so conducted as to be injurious to the health and happiness, or imminently dangerous to persons or property lawfully on the land or water beneath. The landing of an aircraft on the lands or waters of another, without his consent, is unlawful, except in the case of a forced landing. For damages caused by a forced landing, however, the owner or lessee of the aircraft or the aeronaut shall be liable.
2. Dangerous Flying Misdemeanor (NC Gen. Stat. § 63-18). Any airman or passenger who, while in flight over a thickly inhabited area or over a public gathering within this State, shall engage in trick or acrobatic flying, or in any acrobatic feat, or shall except while in landing or taking off, fly at such a low level as to disturb the public peace or the rights of private persons in the



enjoyment of their homes, or injure the health, or endanger the persons or property on the surface beneath, or drop any object except loose water or loose sand ballast, shall be guilty of a Class 1 misdemeanor.

3. Qualifications of Operator (NC Gen. Stat. § 63-20). This provision requires a person operating an aircraft within the State, in any form of aerial navigation for which a license to operate aircraft issued by the United States government would be required if such aerial navigation were interstate, to have a federal license.
4. Jurisdiction of State over crimes and torts retained (NC Gen. Stat. § 63-24). State courts retain jurisdiction over any crime or tort committed by UAS operators within the State of North Carolina.
5. Secret Peeping (NC Gen. Stat. § 14.196.3). This statute identifies misdemeanor and felony regulations regarding unlawful peeping.
6. Electronic surveillance, interception of certain communications is prohibited (NC Gen. Stat. § 15A-287, Chap. 15A, Article 16 generally).
7. Law enforcement surveillance by means of UAS could be governed in the same manner as other means of aerial surveillance, but this requires further legal analysis.

4. Benefits of UAS to Government Entities

There are many potential benefits for government use of UAS technology. For agencies or local government entities that are currently operating manned flights, unmanned aircraft systems are generally less expensive and less risky than their manned counterparts. For agencies that refrain from utilizing manned flights due to cost or risk, or currently have no effective methods of conducting airborne research, UAS can be a novel and cost-efficient solution.

GPS World, in a November 18, 2013 article, identified FAA-envisioned uses that include security awareness, disaster response (including search and support to rescuers), communications and broadcast (including news/sporting event coverage), cargo transport, spectral and thermal analysis, critical infrastructure monitoring (including power facilities, ports, and pipelines), and commercial photography, aerial mapping and charting, and advertising.

The same article also identifies other commercial and public applications that the FAA will consider adding to the increasing demand for airspace access: crop monitoring, precision surveying and GIS, monitoring vital infrastructure, wildlife monitoring, traffic monitoring and control, firefighting support, and police services. The article also states that many more applications will emerge rapidly once regulations permit ready access to airspace.



The UAS Working Group identified potential uses for state government in the following areas:

1. Agriculture: Airborne cameras are able to detect drought, disease or insect infestation in crops. Crafts can scan several hundred acres of farmland in about 45 minutes. For statewide management, NC Department of Agriculture crop analysts would be able to report where irrigation, fertilization, crop types, or pest infestations are located for statewide management.
2. Precision Surveying and Mapping: UAS can conduct mapping and surveying in a manner similar to manned flights at lower risk and potentially lower cost.
3. Wildlife Monitoring: UAS are able to conduct aerial wildlife surveys and surveillance to enhance wildlife enforcement efforts. UAS can facilitate improved management of our game lands resources for hunters, fishermen, wildlife watchers, and other outdoor recreation.
4. Monitoring of Vital State Infrastructure: UAS has the potential to assess a wide array of infrastructure, ranging from bridges to rock and land slide sites. UAS can assist with safer and potentially less expensive inspections.
5. Public Affairs: Aerial video coverage of major state events and streaming video and photography of state and national parks could enhance marketing, outreach, and information sharing.
6. Cultural Resources: UAS could capture overhead imagery of historic locations and archeological sites that was previously unavailable due to cost or access to sensors.
7. Traffic Monitoring and Control: UAS would be able to provide real-time traffic monitoring and assist with traffic control.
8. Migration Monitoring and Stewardship: UAS can provide timely monitoring of sites with enhanced resolution.
9. NC Emergency Management:
 - a. Search and Rescue: UAS can provide both infrared and traditional video capability for search and rescue missions in coordination with a search party, especially over difficult terrain.
 - b. Pre- and Post-Disaster Photography: UAS can photograph areas before and after hurricanes or other natural disasters and help identify damage and priorities for emergency responders.
 - c. Terror Activity: UAS can fly into potentially hazardous areas in the event of a terrorist attack. UAS can also support terrorist mitigation teams with safe aerial imagery to support real-time situation awareness.



10. Local Emergency Management:

- a. Firefighting Support: Weather sensors, infrared and traditional cameras, and video can support firefighters' efforts to manage fires.
- b. Public Safety: UAS can provide support for police pursuits, standoffs, hostage situations, crime scene investigations, and other uses subject to search and seizure rules.
- c. 911 Response: UAS can put "eyes" on scene ahead of EMS, law enforcement, or fire crews, allowing emergency management officials to assess a situation and monitor an event before ground teams arrive.

5. Potential Participants

Given the potential government uses described in Section 4, the UAS Working Group identified the following list of entities that would benefit most from UAS operations in the state:

1. Department of Transportation
2. Department of Environment and Natural Resources
3. Department of Public Safety (including NC Emergency Management)
4. Department of Commerce
5. Department of Agriculture and Consumer Services
6. Local Law Enforcement Agencies
7. Colleges and Universities

6. Benefits of Commercial UAS to North Carolina

The Association for Unmanned Vehicle Systems International (AUVSI) Economic Impact Report predicts that the integration of UAS into the national airspace for commercial applications will create nearly 1200 UAS jobs in North Carolina by 2025³. The aircraft manufacturing industry is estimated to contribute slightly more than \$11.5 million dollars to the state's economy⁴, and the state's aerospace manufacturing sector is likely to expand with the commercialization of UAS technology. While there are multiple uses for UAS, the initial focus of North Carolina's UAS industry is expected to be in the agricultural⁵ and public safety markets.

