



September 4, 2015

The Honorable Terry McAuliffe
Governor of Virginia
Patrick Henry Building, 3rd Floor
1111 East Broad Street
Richmond, Virginia 23219

Governor McAuliffe

Pursuant to Section J.2. of Item 419 of the *2015 Appropriation Act*, the Center for Innovative Technology is required to deliver to the Governor and the Chairmen of the House Appropriations and Senate Finance Committees a final business plan for growing the unmanned systems industry. The enclosed document, entitled *Virginia Unmanned Systems Business Plan Report*, satisfies this requirement.

The report makes several recommendations addressing how to most effectively leverage the unmanned systems industry to make greater contributions to the Virginia economy. Please contact me at bob.stolle@cit.org if you have any questions.

Respectfully,

A handwritten signature in black ink, appearing to read 'Bob Stolle', is written over a light blue horizontal line.

Bob Stolle
Senior Vice President Operations
The Center for Innovative Technology

cc: The Honorable S. Chris Jones, Chairman, House Appropriations Committee
The Honorable Walter A. Stosch, Co-Chairman, Senate Finance Committee
The Honorable Charles J. Colgan, Co-Chairman, Senate Finance Committee
The Honorable Paul Reagan, Chief of Staff
The Honorable Karen Jackson, Secretary of Technology

Enclosure

Center for Innovative Technology
2214 Rock Hill Road
Suite 600
Herndon, VA 20170-4228



September 4, 2015

The Honorable S. Chris Jones
Chair, House Appropriations Committee
General Assembly Building, 9th Floor
201 North 9th Street
Richmond, VA 23219

Delegate Jones

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September 4, 2015

The Honorable Walter Stosch
Co-Chair, Senate Finance Committee
General Assembly Building, 10th Floor
201 North 9th Street
Richmond, VA 23219

Senator Stosch

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Virginia Unmanned Systems Business Plan

Current State.....	2
Commonwealth Initiatives and Accomplishments	3
Air:.....	3
Marine:.....	4
Land:.....	5
Education/Workforce:	6
Results of Recent Studies.....	7
Common Themes:	11
Policy.....	11
Regional Initiatives.....	11
Northern Virginia:	11
Southwest Virginia:	12
Hampton Roads:	12
Eastern Shore:	12
Central and Southern Virginia:.....	13
Summary of Findings:	13
Plans and Recommendations.....	14

Current State

Advances in automation and related technologies have led to an exponential growth in demand for Unmanned Systems services and applications. Ready access to very inexpensive and easy to use Unmanned Aerial Systems (UAS) platforms by companies large and small have led to innovative uses spanning film production, agriculture, infrastructure inspections, first responders, lifesaving, and natural resources management. These advances are rapidly finding their way into automobiles, farm and other surface machinery, and maritime surface and underwater systems. Within the field of UAS, the industry consists of a vast number of entrepreneurs and startup firms exploring various business models and systems that can be provided at low cost to many customers, with major corporations largely engaged in production of very high cost systems supporting demanding Department of Defense (DoD) applications. These major corporations are actively watching the UAS market evolution to identify business models, including related services, appropriate to the strategies and cost structures of the large firms.

Virginia is home to a unique combination of assets that position the Commonwealth well to take a major leadership role in this emerging field, not only in all domains of UnManned Systems (UMS) (air, land, and sea) but also in the entire support structure from education, research and development, testing, deployment, maintenance, and multiple related services. Realizing this leadership role and economic growth potential requires both (1) activating the value propositions already resident in Virginia and (2)

mitigating barriers to growth including policy, regulation, and access to stage-appropriate incentives and capital by the entrepreneurial and small firms.

