



2018 Ohio Aerospace, Aviation, and Defense Employment, Education, and Economics, Federal & State Policy History, Strategy, and Agenda

Ohio has brought industry and university leaders together, as well as elected officials from across Ohio to form the Ohio Aerospace and Aviation Council (OAAC) and the Ohio Aerospace and Aviation Technology Committee (OAATC). Together, the OAAC and the OAATC are chartered to develop a strategy and framework in order to support, retain, and create jobs within Ohio's aerospace, aviation, and defense industries, including related Federal, academic, and non-profit installations and assets. The OAAC/OAATC adopted specific strategies, guided by the integration, engagement, and alignment of Ohio stakeholder interests, to rally those with a common vision and mission to advocate for, guide and integrate Ohio's aerospace and aviation industry.

Vision: Ohio – America's Leader in Global Aviation and Aerospace

Mission: Create opportunities in Ohio for economic growth, jobs, education, and to shape and grow the future of the Aviation and Aerospace Industries

The OAAC/OAATC with JobsOhio have validated Ohio's aerospace industry as one of Ohio's largest – directly employing over 100,000 full-time workers. Ohio has no other industrial sector in which its Federal facilities, industry, and academic institutions play as dominant a role in U.S. industrial production, export, research & development (R&D), and policy leadership as Ohio's aerospace industry. Consider the following:

- Ohio is a leader in aerospace manufacturing attractiveness¹
- Ohio is the undisputed leader in US Military aviation research & development²
- Ohio is the undisputed leading supplier to the world's major aerospace, aviation, and defense OEMs (ex. Boeing and Airbus)³
- Ohio offers unique test facilities and world-class R&D in emerging aerospace innovation areas: simulated space environments, hypersonics, hyperloop-mobility, aeronautics, materials, sensors, aerospace power and propulsion, aerospace medicine and human effectiveness, advanced manufacturing, and additive manufacturing

Current Strategies/Opportunities

Improve Ohio's aviation infrastructure to meet the global requirements of Ohio companies by establishing a dedicated aerospace staff position within the administration reporting to the Governor;

- Continue to unite Ohio under an aligned aerospace theme and strategy, focusing collective regional interests, and provide a face and focal point of Ohio's aerospace sector
- Support the industry development of Ohio Unmanned Aircraft Systems (UAS) and Personnel Air Vehicles (PAV) and an academic focus capitalizing on unique assets within the State to drive industry growth, i.e. Integration of Ground Radar to integrate UAS operations within National Air Space, and US33 Smart Corridor integration for UAS systems with DriveOhio autonomy strategies
- Leverage Ohio's dominant position in advanced materials R&D for direct application to hypersonics and next generation aerospace use
- Continue to provide state funding for university based R&D with aerospace and aviation centers of excellence, and the Ohio Federal Research Network to attract top talent

¹ [PwC 2017 Aerospace Manufacturing Attractiveness Rankings](#)

² [AFRL - HQ Dayton Ohio - WPAFB - Aero-space R&D](#)