North Carolina has the potential to play a significant role in the commercialization and broader expansion of UAS technologies. Existing data suggests the state has a substantial R&D capacity related

³ AUVSI Economic Report, 2013

⁴ IMPLAN 2011, value added, sector 284 Aircraft Manufacturing

⁵ The agricultural industry includes forestry, fishing and hunting



to unmanned systems⁶. North Carolina also receives significant funding from the Department of Defense, with more than 50 companies already engaged as defense prime contractors.⁷ This existing labor pool and supply chain will be poised to grow in the near term as more firms test and deploy UAS, and the development of a UAS ecosystem will likely enhance existing development of products and lead to technology transitions and supply chain co-locations. This ecosystem will connect industry with workforce, veterans with jobs, testing facilities with research teams, users with developers, and local talents with opportunities.

In partnership with NGAT, North Carolina created a UAS testing center at Hyde County Airport called the Gull Rock Test Site (GRTS).⁸ NGAT's continuing operations allow North Carolina to focus on a statewide integration strategy through the UAS ecosystem model, which utilizes natural resources across the state for economic growth and access to UAS capabilities.

UAS for agriculture applications are predicted to dominate the emerging commercial markets. North Carolina is well suited to support the industry growth, market testing, and talent development expectations for these markets. With 30,000 acres of farm land, maritime access, and a sparse population, the Gull Rock UAS Test Site is well positioned on the east coast to fulfill the testing and research requirements for agriculture UAS use. The eighteen Department of Agriculture research stations across the state also present a variety of UAS testing and research opportunities for industry and academic activities. These resources are already receiving significant interest through NGAT, including the need to connect with agricultural scientists and consultants in the state.

Beyond agriculture, North Carolina offers three distinct geographic areas. Ranging from mountains on the west, to the central piedmont, with plains and coastline on the east, few other states offer holistic access to all of these areas for testing and development. Systems can be tested in multiple environments to validate aircraft performance, sensor performance, or geographic impacts. Companies can settle across the state in the region that best meets their requirements, as the existing aerospace industry has already done, ranging from GE in Asheville to TCOM in Elizabeth City. NGAT is currently evaluating the need and potential for adding an additional seven COA locations across the state to meet research interests of industry, academic, and agency partners.

This statewide approach to accessing airspace and building infrastructure for UAS testing and development will not only benefit industry, it will also support continued FAA research. North Carolina's integration approach will provide the FAA with lessons learned while the state continues to explore new opportunities for accessing the airspace, such as statewide COAs specific to agriculture and emergency management operations. These operations will continue to follow all North Carolina

⁶ *The 2009 North Carolina Defense Asset Inventory and Target Industry Cluster Analysis, A Strategy For Growing North Carolina's Defense and Homeland Security Economy*, North Carolina Military Foundation, July 2009

⁷ *The 2009 North Carolina Defense Asset Inventory and Target Industry Cluster Analysis, A Strategy For Growing North Carolina's Defense and Homeland Security Economy*, North Carolina Military Foundation, July 2009

⁸ NC State University and NC Department of Commerce, Gull Rock Test Site Economic Impact Study. 5/6/13



governance requirements and could position the state as the first to establish a governance model that would allow expanded use in these areas.

Detailed information on the range of potential employment impacts can be found below⁹.

Analysis Results: 2025 Projected Range of Jobs and Labor Income						
Expansion Scenario			Direct Jobs	Indirect + Induced	Total Jobs	Total Labor Income
1	Services and Manufacturing	Baseline 1	128	114	242	\$12,124,000
		5 companies	638	566	1,204	\$60,620,000
		10 companies	1,275	1,132	2,407	\$121,240,000
		20 companies	2,551	2,262	4,813	\$242,479,000
2	Only Services	Baseline 2	121	100	221	\$10,876,000
		5 Companies	605	498	1103	\$54,378,000
		10 Companies	1,210	995	2,205	\$108,756,000
		20 Companies	2,420	1,989	4,409	\$217,512,000
3	Only Manufacturing	Baseline 3	7	14	21	\$1,248,000
		5 Companies	33	68	101	\$6,242,000
		10 Companies	65	137	202	\$12,484,000
		20 Companies	131	273	404	\$24,967,000

Additional manufacturing potential exists and is summarized in the table below.

Analysis Results: 2025 Projected Range of Gross Domestic Product			
Expansion Scenarios			Total Effect on GDP
1	Services and MFG	Services & MFG Baseline	\$15,997,000
		5 companies	\$78,805,000
		10 companies	\$157,609,000
		20 companies	\$315,219,000
2	Services	Services Baseline	\$14,114,000
		5 Companies	\$69,389,000
		10 Companies	\$138,777,000
		20 Companies	\$277,554,000
3	Manufacturing	MFG Baseline	\$1,883,000
		5 Companies	\$9,416,000
		10 Companies	\$18,832,000
		20 Companies	\$37,665,000

⁹ Statistics provided by the NC Department of Commerce

7. Operational Considerations

A needs assessment was circulated among state agencies to determine how UAS might assist their operations. The results revealed an interest in accurate and reliable high definition video, thermal imagery, multispectral, and possibly light/radar (LIDAR) imagery. Based upon this information the UAS Working Group discussed at length the pros and cons of state-owned aircraft and determined that there are two near-term options for state agencies to conduct UAS operations. The proposed governance model works effectively with either option.