Commonwealth Initiatives and Accomplishments

Air:

The Commonwealth has already made great strides in supporting the existing unmanned systems industry and facilitating growth. The leadership and support of the Secretary of Technology led to Virginia's successful bid to be selected as a UAS Test Site by the FAA¹. The Mid-Atlantic Aviation Partnership (MAAP) is a three-state partnership (Virginia, Maryland, New Jersey) led by Virginia Tech. Startup funding was provided through the Commonwealth of Virginia's Federal Activity Contingency Trust (FACT) Fund, \$1.0M in FY 14, \$1.2M in FY 15, and \$436K in FY 16. The research conducted under MAAP Certificate of Authorizations (COA) span Beyond Line Of Sight (BLOS) concepts, vehicle systems integration, sensor testing, first responder applications, linear infrastructure inspections, and more. To date the MAAP has been awarded contracts in excess of \$450,000 with over \$1,000,000 in additional proposals awaiting award. The MAAP recently submitted proposals to NASA Ames (a NASA UAS Test Site request for proposal) and to the FAA for a Master Agreement. These two proposals alone would constitute over \$1 million in awards (note the FAA Master Agreement was awarded in July 2015 and the NASA award remains pending). Additionally, MAAP is continuing long lead time business development efforts with a number of major UAS manufacturers. In partnership with the Virginia Department of Aviation and industry members the MAAP has developed and deployed a training program for emergency first responders. The MAAP has developed relationships with media outlets for programs to train news crews in the use of UAS for reporting. In partnership with Dominion Resources and Colonial Pipeline the MAAP has established a Certificate of Authorization (COA) in central Virginia and supported research in the use of UAS for linear infrastructure inspection, in the process bringing an out of state startup to Virginia.

Virginia made national headlines on July 17 when the MAAP, Wise County, an Australian firm Flirtey, the Remote Area Medical (RAM) Clinic, and NASA Langley Research Center joined forces to conduct the first FAA-approved humanitarian UAS delivery of medicines to patients². In conjunction with this event SeeSpan conducted the first interview of a Governor³ using UAS video coverage.

¹ The other five UAS test sites selected by the FAA are: Alaska (includes test ranges in Hawaii, Oregon, Kansas, and Tennessee), State of Nevada, Texas A&M University, New York's Griffiss International Airport (includes test range locations in Massachusetts and Michigan), and North Dakota Department of Commerce.

² Press Release: <http://www.vtnews.vt.edu/articles/2015/07/071715-ictas-dronedelivery.html>

Full video of UAS delivery: - http://youtu.be/xEm7bl_meQY

³ SeeSpan interview: <https://www.youtube.com/watch?v=hex6Gk6o6h4>



Governor Terry McAuliffe at the RAM UAS delivery demo



Flirtey UAS in flight

Marine:

In the field of maritime unmanned systems, the eastern Virginia regions, including Hampton Roads, provide a world-class maritime development environment. These regions provide:

- Universities, small companies, and large firms that are advancing maritime vehicles, autonomy, and manufacturing and servicing.
- Proximity to defense agencies funding the development of future generations of unmanned systems for the warfighter, including Defense Advanced Research Project Agency (DARPA), Office of Naval Research (ONR), and Naval Surface Warfare centers Dahlgren and Carderock.
- Access to waters ranging from swamps to shallow rivers to oceanic.
- Close proximity to system users, including numerous defense installations and assets, for rapid prototyping, testing, and feedback.
- Close proximity to Washington, DC stakeholders.
- A family friendly local with low cost of living in vibrant city locations.
- Mid-Atlantic Aviation Partnership support for UAS operations for joint maritime/air testing.
- Close proximity to use cases including defense, Virginia Institute of Marine Science and Chesapeake Bay resource protection needs, and a nascent offshore energy industry.

The oceanic deep waters, Chesapeake Bay, Hampton Roads harbors, and nearby rivers and swamps provide an incredibly rich testing environment that has been employed in recent years by the NASA Jet Propulsion Laboratory (JPL), Pennsylvania State University, ONR, and DARPA. Examples of testing in Virginia includes the 2014 ONR testing of robotic swarming boats in the James River⁴ and the ONR Project Silent Nemo tests⁵ at Joint Expeditionary Base Little Creek, a 5-foot, 100-pound experimental robot developed by Boston Engineering that is designed to look and swim like a Bluefin tuna. Project leadership for the swarm boat demonstration was provided by the Naval Surface Warfare Carderock Combatant Craft Division in Norfolk and autonomous systems developed by Spatial Integrated Systems of Virginia Beach.