³ https://jobsohio.com/site/assets/files/2271/ohio_aerospace_2018.pdf



- Maintain and expand Ohio's position as a worldwide leader of cutting edge aerospace R&D, testing facilities and capabilities, i.e. hypersonic test facilities at AFRL, NASA GRC and Plum Brook Station, support the logistics transportation modifications from Mansfield airport to provide large test article transport to NASA Glenn Research Center Plum Brook Station
- Expand Ohio's aerospace supply network by supporting the expansion of Ohio's maintenance, repair, and overhaul (MRO) industry and support an MRO Center of Excellence to drive this expansion
- Develop a statewide initiative to provide greater focus and support for the retention and expansion of the Ohio aircraft power and propulsion development and manufacturing sector
- Develop and support a state-level Office of Government and Military Affairs reporting to the Governor to assure preparedness of regular military, national air guard, NASA, and other Federal installations associated with aerospace to secure against Base Realignment and Closure (BRAC) Federal initiatives
- Expand Ohio's DriveOhio initiative and assure an integrated focus on autonomous mobility solutions which include first and last mile UAS/PAV and aviation multi-modal connectivity with planned automotive strategies
- Support the national development of Air Traffic Reform, including the implementation, performance evaluation and testing of Next Generation (NextGen) technologies within Ohio commercial and general aviation airports
- Support development of the Ohio Unmanned Aircraft Systems (UAS) Industry through favorable regulatory policies to test and operate such systems with statewide pre-emption laws
- Assist in preparing Ohio's workforce to meet the in-demand job needs of the aerospace and aviation sectors through industry training partnerships and state based decision making for available Federal and state training initiatives
- Continue to maintain and improve Ohio's air service infrastructure aligned with NextGen Priorities Joint Implementation Plan
- Support programs and assets critical to the future of Ohio's primary Federal Aerospace and Defense facilities
- Leveraging Ohio's Federal and state aerospace and aviation research and development assets and support Ohio BOLD and other innovation cluster platforms
- Providing a mature general aviation tax exemption policy to drive aviation/UAV/PAV/MRO and other aircraft operation expansion
- Supporting STEM education from K-12 and state funded higher education programs aligned to industry needs
- Support Ohio Global Reach to Engage Academic Talent (G.R.E.A.T.) and other workforce and STEM education initiatives to facilitate policy, networking, and integration programs that keep aerospace and aviation academic talent in Ohio

One Ohio

The goal of the OAAC and the OAATC is to retain and expand the 100,000 direct jobs associated with Ohio's aerospace, aviation, and defense sectors. In developing their strategy, the OAAC/OAATC have benchmarked Ohio's advocacy efforts at the Federal and state levels, as compared to similar efforts by other states. It was found that Ohio's advocacy in support of these sectors is often conducted by regional partnership organizations, companies, and nonprofit organizations. Conversely, other major aviation and aerospace industry states benefit from aligned statewide advocacy to their Federal and state officials. To optimize Ohio's position, a framework supporting a One Ohio aviation and aerospace strategy has been developed to align our efforts and to serve as a call to ACTION of Ohio stakeholders. The OAAC/OAATC approach is to provide single points of contact with representation from all regional stakeholders resulting in a single inclusive industry agenda.



SECTION I: SUPPORT PROGRAMS CRITICAL TO THE FUTURE OF OHIO'S PRIMARY FEDERAL AEROSPACE AND DEFENSE FACILITIES

A. Annual National Defense Authorization Act, Budget Control Act and National Space Council

Joint Federal and State Request

Federal leaders are encouraged to work together on a balanced solution to the nation's fiscal challenges that allows for thorough consideration and funding of national defense priorities and next generation aerospace Research, Development, Test, and Evaluation (RDT&E).

The Budget Control Act (BCA) of 2011 and BCA Amendments⁴

The Budget Control Act of 2011⁵ mandated limits on National Defense discretionary base budget authority which indiscriminately required funding reductions to the Department of Defense budget over a ten year period commencing in 2013. While trimming of the defense budget may be necessary to reduce Federal budget deficits, it is essential that the future security of our nation not be compromised in the process. Due to this indiscriminate limit, it has negatively impacted and harmed the readiness of the U.S. military and was compounded due to operating for ten of the last 11 years under continuing resolutions of unpredictable duration.

Modifications in the Department of Defense spending should be based on thoughtful appraisal of the security threats to the nation and the future role our country intends to play in international relations, the contested domain of Space and increased threats of hypersonic weapons and falling behind in advanced technologies and cyber-attacks. While economic realities cannot be ignored, they are but one of the many factors that need to be considered in the development and funding of a national defense structure that adequately provides for the nation's security.

The indiscriminate Department of Defense Budget reduction process mandated by the Budget Control Act of 2011 does not provide opportunity for adequate consideration of the security challenges we face as a nation or the strategic alternatives necessary to address those challenges. We support the BCA amendments⁶.