1. The first option would be through a leasing arrangement with vendors. The leasing arrangements can be managed by each agency or through a central organization. For example, UAS assets leased or owned by NGAT could be contracted by agencies (subject to availability) or additional contracts could be established.
 - a. Pros:
 - i. A leasing arrangement allows the state to benefit from the latest technology and provides agencies with access to various types of aircraft that are appropriate for a wide range of missions.
 - ii. A leasing arrangement relieves the agencies of the cost and burden of having to maintain aircraft and continue to prove airworthiness.
 - iii. The vendor would be responsible for the purchase, care, and maintenance of the payload on board its own aircraft, whether video camera, still camera, infrared sensor, or other technology.
 - iv. The vendor who offers UAS services would have to provide a manned pilot in instances when the FAA requires UAS to be operated by a trained and FAA-licensed manned aircraft pilot.
 - v. UAS aircraft are flown with an operations core (transmitters, equipment, vehicles, data storage devices, sensors). A leasing arrangement gives the vendor responsibility for logistics and maintenance of that equipment.
 - b. Cons:
 - i. The costs associated with a vendor's lease option are not yet known. A by-hour or by-day arrangement with a vendor for end-to-end services could be cost prohibitive.
 - ii. The possibility of vendors utilizing proprietary sensors, algorithms, techniques that have public use restrictions.
 - iii. Under current conditions, the state as the public agency is still responsible for confirming the airworthiness of the UAS, ensuring the crews are properly trained, and obtaining a COA for every potential flight location.
2. The second option would be for state agencies and/or local government entities to directly purchase unmanned aircraft systems.



- a. Pros:
 - i. Small UAS aircraft (less than 55 pounds) can be cost-efficient for state and local agencies that have aerial asset needs, and the costs of operations and maintenance can be relatively low.
 - ii. Sensors, data collection, and processing techniques that are not proprietary to vendors.
 - iii. Self-containment of UAS capabilities- staff, equipment, policies.
- b. Cons:
 - i. Maintaining flight currency could be added to existing employee workloads.
 - ii. The cost of dedicated crews (if needed) must be factored into new programs, including maintaining medical certificates for pilots and observers.
 - iii. The capabilities of the agency-owned UAS potentially limit what missions could be performed.
 - iv. The design life for a robust small unmanned aircraft system is typically 75-100 flights between major repairs/replacement. That lifecycle can be anywhere from 2 to 3 years. Although the system is more affordable than a manned aviation asset, asset management costs must be factored into the purchase decision analysis, not just the initial acquisition.
 - v. More difficult to maintain common processes and resources for data management, equipment logistics, potential inter-agency sharing, and reporting.

8. Governance

As the FAA determines how to safely incorporate this technology into U.S. airspace, it is critical that the state define a governance plan for operations and data management if it pursues the use of UAS technology. The proposed governance process for standard and emergency/time-critical operations can be seen in Figures 1 and 2. Roles and responsibilities for North Carolina UAS governance are outlined in the paragraphs below.