⁴ Swarm boat: <http://www.onr.navy.mil/Media-Center/Press-Releases/2014/autonomous-swarm-boat-unmanned-caracas.aspx>

⁵ Silent Nemo, GhostSwimmer: http://www.navy.mil/submit/display.asp?story_id=84845

Land:

Virginia paves the way in the development of automated and autonomous land vehicle technologies, including automotive automation and autonomous systems for commercial and defense applications. We have the subject covered from applied research through technology maturation and highway testing of automated cars.

Virginia Tech's Unmanned Systems Laboratory conducts leading edge research into autonomous air and ground systems. The nearby TORC Robotics, a Virginia Tech spinoff, is maturing vehicle automation and autonomy applicable to both defense and commercial applications. Naval Surface Warfare Center Dahlgren Division and others are integrating and testing these technologies for autonomous maritime surface and autonomous land vehicles. With an emphasis on technology transfer these developments are ready for application to a multitude of unmanned ground vehicles including agricultural, mining, and construction and automated cars. The Connected Vehicle/Infrastructure University Transportation Center (CVI-UTC) conducts research that will advance surface transportation through the application of innovative research and using connected-vehicle and infrastructure technologies to improve safety, state of good repair, economic competitiveness, livable communities, and environmental sustainability. The University of Virginia Center for Transportation Studies is one of three members of the CVI UTC.

The Virginia Department of Transportation (VDOT) and the Department of Motor Vehicles have entered into a new partnership with the Virginia Tech Transportation Institute (VTI), Transurban and HERE—Nokia's mapping business—to create the Virginia Automated Corridors⁶. This initiative will streamline the use of Virginia roads and state-of-the-art test facilities for automated-vehicle testing, certification, and migration towards deployment. These corridors cover more than 70 miles of interstates and arterials in the Northern Virginia region and will provide car companies and suppliers of automated vehicles the ideal, real-world environments they need to test complex scenarios prior to putting their vehicles on more roadways. The proximity of the Virginia Automated Corridors to Washington, DC facilitates access to the northern Virginia technology corridor and decision makers in DoD and Federal agencies. Two test-track environments are included - the Virginia Smart Road at VTI and the Virginia International Raceway. The corridors integrate access to dedicated high-occupancy toll lanes, high-definition mapping capabilities, real-time traffic and incidents, intelligent routing, location cloud technology, pavement markings maintained by VDOT for completeness and retro-reflectivity, accurate localization via high-precision global navigation satellite systems, dedicated short-range communications and cellular technology, and sophisticated, unobtrusive data acquisition systems.

⁶ Press Release, June 2, 2015; Governor McAuliffe Announces New Partnership to Make Virginia a Leader in Automated-Vehicle Industry: <https://governor.virginia.gov/newsroom/newsarticle?articleId=8526>

Education/Workforce:

Virginia has one of the most well-educated workforces to support the unmanned systems industry.

- More than 35% of Virginians have at least a bachelor's degree, the 8th highest rate in the country
- Over 1,400 doctorate degrees in science and engineering are awarded annually from Virginia universities
- More than 15,000 science and engineering graduate students pursue advanced degrees in Virginia
- Approximately 18,000 people leave Virginia military bases each year and enter the civilian workforce

The education of the unmanned systems workforce from the researchers and engineers, to the operators, to maintenance, cyber security, and applications software and legal services is performed in Virginia's institutions. This workforce includes the high-tech skills found in our northern Virginia Technology Corridor, highly skilled veterans returning to civilian life for our many defense installations, and leading edge research performed at our universities and local federal laboratories. The Secretary of Technology Virginia Unmanned Systems (VUS) website⁷ currently lists 13 institutions of higher learning providing degrees directly relevant to the engineering, production or operation of unmanned systems and related services. While Virginia has the quality of education and workforce required; the demand in this growing industry exceeds the supply in some areas, including the cyber-security aspects of unmanned physical systems.