Recommendations

Our Federal leaders are strongly urged to work together on a balanced solution to the nation's fiscal challenges that allows for thorough consideration and funding of national defense priorities and those priorities aligned to current and future changing threats. We support any amendment and/or direction that can provide for a more predictable and aligned strategic investment in RDT&E and the preparedness of our military to the new threats and that of the contested Space domain and cyber-attacks.

⁴ [The Defense Budget and Budget Control Act - frequently asked questions](#)

⁵ [Budget Control Act of 2011 - Wikipedia Page](#)

⁶ [The Defense Budget and Budget Control Act - frequently asked questions](#), Summary page - Bipartisan Budget Act of 2018 (P.L. 115-123)



B. Support retention of major Ohio aerospace and defense installations and industrial complexes at risk in future rounds of aerospace and defense consolidations and budget cutting

Joint Federal and State Request – Base Realignment and Closure (BRAC)

At the inception of the OAATC in the 131st General Assembly, Base Realignment and Closure (BRAC) was established as one of the five focus areas based on Ohio’s military sectors connection and importance to Ohio’s aerospace and aviation industries. This was a critical area of interest and priority for both the OAATC and the OAAC. At the beginning of the 132nd General Assembly, the Ohio House of Representatives preparing for a BRAC as early as 2019, created the ‘BRAC and Military Affairs Task Force ’ (BMATF). The goal of the task force was to research the various Ohio military and NASA missions; assess strengths, weaknesses, and opportunities for missions; and provide recommendations on long-term sustainment of these installations, as well as processes to routinely and consistently ascertain and advocate for new opportunities.

The BMATF was stood up in August 2017. Its 12 members include military, community, and academic leaders, as well as legislators. This group reviewed all previous BRAC reports and inventories, visited 13 installations throughout the state, and interviewed numerous vital partners to come up with its recommendation. The culmination of recommendations and task force activities were released on 29 May 2018 and made available via the internet (**BRAC Taskforce Report**⁷). The primary recommendation of the committee has since been drafted into legislation and introduced in the Ohio House of Representatives as House Bill 696.

House Bill 696⁸ will establish the Office of Government and Military Affairs under the Governor. This office will be responsible for developing a facilities and installations strategy for Ohio and conduct a regular review of Federal installation strengths and weaknesses to include military value and facility conditions. Additionally, this office will work closely with the Department of Veteran Services and the Adjutant General to set up regular meetings and updates with military affairs committees across the state as well as visits to bases around the state to understand all mission sets. Perhaps its greatest purpose will be to advocate with legislators to secure funds during the operating and capital budgets to fund infrastructure and programs to increase the military value of Ohio’s installations.

Given the redundant BRAC assessment task, the OAATC decided in 2017 to defer the focus on BRAC to the BMATF, and reform the committee based around three work groups (Education, Economic Development, and Advocacy). The OAATC fully supports the findings of the nine-month BMATF report.

⁷ [Ohio BRAC Task Force Report - Rep. Perales Released on 8/29/2018](#)

⁸ [Ohio House of Representatives Bill 696 summary](#)



Defense Base Realignment and Closure (BRAC)

The Trump Administration requested a BRAC in the 2018 Department of Defense Budget proposal of May 23, 2017⁹. On January 26, 2012, Defense Secretary Leon Panetta announced the Obama Administration's intention to request another round of base closures through the Defense Base Realignment and Closure (BRAC) process. This will continue to be a focus of the current administration and future presidential administrations.

Ohio is home to approximately 8,000 active duty military personnel, 25,000 civilian employees of the Department of Defense, and thousands of contractors who directly support our military bases. Of these, 27,000 are located on a single site – Wright-Patterson Air Force Base outside of Dayton – which is the largest single-site employer in Ohio. In addition, there are 43,000 Reservists and members of the National Guard in Ohio. Any of these jobs could be threatened by a base closure round. During the previous four BRAC rounds, three Department of Defense installations in Ohio were closed; 1991 Rickenbacker Air National Guard Base; 1993 Defense Information Technology Service Organization, Columbus Annex Dayton, 1993 Defense Information Technology Services Organization, Cleveland; 1993 Gentile Air Force Station (Defense Electronics Supply Center), Dayton; 1993 Newark Air Force Base. A BRAC round could also mean opportunity – those same BRAC rounds also reallocate missions and bring thousands of jobs into Ohio¹⁰.