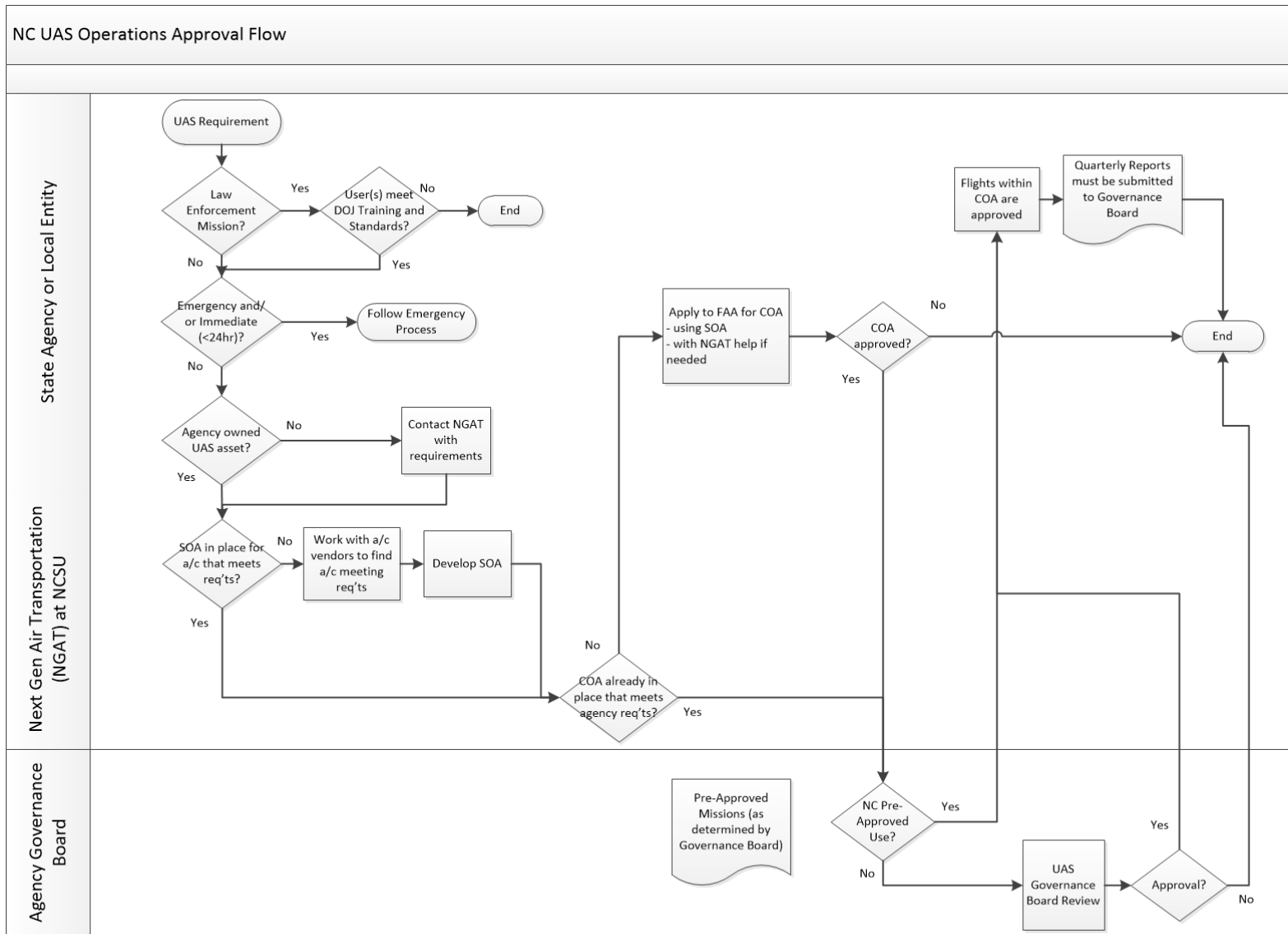


Figure 1: Standard Approval Process

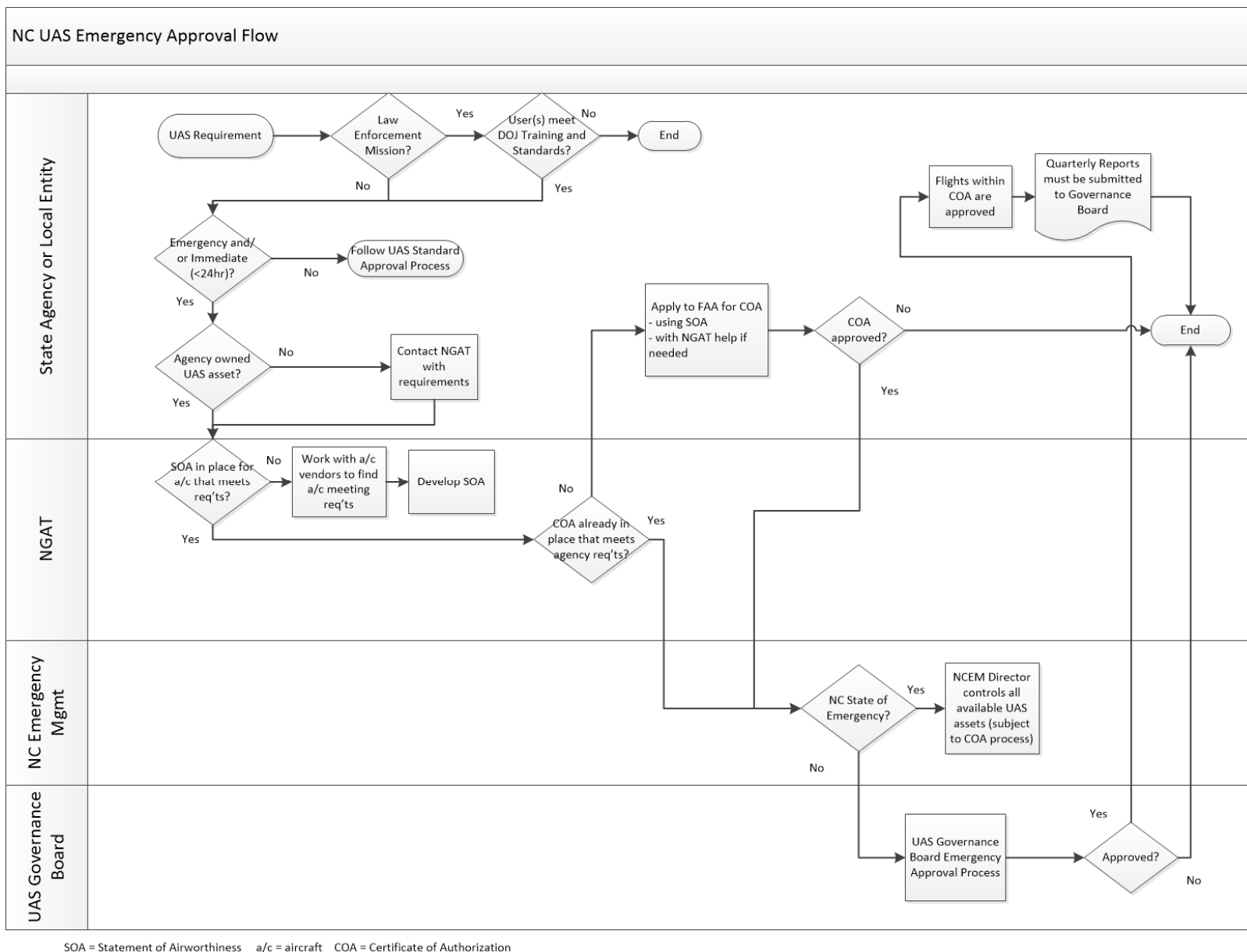


Figure 2: Emergency/Time Critical Approval Process

Federal Aviation Administration

The first governance level for North Carolina's UAS operations will be the FAA. If a state agency or local government entity has not received FAA approval for a specific purpose, aircraft, and location, the flights will not be allowed. Currently, the FAA requires a Certificate of Authorization (COA) for any UAS flights in US States or territories. From the FAA's website:¹⁰

A COA is an authorization issued by the Air Traffic Organization to a public operator for a specific UA activity. After a complete application is submitted, FAA conducts a comprehensive operational and technical review. If necessary, provisions or limitations may be imposed as part of the approval to ensure the UA can operate safely with other airspace users. In most cases, FAA will provide a formal response within 60 days from the time a completed application is submitted.