Additionally unmanned aerial, ground, and maritime systems share many technical challenges in common. The proximity of Virginia's research institutions, federal laboratories, and testing capabilities provide the ecosystem where ideas and technology advances can be readily leveraged across these domains. A critical challenge which Virginia is well-poised to address is the cyber security of unmanned systems. Recent demonstrations of hacking into both cars and UAS have highlighted the need to secure these systems from malicious intent. The Virginia Cyber-Unmanned Systems Consortium was established in 2015 and consists of Virginia academic, industrial, and governmental agencies with contributions to bring to this challenge that resides at the intersection of cyber-security and unmanned systems. This consortium is sponsoring the Cyber-Unmanned Systems Technology Showcase⁸ in Chester, Virginia on September 29-30.

On June 12, 2015, Governor Terry McAuliffe signed Executive Order 43⁹, creating the Virginia Unmanned Systems Commission for the purpose of establishing Virginia as the paramount home to the unmanned systems industry. The Commission will be composed by the Secretaries of Technology, Commerce and Trade, Education, Veterans and Defense Affairs, two Representatives from the Virginia Congressional Delegation, and 11 private sector experts. The work from this Commission will vet, add to, and deepen the findings and recommendations of this business plan and spur the growth of this emerging industry and contribute to the development of the new Virginia economy.

⁷ <https://vus.virginia.gov/why-virginia/education-and-workforce/>

⁸ Technology Showcase web site: <http://vus.virginia.gov/registration/>

⁹ EO43: <https://governor.virginia.gov/newsroom/newsarticle?articleId=8593>

Results of Recent Studies

Four recent studies as well as industry outreach by the Office of Secretary of Technology, Special Advisor for Unmanned Systems, suggest value propositions and challenges for Virginia. The Association for Unmanned Vehicle Systems International (AUVSI) produced an economic impact report¹⁰ for UAS in 2013. The Virginia Tech Institute for Critical Technology produced a report¹¹ in 2014 describing the unmanned systems industry in Virginia and key policy issues and opportunities. More recently the National Institute for Standards and Technology (NIST) Manufacturing Extension Partnership (MEP), GENEDGE, and RTI International collaborated to evaluate the value position and challenges to Virginia using their Technology Driven Market Indicator (TDMI) process. As of this writing a report out briefing has been conducted and final report is in preparation with an expected September delivery. Additionally the NASA Langley Research Center has conducted a survey of the unmanned systems industry to identify opportunities and challenges. This report is currently being finalized.

The AUVSI economic impact study concluded that during the 11-year period 2015-2025:

- UAS integration is expected to contribute \$82.1 billion to the nation's economy by agriculture, public safety and other activities;
- 103,776 new jobs will be created, with 844,741 job years worked over the time period;
- UAS integration is expected to contribute \$75.6 billion economic impact by agriculture, \$3.2 billion by public safety and \$3.2 billion by other activities;
- The manufacturing jobs created will be high paying (\$40,000) and require technical baccalaureate degrees; and
- In the first three years, U.S. airspace integration will create more than 34,000 manufacturing jobs and more than 70,000 new jobs.
- Virginia is included in the top 10 states predicted to see the most gains in terms of job creation and additional revenue as production of UAS increase, with an estimated \$463M in economic impact, \$4.47M in tax revenue, and 2380 jobs created. However, a variety of factors—state laws, tax incentives, regulations, the establishment of test sites and the adoption of UAS technology by end users—will ultimately determine where jobs flow.

This study, conducted in 2012 and reported in early 2013, did not foresee the growth of UAS for linear infrastructure inspections and geospatial imaging already being explored within Virginia. Nor did the study consider the huge potential for related needs such as the cyber-security of these systems. The study was entirely focused on unmanned aerial systems and does not state the economic impact of maritime systems and automated ground vehicle systems, both of which are highly significant to the Commonwealth of Virginia.

The Virginia Tech study and outreach feedback suggest:

- An uncertain policy and regulatory environment is a barrier to attaching industry. The legitimate concerns of safety and privacy must be balanced with the role of the FAA in regulating airspace. Premature or over-regulation of emerging technologies has the potential to stifle experimentation, innovation, and job growth.