Congressional approval is required to initiate a BRAC round. However, members of the delegation should be in contact with local military base supporters to begin coordinating efforts. During the last BRAC rounds, members of the delegation provided testimony during BRAC public hearings, contacted members of the BRAC commission, obtained essential data from the Department of Defense to support a community case, and helped publicly identify key BRAC issues.

Moreover, even in the absence of a formal BRAC, the Department of Defense Budget cuts and program realignments could place Ohio's major Department of Defense assets at risk. Examples of this include a proposed amendment by the Chairman of the U.S. House Armed Services Committee to the FY19 National Defense Authorization Act (NDAA) that would have impacted as many as 6,000 jobs at the Defense Supply Center of Columbus¹¹. It is critical to remain vigilant during the drafting and approval of the NDAA and actively assess and strengthen Ohio's bases so they are ready should formal or informal processes begin. Likewise, realignments and site selections for new missions could increase the state's defense assets.

Recommendations

Central to the State's BRAC efforts will be the protection of Wright-Patterson Air Force Base (WPAFB), which has by far the greatest at stake to lose. In that same token, WPAFB could have the largest potential wins for the state if work is consolidated there. Community leaders, led by the Dayton Development Coalition, are developing plans based on the previous BRAC efforts. All of Dayton has a stake in WPAFB, and as a result, can grow with mission expansion or suffer from losing missions

⁹ [DoD Releases FY 2018 Budget Proposal - press release, link to full budget within link](#)

¹⁰ [Ohio BRAC Task Force Report - Rep. Perales Released on 8/29/2018](#)

¹¹ [U.S. Congress Women Joyce Beatty - Statement - May 24th, 2018](#)



Joint Federal and State Request – NASA Glenn Research Center

Coordinate with local community development and major aerospace and defense organizations to develop strategies to ensure maximum state gains and minimal losses in future rounds of NASA consolidations and budget reductions.

NASA John H. Glenn Research Center and Plum Brook Station¹²

The National Aeronautics and Space Administration (NASA) John H. Glenn Research Center is located at Lewis Field, a 350-acre site adjacent to Cleveland Hopkins International Airport. NASA Glenn's physical plant includes more than 150 buildings that contain a unique collection of world-class test facilities. NASA Glenn also operates the 6,400-acre Plum Brook Station near Sandusky, Ohio, 50 miles west of Cleveland¹³. It specializes in large-scale tests associated with specialized test facilities and has special facilities that have safety risks associated with them and would be hazardous within the confines of the main campus. In a recent 2017 economic impact study by the Center for Economic Development of the Cleveland State University, NASA Glenn's current activities support over 7,000 jobs in Ohio and over 7,000 in Northeast Ohio generating \$123.7 million in local, state, and Federal taxes. These jobs generate an increase in labor income across the state by \$510.8 million. The largest occupational categories are scientists and engineers which drive innovation and support the advanced technology knowledge based economy of the state. NASA Glenn's activities in Northeast Ohio generate increased demand output valued at over \$1.42 billion for goods and services produced in the region and output at the State of Ohio of over \$1.48 billion¹⁴.

Recommendations

Coordinate with local community development and major aerospace and defense industrial organizations to develop strategies to ensure maximum state gains with minimal losses to employment at the NASA Glenn Research Center in future rounds of aerospace facility consolidations and budget reductions. Focus on supporting growth technologies and mission responsibilities being led by the center in physical and life science, power for space and more electrified aircraft, propulsion both air breathing and in-space electric propulsion, communications, materials and hypersonic testing.

Joint Federal and State Request – Aerospace and Defense Industrial Facilities

Coordinate with local community development and major aerospace and defense industrial organizations to develop strategies to ensure maximum state gains with minimal losses in future rounds of aerospace and defense consolidations and budget reductions.