As FAA processes and requirements for UAS operations change, all state government entities must continue to adhere to the most current rules and regulations as a minimum requirement to operate UAS in North Carolina.

UAS Governance Board

For the second governance level after the FAA, the UAS Working Group recommends a cross-functional board, called the "UAS Governance Board" to govern UAS operations within the state. The state's 911 Board provides the model for the UAS Governance Board because of parallels in governance and operation. The 911 Board has successfully carried out its mission to "consolidate the State's Enhanced 911 system under a single board with a uniform 911 service charge to integrate the State's 911 system, enhance efficiency and accountability, and create a level competitive playing field among voice communication technologies." The board is housed at ITS, so its operations are well known to ITS.

911 Board members represent a cross section of interested sectors; e.g. law enforcement, fire, EMS, local government, and telecommunications providers. Proposed members of the UAS Governance Board are as follows:

State Agency Representatives (6)

- State Chief Information Officer (or designee) will act as chair
- Secretary of the Department of Transportation (or designee)
- Secretary of the Department of Energy and Natural Resources (or designee)
- Secretary of the Department of Public Safety (or designee)
- North Carolina Attorney General (or designee)
- Next Generation Air Transportation Center Director (or designee)

¹⁰ http://www.faa.gov/about/office_org/headquarters_offices/ato/service_units/systemops/aaim/organizations/uas/coa/



Governor and Legislative Representatives (7)

- Member of the State Bar appointed by the Governor
- Two (2) members of the general public having knowledge and expertise in matters of aviation or information privacy appointed by the Governor
- Member appointed by the General Assembly upon recommendation of the President Pro Tempore of the Senate
- Member appointed by the General Assembly upon the recommendation of the Speaker of the House of Representatives
- A member of the North Carolina Sheriffs' Association or Chiefs of Police Association appointed by the Governor upon nomination by the President of the Association
- A member representing local first responders appointed by the Governor

The 911 Board is funded by a service fee (NCG.S. 62A-43) collected by telecommunications providers and retailers of prepaid cellular telecommunications services consistent with Federal Communication Commission Orders. UAS Governance Board funding is the subject of an expansion budget request. If properly funded, clerical and professional staff support for the UAS Governance Board could be provided by the Office of Information Technology Services and the Department of Transportation. As with the 911 Board, the expected requirement is an Executive Director and a clerical staff person who would coordinate and facilitate meetings, execute communications and outreach efforts, and other similar duties.

The Board Chair would determine the frequency of in-person meetings and whether and how often the board will meet to provide discussion, approvals, and other business via electronic means. Some potential powers and duties of the UAS Governance Board include:

- Establish and update statewide policies for all UAS operations
- Determine and publish a list of pre-approved state uses¹¹
- Create standards for UAS use and operations
- Approve or disapprove UAS operations
- Meet as required to address UAS requests or discuss updates to statewide policies
- Establish an expedited process for reviewing time-critical or exigent requests
- In coordination with the Department of Justice, establish and approve law enforcement training and standards for UAS operations
- Research legal implications (for example, search and seizure or use of warrants) of law enforcement UAS operations

¹¹ The working group foresees certain categories of UAS operations that are low risk and might warrant pre-approval from the UAS Governance Board. This would relieve the Committee of having to approve every mission request while still ensuring the safety and privacy of citizens. While the ultimate decision is up to the Committee, some examples the working group discussed that might be considered were operations for crop analysis, forestry, coastal erosion, wildlife studies, mapping, land surveys, environmental analysis, and travel/tourism.

Should the General Assembly approve this plan, it is proposed that UAS Governance Board approval for UAS operations would supersede the current State CIO waiver requirement.

Next Generation Air Transportation Center (NGAT) at NC State University

The NGAT will play a critical role in the state's UAS operations. A Statement of Airworthiness (SOA) is a required element of the process when requesting a COA from the FAA. NGAT is available to all state agencies and local government entities to assist with obtaining a SOA. Additionally, the NGAT could assist agencies in obtaining COAs and in collaborating with UAS vendors for system acquisition or leasing options.

Specifically, the NGAT could:

- Assist in developing UAS Statements of Airworthiness when requested by agencies or local government entities
- Assist agencies and local government entities in obtaining COAs when requested
- Act as the UAS research, test, and development point of contact for vendors looking for entry into North Carolina
- Establish and maintain lease contracts with UAS vendors that can be used by state agencies or local government entities for approved UAS operations
- Establish and maintain a fee structure for leasing of UAS planes and operators from private vendors
- Establish and maintain a fee structure for NGAT-owned aircraft and operations services for use by state agencies and local government entities.

(Note: should other university programs be established, these would be shared responsibilities)

Other Educational Entities

The UAS Governance Board would have approval authority should other education entities desire to participate in UAS research and operations. As these programs come online, the Governance Board can establish roles and responsibilities similar to those of NGAT.

State Agencies and Local Government Entities

Until otherwise determined by the state's Legislative branch, UAS operations would not be permitted without adherence to these governance policies. Currently, the minimum requirement for an agency to operate UAS is an FAA COA, which requires the following four elements:

1. Validation that the organization is a public agency of the state, verified on letterhead from the State Attorney General.
2. A Statement of Airworthiness, self-certifying the aircraft system as technically safe to operate.



3. An airspace description characterizing the specific flight location, air traffic activities, and communication coordination plans.
4. A set of Standard Operating Procedures (SOPs) that describe preflight communication requirements, flight operations, emergency operations, communication procedures, and flight objectives, including anticipated missions.