¹⁰ The Economic Impact of Unmanned Aircraft Systems Integration in the United States, March 2013, http://robohub.org/_uploads/AUVSI_New_Economic_Report_2013_Full.pdf

¹¹ The Future of Unmanned Vehicle Systems in Virginia; <https://vus.virginia.gov/media/4119/thefutureofuvsinvirginia2014.pdf>

- Given the high fixed costs of setting up a production facility one might expect that manufacturing operations will be slowest to relocate or expand employment. In contrast, non-manufacturing industries, which include engineering and technology jobs, may be poised for faster near-term growth. Virginia's relative strength lies not in vehicle or component manufacturing, but in the technical service industries that support all modes of autonomous vehicles.

The GENEDGE/RTI/NIST study suggests:

- Significant, diverse assets to support unmanned systems companies are spread across the Commonwealth. Commonwealth assets include test sites, high concentrations of military retirees, and research institutions.
- Virginia has an established strength in an important adjacency: data analytics.
- The Commonwealth's education assets and workforce are uniquely well-suited to support unmanned systems companies today and into the future.
 - Highly skilled data analysts and acquisition specialists
 - Engineers: mechanical, software, systems
 - High concentrations of retired military, with their training as operators and engineering expertise.
- Unmanned systems companies all over Virginia benefit from proximity to their customers, test sites, and research assets.
- Virginia has the research capabilities and infrastructure to develop and test solutions for key unmanned systems market needs and delivering actionable data.
- Given that the international commercial market for unmanned systems is larger and growing faster than the U.S. commercial market, award-winning programs like Virginia Leaders in Export Trade (VALET) are of significant value to unmanned systems companies.
- Because of the dynamic environments unmanned systems must operate in and the time/expense to test in these multiple environments, modeling and simulation is critical in testing and developing new ideas and technologies. Virginia has a notable strength in modeling and simulation.
- Other than FAA regulatory barriers, top barriers cited by unmanned systems companies are consistent with a nascent, developing market. These included:
 - Technology awareness & acceptance (by the consumers)
 - Workforce (demand exceeding supply)
 - Technology still developing
 - Power/increased endurance
 - Funding
 - Affordable pricing for commercial applications
 - Sequestration
 - Supply chain
 - Expense of test sites
 - Cyber-security
- Commonalities exist among all unmanned systems; however, interviewed companies have not yet researched what is needed. Common system needs included:
 - Warehousing—A place to store unmanned systems components when not in use
 - Cyber-security—Technologies, processes, and practices designed to protect networks, computers, programs, and data from attack, damage, or unauthorized access/control

- Maintenance—Ability to repair and service platforms and components
- Communication—Between the platform and operator and possibly communication between multiple platforms operating in an area
- Data “off loading”—The ability to store, analyze, and download data
- Needs and Opportunities findings from companies:
 - Actionable, analyzed data will be customers’ greatest need.
 - Service and supply companies, even more so than platform manufacturers, will be an area of significant growth; they require unique workforce skills.
 - For water-based systems, the Navy is currently the primary customer and is subjected to sequestration; the commercial market for these vehicles includes survey, search, delivery, and salvage services.
 - Major growth is happening in the hobbyist market, with a growing opportunity for training, maintenance, and repair of these systems.
 - Companies are struggling to make ruggedly designed military systems affordable for the emerging commercial market; commercially focused companies are filling this gap.
 - Government investments are spurring commercial application development.
 - Companies struggle to establish and expand their international business.