¹² <https://www.nasa.gov/centers/glenn/about/testfacilities/index.html>

¹³ [Iryna Lendel, Jinhee Yun, The NASA Glenn Research Center: An Economic Impact Study Fiscal Year 2017, Maxine Goodman Levin College of Urban Affairs Cleveland State University](#)

¹⁴ [Iryna Lendel, Jinhee Yun, The NASA Glenn Research Center: An Economic Impact Study Fiscal Year 2017, Maxine Goodman Levin College of Urban Affairs Cleveland State University](#)



Major “At-Risk” Ohio Aerospace and Defense Industrial Facilities

As a result of the ongoing emphasis on defense expenditure, cost savings and reductions and facility consolidations, several major Ohio aerospace and defense industrial facilities are at risk of major employment reductions or potential out of state relocations. These include:

- The Joint Systems Manufacturing Center, (JSMC) Lima, Ohio: This center has long been tasked with the manufacturing and upgrading of the Army’s M1 Abrams battle tank. In 2011, the Army ceased its acquisition of new M1 Abrams battle tanks in anticipation of the development of a new line of tanks expected to be unveiled in 2017. Over the objections of the Army, the Congress approved \$255 million to upgrade dozens of M1s through 2014 and thereby sustain operation of the center. The future of the center and its jobs have been at risk over the years. The extension of the Abrams upgrade program and a new vehicle has given new life to the Lima operations requiring a resurgence and need for skilled labor like welders and other skilled trades.^{15, 16}
- Boeing Guidance Repair Center, Central Ohio Aerospace and Technology Center (COATC), Heath, Ohio: The Boeing Company is in year 13 of a 15 year contract for maintenance, repair, and overhaul of inertial navigation and guidance systems for aircraft and missile systems at the Heath, Ohio, Boeing Guidance Repair Center. This location is Boeing’s largest physical presence in Ohio, a state in which the company subcontracted with over 490 vendors for \$8.2 billion worth of business in 2011. The Air Force customer re-competed the contract and Boeing Strategic Defense and Missile Systems was awarded the follow on Indefinite Delivery Indefinite Quantity contract through 2021¹⁷. The repair center was privatized in 1996 when before this it was known as the Newark Air Force Base¹⁸
- Air Force Primary Standards Laboratory (AFPSL) Flow Lab Modernization, Central Ohio Aerospace and Technology Center (COATC), Heath, Ohio: The largest of the Pentagon’s standards laboratories, the Air Force Primary Standards Laboratory (AFPSL) is outsourced to Bionetics Corporation and has been managed as a privatized lab since Privatization-in-Place in 1996. Bionetics, on behalf of the U.S. Air Force, provides world class metrology and calibration services with 52 labs operating in 19 different metrology disciplines. The privatized model has been a success. However, competing labs in other states have added systems that are similar to those at the AFPSL. The lab needs updates to retain its competitiveness and, long-term, be retained in Ohio. Most notably, planning is underway for modernization and upgrade of the flow lab capabilities at the AFPSL¹⁹
- Air Force Institute of Technology (AFIT), Wright Patterson Air Force Base, Ohio: AFIT is the Air Force’s Graduate School of Engineering and Management as well as its Institution for Technical Professional Continuing Education. It awards masters and doctorate degrees and provides

¹⁵ <https://www.forbes.com/sites/lorenthompson/2018/02/14/tanks-to-ohio-how-trumps-industrial-policy-shop-leverages-pentagon-spending-to-create-jobs/#11cfb63a177d>

¹⁶ <https://www.limaohio.com/news/252124/joint-systems-manufacturing-center-seeks-new-employees-as-tank-production-increases>

¹⁷ <https://www.dispatch.com/content/stories/business/2015/07/06/boeing-to-maintain-guidance-systems-for-u-s-missiles.html>

¹⁸ <https://www.boeing.com/news/frontiers/archive/2003/may/mainfeature.html>

¹⁹ <http://www.hnlcpa.com/news/ohioaerospacedaybriefing2008.pdf>



continuing education for thousands of students each year. In 1997, the Air Force Secretary decided to close AFIT, a decision which was later reversed. The 2005 Defense Base Closure and Realignment Commission considered then rejected a proposal to close the school. As recently as 2012, Air Force education leaders began plans to close the school. Closure of the AFIT would diminish the Air Force's education and research capacity

Recommendations

Coordinate with local community development and major aerospace and defense industrial organizations to develop strategies to ensure maximum state gains with minimal losses in future rounds of aerospace and defense consolidations and budget reductions.