Additionally, and depending on mission type, the agency must obtain UAS Governance Board approval before flight operations would be allowed.

North Carolina Emergency Management

In the event of a declared State of Emergency in North Carolina, the Department of Emergency Management (NCEM) would be notified by the NGAT and the UAS Governance Board of any available UAS assets. NCEM could repurpose UAS assets as needed for disaster preparation or recovery or other emergency uses, but must do so subject to the FAA's COA process. NGAT could assist in emergency COA applications should NCEM choose to exercise this option. If not, then NCEM should allow agencies to operate subject to the FAA and NC governance processes.

North Carolina Information Sharing and Analysis Center

Citizens are concerned about personal privacy, particularly as it relates to the use of UAS technology by law enforcement agencies. Public opinion has been largely consistent in expressing concerns that the Fourth Amendment or other personal rights could be violated by UAS use.¹² Law enforcement operations are highly sensitive in nature, and there is a need to ensure that rules of evidence, search-and-seizure, court admissibility, and right-to-privacy are addressed. For this reason, the UAS Working Group recommends that the UAS Governance Board work with members of the law enforcement community and the North Carolina Information Sharing and Analysis Center (NC ISAAC) team to address these issues.

NC ISAAC is an information sharing organization for law enforcement. It is led by the North Carolina State Bureau of Investigations, but has analytic and investigative support from the FBI, Homeland Security, NC National Guard, Division of Alcohol Law Enforcement, NC State Highway Patrol, NC State University Police Department, Sheriff's Association of NC, and the Apex Police Department. Additionally, NC ISAAC partners with over 40 federal, state, regional, and local agencies, including the North Carolina Chiefs of Police, Department of Corrections, Municipal Police Departments, the NC Attorney General's Office, NC State Ports Authority, and many others.

¹² Monmouth University Poll – August 2013; Rasmussen Reports poll – October 2013; Associated Press Article *States Consider Regulation of Drones in US Skies* – August 2013



9. Guidelines and Limitations

Prior to securing approval from the proposed UAS Governance Board, any government entity that seeks to operate UAS in North Carolina must satisfy the FAA's approval process, which is extensive and requires thorough planning. NGAT currently has FAA COAs and State CIO approval for three locations (Hyde County, Butner, and Caratoke) and is preparing more COA locations to continue flights for research, development, industry partnership, and state operations. Other organizations could benefit from using NGAT's COAs through an expedited FAA process.

Because of the low costs of many UAS aircraft and the ease of obtaining them, unsanctioned operations within the state are and will remain a risk. It is incumbent upon the state to provide a manageable process for UAS approvals, which is the intent of this document. The UAS Governance Board could consider what penalties it would impose for rogue operations of UAS assets by state agencies and local government entities and who has the authority to apply those penalties.

Law enforcement operations would be subject to the Department of Justice training and standards regulations established by the UAS Governance Board.

Funding is a current limitation, as neither agencies nor the state as a whole has funding in place for UAS governance or operations (with the exception of startup costs provided by the General Assembly in 2013 for DOT/NGAT startup).

At the time of implementation of these policies, should an agency or government entity have already purchased a UAS aircraft, its use would be subject to the governance model discussed here. The only known authorized use as of this writing is for the NGAT at its three locations, so any other government-sponsored use must cease until appropriate approvals have been gained.

10. Outreach and Communications

Public outreach, education, and the free exchange of information are necessary elements of any government program that raises concerns about citizen privacy and data collection. The North Carolina UAS Program is being developed with transparency and a commitment to maintaining open communications with the public. Establishing policies that respect privacy considerations is as important to the success of UAS in the state as the safety and application development research being conducted by NGAT.

NGAT is currently the lead organization for UAS research and testing. Using NC State University resources and communication channels, NGAT provides information about all current UAS flight activities, including planned flights, data from flights, and flight descriptions (aircraft, sensors, flight times, etc). This information will be shared publicly through the NGAT website when it is re-launched in the spring of 2014.



NGAT, NCSU Communications, DOT Communications, and the State CIO's Office are developing communication tools to help educate the public about the state's research and evaluation of UAS integration and development. This coordination across agencies is essential to building public trust and understanding about this emerging industry.

NGAT is evaluating its options for hosting public demonstrations of UAS at FAA-approved flight locations. These demonstrations will focus on the potential of UAS for agriculture imagery capture and emergency response situation awareness monitoring. These events, along with news articles, research reports, and other announcements will be shared through the NGAT and NCSU websites. NGAT staff are also available to speak at events where UAS integration and applications may be of interest to the audience, including agriculture, emergency management, flying (i.e. pilots, air traffic control, airport operations), or education-related events.

11. Estimated Costs of Establishing a UAS Program

Governance Board Support

To be effective as a governing body, the UAS Governance Board will require personnel support comparable to the support given to the 911 Board, including a board director, meeting facilitation, communications, and outreach. The UAS Governance Board would require an Executive Director and a data analyst. These costs are estimated at \$215,000 per year (including personnel, benefits, overhead, peripherals, furniture, and space).

Centralized Data Storage and Maintenance

If properly funded, UAS data should be collected, centralized, catalogued, indexed, and shared among agencies, allowing for a more efficient use of resources. For example, if DENR wants to collect watershed data in an area where DOT needs to study road conditions, the data should be shared between agencies to prevent duplication.

One vision for the UAS program would be to include UAS video in the NC OneMap System to add a layer of video capability to the maps.

Although centralized data storage and management has not been fully planned, initial estimates indicate that one full FTE would be needed to manage the data, along with storage costs and integration costs. This is estimated at \$100,000 - \$150,000 per year.

Operations

The data below has been provided by the NGAT as an estimate of start-up and recurring costs of operating and maintaining a complete UAS system, along with data storage, analysis, and upkeep.