The GENEDGE/RTI/NIST out brief also contained the following recommendations:

1. Activate value propositions:
 - a. For our value propositions, but particularly with respect to diversity/distribution of assets and workforce, a critical step to activating is to communicate the presence and benefits of these assets.
 - b. Assess the current level of connection and cooperation between unmanned systems and modeling-simulation assets. As needed, connect and convene key stakeholders to identify growth-oriented opportunities for collaboration.
 - c. Communicate the value of the VALET program to both Virginia unmanned systems companies and economic development prospects. Encourage unmanned systems companies to apply, allocating additional funding to expand capacity if necessary.
2. Mitigate Barriers to Growth:
 - a. Advocate for continued easing of FAA restrictions.
 - b. Consult Virginia businesses in the development of state unmanned systems legislation.
 - c. The Mid-Atlantic Aviation Partnership should stay agile and responsive to companies’ testing needs; stay cost-competitive.
 - d. Convene key industry and research (academic, non-profit, and federal) stakeholders to identify and advance technological solutions to key shared needs.
3. Look to the future:
 - a. Ensure that the Virginia Unmanned Systems Commission has active, engaged representation from industry (including small businesses) and research backgrounds.
 - b. Focus attention and resources on:
 - i. Providers of actionable data vs. unmanned air or ground vehicle manufacturers
 - ii. Unmanned maritime vehicle manufacturers
 - c. Focus economic development efforts on growing Virginia companies (including small companies and startups), and attracting small companies and startups.
 - d. Raise awareness of (and help advance solutions for) cyber-security among unmanned systems companies.

The NASA Langley study suggests:

- The landscape made up of both established entities and small firms (<10 workers).
- All have positive expectations for job creation in next two years.
- The greatest employment needs currently and for the near future are for STEM workers (software developers and engineers) followed by manufacturing workers.
- The biggest hurdle to development: “Overcoming regulatory barriers”.
- Other barriers reported include secure communications between unmanned systems and ground stations, cultural beliefs and concerns, safety of people and equipment around unmanned systems, access to infrastructure and test sites, access to talented workers, and software availability.

The outreach by the SoTech to academia and firms across Virginia, defense installations, and including discussion with academic institutions active in the innovation and incubator environments suggest:

- There is a lack of stage-appropriate capital and incentives for an emerging industry characterized by numerous entrepreneurial and startup companies. These firms cannot guarantee the near-term revenue or job gains required by existing Commonwealth incentive options. Provide emerging industry specific aid.
- There is a plethora of leading edge work being conducted within Virginia and opportunities to develop partnerships between intellectual centers and testing assets. However these are not widely known nor communicated. Marketing should become a resourced priority.
- Requests are heard from firms in both the aerial and maritime domains for low-cost and easy access to testing facilities. For small firms that need to test often to develop and prove their technologies, rapid experimentation cycles are required with proximity to the engineers and potentially the customers. An “easy button” is a frequently heard request to include assistance with navigating the processes and regulations and legal agreements required for testing.
- Develop a process to educate public and legislators and separate the 4th amendment data issues from the platform that data is collected from.
- Avoid premature regulation of the driverless car industry. Continue and bolster current efforts (VTTI, VDOT/DMV) to attract this community and promote Virginia.
- University IP policy: Waive licensing fees and freely give away IP to emerging industries.
- Provide multi-discipline and multi-domain incubator or innovation spaces to leverage common needs and opportunities across air, land, and sea systems and bringing together venture capital, entrepreneurs, major firms, academia, and customers. This environment is in the process of being created with initiatives such as the Virginia Tech Center Research Park in Newport News.
- Consider the entire support structure including education, research and development, manufacturing, testing and evaluation, deployment, maintenance, and multiple related services such as cyber-security, software applications, data analytics, legal, business services, and other.
- The Commonwealth, while considering sequestration and the need to reduce dependency on Federal funds, should not overlook the significant investments by the Department of Defense for the next generation of unmanned systems. Significant opportunity for research, engineering, testing, and deployment of these systems is present within Virginia and already activated. The potential to leverage this activity for technology transfer and job creation for both DoD and civilian applications is significant.
- Hold an annual unmanned systems summit (Virginia or Mid-Atlantic...).

Common Themes:

Common themes arising from these studies and outreach include:

- The emerging unmanned systems industry presents opportunity for significant economic impact and growth in jobs and tax revenues.
- The growth of the industry within Virginia will be affected by policy, regulation, incentives, and testing facilities that are low-cost, easy to use from the developers' perspective, and facilitate rapid experimentation cycles. Incentives are needed that are suitable for an emerging industry, characterized by multiple small firms that will be experimenting with the technology and business models.
- The Commonwealth of Virginia has tremendous assets relevant to grow this industry. These include air, land, and sea test environments, world-class workforce and research institutions, significant related Department of Defense activity, a business friendly environment, and close proximity to policy makers and users. These assets are not yet well integrated or well known.