C. Support the NASA Glenn Research Center (GRC)

Joint Federal and State Request

Support programs of critical importance to the viability of the NASA Glenn Research Center (GRC), specifically:

- Federal FY'19 Appropriation Requests
- State and Federal support for the re-opening of the Plum Brook hypersonic test facility

Federal FY'19 Appropriation Requests

Specific appropriation accounts that are critical to the health of the center and the region are Deep Space Exploration Systems, Exploration Research and Technology, Low Earth Orbit (LEO) and Spaceflight Operations, Science, Aeronautics, and Education. Within these accounts, NASA Glenn provides the following key NASA leadership:

Deep Space Exploration Systems

GRC is responsible for the first element to be launched as part of the Lunar Orbital Platform, known as Gateway. The first component will be the Power and Propulsion Element (PPE), used to maneuver the rest of the Platform with a core competency of NASA Glenn - Solar Electric Propulsion. The PPE will also contain another GRC competency – advanced space communications. GRC leads the integration of the European Service Module, which provides power and propulsion to the Orion crew capsule. GRC's Plum Brook Station is home to some of the world's most capable environmental test facilities for large-scale spaceflight hardware. At Plum Brook, Orion and several Commercial Crew providers will expose their spaceflight hardware to vibro-acoustic and thermal vacuum testing, and test fire their engines in a vacuum. In addition, GRC supports Explorations Systems Development, and advances capabilities in the International Space Station (ISS) research through fire safety, fluids characterization, human health evaluations, as well as exploration technologies.

Exploration Research and Technology LEO and Space Flight Operations

GRC leads the agency in technical expertise developing technology in electric power, spacecraft propulsion, advanced materials, and human research enabling safe and effective operations in various space environments. GRC leads the development for two technology demonstrations, solar electric propulsion, which will enable on-orbit transfer and accommodate increasing power demands for satellites, and the development and integration of cryogenic fluid technologies for the evolvable cryogenics project. GRC also leads sub-kilowatt electric propulsion, extreme environment solar power, rapid analysis & manufacturing propulsion technology, and composite technology for exploration technology development



projects. In addition, GRC provides technical oversight and management for the SBIR/STTR awards aligned with the GRC's technical expertise, and program management support for the Space Technology Research Grants program. GRC also conducts and supports the Human Research Program (HRP), develops GRC-based capabilities through the Center Innovation Fund, supports Technology Transfer activities, and provides strategic guidance to the Office of the Chief Technologist from the GRC's perspective.

LEO, Spaceflight Operations and Science

For LEO & Spaceflight Operations, GRC supports ISS, advanced communications capabilities for the Space Communications and Navigations (SCaN) program, and the Rocket Propulsion Test Program. GRC will continue to be responsible for the operation and exploration-related technology development and demonstrations as part of ISS Research in physical sciences, including operation of combustion and fluids research facilities. GRC provides SCaN radio frequency spectrum management, space communication technology development and commercial service strategy, and specific tests and experiments in space communications to drive commercial communication mission use. In addition, GRC manages the test stands for Rocket Propulsion Testing, located at Plum Brook Station, which support rocket engine components and full scale tests in a vacuum. GRC supports Planetary Science research and technology through advanced radioisotope power system development and ion propulsion development.