State agencies have options that would allow them to lower the costs for a smaller operations package. For example, if an agency has an instrument-rated manned pilot on staff and wants to train that individual in UAS operations, the recurring costs of that person's salary would already be accounted for.

Utilizing a contracting model for UAS use (paying for the entire service from a vendor) would eliminate many of the startup costs associated with establishing a UAS program, however, estimates for the cost of this type of vendor arrangement are not yet known.

Each agency would have to determine which elements of the below best meet their needs. Minimum requirements would include the vehicle, computing hardware, pilot, and travel.

UAS Program Costs		Estimated Start-up Costs	Annual Recurring	Description
Equipment				
	Fixed Wing Aircraft system	\$ 150,000	\$ 22,500	complete aircraft system (2 aircraft) with HD camera payloads
	Multi-copter Aircraft system	\$ 65,000	\$ 9,750	complete aircraft system (1 aircraft) with HD payload
	Infra-red payload	\$ 20,000	\$ 3,000	small IR payload for use on both systems
	Mobile Command Vehicle	\$ 50,000	\$ 7,500	response vehicle with connectivity, radio gateway, storage, display and computing racks
	Radios	\$ 5,000	-	for field communications
	4x4 vehicle	\$ 10,000	-	for operational area mobility
	Data Management System	\$ 130,000	\$ 65,000	for video analytics, storage, cataloguing, sharing, audits
	Flight Ops Management Software	\$ 130,000	\$ 65,000	for resource, crew, and flight ops management, supports FAA/state reporting requirements
	Computing hardware	\$ 25,000	\$ 3,750	data repository
	Field Supplies	\$ 15,000	\$ 3,750	Generators, batteries, tents, binoculars, tools, etc to support field operations
		\$ 600,000	\$ 180,250	
Staffing		salary		
	Chief Pilot	\$ 65,000	\$ 65,000	This is a UAS pilot. Recommend at least an FAA instrument rated pilot.
	Observer #1	\$ 25,000	\$ 25,000	Ground observers must have Class 2 FAA Medical certificates.
	Observer #2	\$ 25,000	\$ 25,000	Ground observers must have Class 2 FAA Medical certificates.
	Data Analyst	\$ 55,000	\$ 55,000	This position will manage the UAS captured data providing mission analysis and meeting state policy requirements.
	Mission Coordinator (Range Manager, Airspace Coordinator)	\$ 50,000	\$ 50,000	This position will oversee flight operations, coordination with FAA, flight crew training and currency status.
		\$ 220,000	\$ 220,000	
Resources				
	Travel for UAS operations	\$ 5,000	\$ 10,000	
	NGAT Consulting Support	\$ 25,000	\$ 25,000	
	TOTAL	\$850,000	\$ 435,250	



12. Potential Sources of Funding

1. A request for appropriations to support the costs associated with supporting the UAS Governance Board is being submitted for FY2014-15. If the challenges of predicting usage can be solved, another option would be to collect permitting fees for UAS operations.
2. The NGAT has outlined a plan for an Industry Membership Program that would provide vendors with access to flight test facilities and allow them to sponsor research directly with the university. Estimated revenues from the membership dues are \$100,000 in 2014 and \$500,000 in 2015. This money would support research operations conducted with the NGAT/vendor partner, and in turn could be used for bettering the infrastructure at all NCSU-sponsored UAS facilities in the state.
3. For agencies that currently operate manned flights for the capabilities mentioned in this document (i.e. mapping), the by-hour cost of owning and operating a UAS could be significantly lower, allowing agencies to maximize their resources through cost avoidance.
4. The 2013 budget secured approximately \$2.5M for DOT to assist in establishing the UAS program. Some of that funding could continue to be applied to ongoing costs, but the non-recurring funding would not cover any personnel requirements.
5. Additional sources of funding could be through Grants or other federal funding, and through traditional equipment procurement channels.

13. Recommendations for Further Legislation and Policy Implications

1. The recommended Governance structure is through a governing board. Should the General Assembly require a Board structure, legislative action would be required. The Board would have the authority to establish review and approval processes for non-law-enforcement operations within the state and carry out the duties discussed in Section 8 of this report.
2. Should legal opinion about the laws described in Section 3 of this report determine that said laws do not apply to UAS operations, the North Carolina General Assembly should consider enacting parallel laws specifically directed at UAS operations.
3. Consideration could be given to allowing the owners of UAS data to charge for the time and technology associated with public records requests. Searching for, copying, and providing specific UAS-collected data (typically large HD or infrared imagery and video files) could involve significant expense. Additional challenges include how an agency permits inspection (not just copying) of these records and the format in which they are produced in response to a records request.



4. Current session law dictates that the State CIO must approve all UAS operations by local and state government entities. An update would be required to indicate that all government UAS operations in the state will be governed according to this report/plan moving forward.
5. Military Affairs - Executive Order 34 requires cabinet agencies to notify the commanding officer of a military installation and the governing body in affected counties and municipalities of projects that may impact military installations. Designated Military Affairs Awareness Coordinators in the cabinet agencies should be familiar with their agency's use of UAS technology and work with the Governor's Military Advisor and the DENR Military Liaison on any military readiness or training concerns which could be impacted by the agency's use of UAS technology.
6. Long Term Issues - The potential for FAA expansion of UAS technology use for commercial purposes and over populated areas might require future study and evaluation.