Policy

Industry indicates that an uncertain policy and regulatory environment is a major barrier to industry growth. Although privacy concerns gain the greatest attention, the scope of policy concern is much broader and includes assessing liability for unmanned and autonomous systems operation on the road, in the air, and in public waters. The potential for a patchwork of local regulations governing access to the air or defining the altitudes at which property rights extend, and hence a UAS is "trespassing", is a deterrent to developing business models for applications such as package delivery. While the FAA has jurisdiction over the regulation of navigable airspace in the United States, it is recognized that "super-adjacent" airspace near the ground is under local and state authority. Otherwise the FAA would have a role in permitting, for example, fences and common structures to be constructed. This super-adjacent airspace is the domain for many UAS applications.

With many unmanned systems applications in early stage experimentation and development, policy and regulations, if prematurely established, have the potential to inhibit the technology development and industry growth. Anecdotal evidence indicates that states that were early in developing policy and attracting development of driverless automobiles may in fact be at a disadvantage today – opening opportunity for Virginia.

Regional Initiatives

Multiple regional efforts are underway coactively moving Virginia forward in the unmanned systems domain.

Northern Virginia:

With leadership from The Aerospace Corporation, the Virginia Cyber-Unmanned Systems Consortium is exploring opportunities at the intersection of cyber-security and unmanned systems. Awareness of the criticality of cyber-security to air, land, and sea unmanned systems is rapidly growing following several highly publicized hacking demonstrations. Virginia and the cyber expertise particularly in northern Virginia are well poised to leverage this emerging demand that

supports all forms of unmanned systems. A Cyber-Unmanned Systems Technology Showcase¹² is being produced September 29-30 to bring together the cyber and unmanned systems communities to explore the opportunity space at the intersection of cyber and unmanned systems.

Southwest Virginia:

Wise County has been proactive in attracting UAS activities to the region including a recent and very highly attended Continuing Legal Education Clinic and the first ever FAA approved humanitarian delivery of medicines to the Remote Area Medical (RAM) clinic, both in July 2015. The medical delivery operation drew national media attention to the region and has engaged the Australian firm Flirtey in exploration of future research and development leading eventually to commercial operations at this location. Firms in the neighboring Blacksburg/Roanoke area have recently organized to begin developing a regional branding strategy to attract growth. The Virginia Tech Transportation Institute (VTTI) in Blacksburg is at the cutting edge of attracting and supporting automobile automation and autonomy and the Virginia Tech is the lead for the Mid-Atlantic Aviation Partnership. The MAAP has been at the leading edge of testing UAS in the context of multiple business models including urban flight, road condition assessment (with the VTTI), the RAM medicine delivery, and news gathering among others.

Hampton Roads:

The Hampton Roads region contains a plethora of education, research, small to large firms, and DoD assets advancing the state of the art of unmanned systems in the maritime domain as well as in the aerial domain. The research and testing capabilities of this area have already attracted testing from DARPA, a New England firm (Boston Engineering), ONR, and Pennsylvania State University. The NASA Langley Research Center has developed an urban UAS flight test environment for a range of UAS research and possesses the highly skilled subject matter expertise to solve UAS and autonomy challenges. A small group of maritime unmanned systems firms and academia are currently organizing to integrate assets, market the region, and strengthen ties to both DoD and emerging civil applications. This team included the Tech Center, a connected, mixed-use environment that closely aligns with people in technology, entrepreneurs and next generation businesses. The team has identified a set of value propositions for the region, many of which apply across the Commonwealth. The region provides the assets noted in the “Commonwealth Initiatives and Accomplishments, Marine” section above.