Aeronautics

GRC supports the Aeronautics strategic vision with significant contributions to multiple projects across the Aeronautics Research Mission Directorate (ARMD). Specifically, GRC leads the development of advanced aircraft propulsion technologies and systems, including revolutionary systems such as electric propulsion for fixed wing and vertical lift vehicles that reduce fuel consumption, noise, and emissions which enable the U.S. industry to maintain and advance its global leadership. GRC's research addresses communication technologies and related integration of Unmanned Aircraft Systems (UAS) in the national airspace. In addition, GRC conducts fundamental hypersonic research which will enhance development of tools and methods to more efficiently design future hypersonic vehicles. The GRC also manages critical ground test capabilities to demonstrate new technologies and investigate aircraft and engine icing.

In order to advance innovation through NASA exploration missions, aeronautics and continued utilization of commercial services and public-private partnerships, robust and properly funded technology development, exploration and Low Earth Orbit support of exploration programs will continue to be necessary to accomplish our nation's exploration and aeronautics goals.

Recommendations

- Full funding of the Trump Administrations FY 19 funding requests should be supported
- Support the addition of funding for NASA education programs
- Support the stable and continued support of aeronautics funding and to increase funding for aeronautics research in next generation electric propulsion for aircraft

Deep Space Exploration System Development

A new Multi-Purpose Crew Vehicle and Space Launch System are essential for human exploration of space beyond low earth orbit and maintaining the leadership of the United States in human exploration. GRC is providing significant contributions to the development of the Multi-Purpose Crew Vehicle and the Space Launch System. Of major importance is GRC's leadership responsibility for the integration of the



European Service Module, development of the Universal State Adapter (USA) and payload shroud for the Space Launch System (SLS). The USA payload shroud development is a high visibility effort and is large in terms of both funding and workforce utilization. GRC is responsible for the first element of the Lunar Orbital Platform known as Gateway deep space exploration. This first element and Gateway is a critical mission for the use of the SLS and comprises a critical GRC responsibility. The next generation in space propulsion is a critical system to the first phase of the Gateway development as part of the Power and Propulsion Element (PPE).

Full scale environmental testing is critical to the successful development of spaceflight hardware. The NASA Plum Brook Station Space Power Facility (also known as the Space Environmental Testing Facility) provides qualification and acceptance environmental testing for space vehicles and should be fully utilized for Exploration Systems Development and other NASA missions.

Recommendations

- Support the continued funding of the SLS
- Direct NASA to fully utilize Plum Brook and the Space Power Facility for Exploration Systems and encourage cross-agency utilization by Air Force Space Command, DOD, NRO, industry, and others
- Support the construction of a runway at Plum Brook to facilitate hardware transportation to optimize the use of Plum Brook and continue the effort that was accomplished by supporting the logistics work done to facilitate transport of large test articles from the Mansfield Airport

Research and Technology, LEO and Spaceflight Operations, and Science

GRC develops technology in electric propulsion, space craft propulsion, advanced materials, and human research enabling safe and effective operations in space. This includes developing technology and science in the physical and life science areas. Solar electric propulsion and development of cryogenic fluid management and systems are critical to the success of future deep space missions and operations. In addition, the development of sub-kilowatt electric propulsion is a critical driver for next generation LEO/MEO and small satellite operations also supporting Gateway needs. GRC provides operations and advanced communications capabilities for SCaN program, for LEO and for the first element PPE. GRC will continue to be responsible for ISS research in physical sciences including operations of the Fluids and Combustion Facility (FCF).

Full utilization of the ISS for life and physical sciences, human research, and technology development and demonstration is essential to provide a major return on the significant U.S. and International investments in this unique facility. With the limited lifetime of the ISS and the time needed to develop scientific payloads and complete the science investigations it is imperative to sustain and commit to funding for life and physical sciences.

Based on its current contributions to the ISS, GRC is the NASA Center best positioned to maximize the capability for physical science research, human research, and technology development on the International Space Station. In particular, developing and manifesting new inserts for the GRC-developed Combustion Integrated Rack and the Fluids Integrated Rack already on the ISS is critical for the full utilization of the ISS research capabilities.