Appendix A: UAS Working Group

A cross-agency and cross-functional UAS Working Group was established to research issues and prepare this report. The Working Group and associated subgroups met regularly starting in October 2013 and included members from the following organizations:

- State Chief Information Officer/Office of Information Technology Services
- North Carolina State University (NCSU)
- Duke University
- Next Generation Air Transportation Division at NCSU
- Department of Transportation
- Department of Energy and Natural Resources
- North Carolina Military Foundation
- Governor's Policy and Legal offices
- North Carolina Innovation Center
- North Carolina National Guard
- Department of Commerce
- Research Triangle Institute
- S 4 Risk Management
- College of the Albemarle
- North Carolina Civil Air Patrol
- North Carolina Emergency Management Division (Department of Public Safety)
- City of Greensboro

Appendix B: UAS-Related Legislation in Other States

1. **California.** AB 1327 restricts law enforcement use of UAS by requiring law enforcement agencies to obtain a warrant before using unmanned aerial vehicles to conduct surveillance activities, with several exceptions.
2. **Florida.** SB 92 defines UAS and limits their use by law enforcement. Under this legislation, law enforcement agencies may use UAS if they obtain a warrant, there is a terrorist threat, or “swift action” is needed to prevent loss of life or to search for a missing person. The law also enables someone harmed by an inappropriate use of UAS to pursue civil remedies and prevents evidence gathered in violation of this code from being admitted in any Florida court.
3. **Idaho.** SB 1134 defines an “Unmanned Aircraft System,” requires warrants for their use by law enforcement, establishes guidelines for their use by private citizens and provides civil penalties for damages caused by improper use.
4. **Illinois.** The state enacted two new laws in 2013. Both measures define “drone” as any aerial vehicle that does not carry a human operator. Illinois HB 1652 prohibits anyone from using UAS to interfere with hunters or fisherman. SB 1587 allows UAS to be used by law enforcement with a warrant, to counter a terrorist attack, to prevent harm to life or to prevent the imminent escape of a suspect, among other situations. Law enforcement agencies must destroy all UAS-collected data within 30 days. A supervisor at the law enforcement agency may retain particular information if there is reasonable suspicion it contains evidence of criminal activity.

The law also requires the Illinois Criminal Justice Information Authority (CJIA) to report on its website every law enforcement agency that owns UAS and the number they own. Each law enforcement agency is responsible for giving this information to the Illinois CJIA.

5. **Montana.** SB 196 limits when information gained from the use of unmanned aerial vehicles may be admitted as evidence in any prosecution or proceeding within the state. The information can be used when it was obtained pursuant to a search warrant, or through a judicially recognized exception to search warrants. The new law defines “unmanned aerial vehicle” as “an aircraft that is operated without direct human intervention from on or within the aircraft,” not including satellites.
6. **Oregon.** HB 2710 defines UAS as an unmanned flying machine, not including model aircraft. The law allows a law enforcement agency to operate one if it has a warrant and for enumerated exceptions including for training purposes. It also requires that UAS operated by a public body be registered with the Oregon Department of Aviation (DOA), which shall keep a registry of UAS operated by public bodies. The law grants the DOA rulemaking authority to implement these provisions. It also creates new crimes and civil penalties for mounting weapons on unmanned aerial vehicles and interfering with or gaining unauthorized access to public UAS. Under certain



conditions a landowner can bring an action against someone flying a UAV lower than 400 feet over their property.

The law also requires that the DOA must report to legislative committees on the status of federal regulations and whether UAV's operated by private parties should be registered in a manner similar to the requirement for other aircraft.

7. **Tennessee.** SB 796 addresses the use of UAS by law enforcement. The new law enables law enforcement to use them in compliance with a search warrant, to counter a high-risk terrorist attack and if swift action is needed to prevent imminent danger to life. Evidence obtained in violation of this law is not admissible in state criminal prosecutions. Additionally, those wronged by such evidence can seek civil remedy.
8. **Texas.** HB 912 enumerates 19 lawful uses for unmanned aircraft, including their use in airspace designated as an FAA test site, their use in connection with a valid search warrant and their use in oil pipeline safety and rig protection. The law creates two new crimes – the illegal use of an unmanned aircraft to capture images and the offense of possessing or distributing the image. Both offenses are class C misdemeanors. “Image” is defined in the law as any sound wave, thermal, ultraviolet, visible light or other electromagnetic waves, odor, or other conditions existing on property or an individual located on the property. Additionally, the measure requires the Department of Public Safety to adopt rules for use of UAS by law enforcement and mandates that law enforcement agencies in communities of over 150,000 people make annual reports on their use. Texas HCR 217 altered reporting requirements from the original HB 912.
9. **Virginia.** HB 2012 and SB 1331 prohibit UAS use by any state agencies “having jurisdiction over criminal law enforcement or regulatory violations” or units of local law enforcement until July 1, 2015. Numerous exceptions to the ban are enumerated, including enabling officials to deploy UAS for Amber Alerts, Blue Alerts and use by the National Guard, by higher education institutions and search and rescue operations. The enacted bills also require the Virginia Department of Criminal Justice Services and other state agencies to research and develop model protocols for UAS use by law enforcement in the state.
10. **Alaska.** The state adopted HCR 6 creating a legislative Task Force on UAS. The task force is charged with creating written recommendations and legislation that allows for UAS to be used in a way that protects privacy. In addition to members of the legislature, the task force will be comprised of representatives from state agencies, aviation organizations and academia. The task force was to provide an initial report of its findings by Jan. 15, 2014, and a final report by July 1, 2014.
11. **Indiana.** Adopted a resolution (SR 27) urging their legislative council to study UAS issues.



12. Seven states adopted resolutions to recognize the benefits of a thriving UAS industry in their state; **Alabama** (HR 381), **California** (AJR 6, SCR 16), **Georgia** (HR 80, HR 81, SR 172), **Idaho** (SCR 103), **Michigan** (HR 280, HR 87), **North Dakota** (HCR 3012), **Nevada** (SCR 7).