Eastern Shore:

The Eastern shore is home to unique testing environments including restricted airspace off the coast, the coastal waters, and low population density landscape near airports suitable for larger UAS testing. Efforts of the region have led to formation of the Wallops Research Park adjacent to the NASA Wallops Flight Facility and a UAS-dedicated runway, soon to be constructed, on Wallops Island adjacent to the Mid-Atlantic Regional Spaceport.

¹² <https://vus.virginia.gov/registration/>

Central and Southern Virginia:

Unique flight testing environments reside in a central Virginia corridor extending from the North Carolina border to northern Virginia, contain extensive linear infrastructure (oil, gas, and electrical lines) and of features relevant to numerous UAS applications. A community of interest has formed to cooperate to leverage this resource for technology maturation of UAS for a number of applications including the inspection of the linear infrastructure, geographic information services functions, and beyond line of sight concepts. Nearby Blackstone is the home of a joint civil-military airport adjacent to restricted airspace over military training areas and a highly professional test capability, provided by UAVPro, for research using small to medium size UAS for both civil and DoD functions. The integration of the central Virginia corridor and Blackstone provides a highly versatile environment for UAS testing, technology maturation, training, services, and maintenance.

Summary of Findings:

1. The emerging unmanned systems industry presents opportunity for significant economic impact and growth in jobs and tax revenues. Virginia is uniquely poised to prosper from the industry given its unique variety of environments for air/land/sea systems development and testing, highly skilled workforce, high concentration of highly skilled defense personnel returning to civilian life, proximity to Washington policy/standards/defense stakeholders, low cost of living, outstanding universities, high tech federal labs, business friendly environment, and customer pull from a variety of civil and defense entities.
2. Major opportunities reside at the intersection of land/sea/air domains with platform agnostic needs such as cyber-security, data analytics, modeling and simulation, Live Virtual Constructive simulation and testing environments, software applications, engineering services, sensors, education, and training. The business opportunities in the development of application software and commercial services as well as platform research, development, and testing are potentially much richer than in the manufacture of the vehicle platforms.
3. Major barriers to growth include the policy and regulatory environment, public acceptance, an adequate supply of highly skilled workforce, access to capital suitable for an emerging industry, and testing assets that are very low-cost and easy to access on the customer's schedule. This emerging industry requires stage-appropriate access to capital, often by entrepreneurial startup firms that cannot provide the assurances of near term revenue or job growth often required to access current incentives.
4. A dedicated Commonwealth economic and business development function for unmanned systems, at this stage of the industry development, would provide a means to coordinate/share intelligence, modify strategy in response to market developments, and market the Commonwealth.

Plans and Recommendations

The approach to leveraging the unmanned systems industry to promote the New Virginia Economy is to:

1. Utilize the newly established Virginia Unmanned Systems Commission to examine the findings and recommendations, add or removed from those findings and recommendations as appropriate, and translate these into specific initiatives, proposals, partnerships, and marketing and business development efforts.
2. Continue support of the Cyber-Unmanned Systems Consortium to hold a Technology Showcase in September and explore means of facilitating the partnerships required to build a thriving environment integrating cyber-security and unmanned systems development for the mutual benefit and growth of both industries.
3. Continue to support the regional initiatives that are ongoing and that promise to establish innovation environments and partnerships, provide outreach/branding/marketing momentum, and directly recruit firms and commerce. Key among these are:
 - a. The central Virginia UAS corridor.
 - b. The Hampton Roads community integration, partnerships, and outreach/marketing. A key component of this community is the development and participation of the Tech Center and others in the region to provide an innovation environment bringing together venture capital, entrepreneurs, large corporations, university, federal labs, and air/maritime test ranges.
4. Develop marketing materials and an outreach strategy for the Commonwealth. Execute this function in conjunction with a dedicated unmanned systems business development position to be filled.
5. Strengthen the Commonwealth's posture in unmanned systems education and workforce development. Integrate multiple programs across the Commonwealth for gap identification, shared programs, and marketing. Evaluate the efficacy of a placement assistance service for coops, apprentices, and mentors to find opportunities in research and industry settings and potentially to provide low-cost or free engineering/technical assistance to entrepreneurial activities and startup firms.