Recommendations

- Support the FY 19 Budget for the exploration research and technology development and the utilization of LEO assets like the ISS
- Support the FY 19 Budget for LEO and Spaceflight operations and support increase to ISS operations to support transitions to research and technology development during ISS transition
- Support the FY 19 Budget for science and technology development and support stable funding for power system development including radioisotope systems and power systems for ion propulsion
- Support for and continued funding of Electric Propulsion (EP) technology development and the demonstration and flight implementation of new EP technology developed by GRC
- Funding should be supported for the continued utilization of ISS and for continued support through the transition to a commercially operated but significantly utilized ISS by NASA physical and life science research

Aeronautics

Supporting NASA's Aeronautics Research Mission is a major effort at GRC and involves significant utilization of GRC's workforce and major facilities. GRC is a performing center in projects including the Aviation Safety, Airspace Systems, Fundamental Aeronautics (the largest aeronautics project which includes subsonic fixed wing, subsonic rotary wing, supersonics, and hypersonics research), Aeronautics Test, and advanced aircraft propulsion technologies and systems including electric propulsion and more electrified aircraft. Airspace Systems directly addresses the air traffic management needs of Next-Gen.

Recommendations

- Support continued stability and long term commitment to NASA aeronautics funding
- Congress and Ohio's Federal representatives should support NASA's 10 year strategic plan in aeronautics
- Support increased GRC and Ohio participation in the NextGen efforts to accelerate research and development enabling NextGen capabilities and integration of autonomous vehicles in the National Air Space

State and Federal Legislation and Agency Request

Continued support to optimize the use of Plum Brook Station (PBS) facilities and for construction of a runway at Plum Brook Station.

GRC's 6,400-acre Plum Brook Station near Sandusky is home to very large-scale, one-of-a-kind aerospace test facilities including:

- The world's largest space environment vacuum chamber
- The world's only facility capable of testing full-scale upper-stage launch vehicles and rocket engines under simulated high-altitude conditions
- Cryogenic test facilities
- Hypersonic wind tunnel

Utilization of these facilities by the world's rapidly growing public and private space launch and satellite industry is hampered by inadequate air transportation to the PBS test site. Supporting the modification of transportation routes from the Mansfield Airport has provided relief and increased utilization for Plum Brook Station. However, extremely expensive and easily damaged space launch systems and satellites currently must be transported to the site by truck from distant airports in Cleveland and Mansfield, exposing them to great risk of damage and contamination. Construction of a runway at Plum Brook



Station would allow for the secure transit of large scale articles for test and verification procedures directly to PBS site by air and support optimal use of this one of a kind test facility.

Recommendations

State and local officials should support construction of a runway at Plum Brook Station to enable secure transit of large scale articles for test and verification procedures directly to PBS by air.

D. Support Wright-Patterson Air Force Base

Joint Federal and State Request

Support programs of critical importance to the viability of the Wright-Patterson Air Force Base (WPAFB) specifically:

Federal Appropriation/Legislation Requests

- Funding for WPAFB Acquisition Management Complex, Phase 5
- Continued funding of the Air Force Institute of Technology (AFIT)
- State actions in support of the Ohio Adjutant General's Infrastructure and Capabilities

Acquisition Management Complex, Phase 5²⁰

Demand for physical space is growing in Wright-Patterson's Life Cycle Management Center (AFLMC)²¹ because of an increased need to improve Department of Defense acquisition programs, the hiring of more government employees to perform work currently done by contractors ("insourcing"), and increased Foreign Military Sales. Wright Patterson AFB has seen steady growth of personnel across the acquisition programs and particularly in the Foreign Military Sales environment. Additional building space is required to support the continual growth.

To meet the space needs, the Air Force developed plans for the 5th phase of the Acquisition Management Complex (AMC). The AMC was initiated in the 1980s as a series of 10 buildings to consolidate the Aeronautical Systems Center (ASC) acquisition workforce. These are the workers who handle design, contracting, and other acquisition functions for aircraft and related weapons systems. To-date, the Air Force has completed phases 1, 2A, 2B, 3, 4A, and 4B of the AMC. The pace of construction was accelerated through a combination of Congressional inserts and support from the Congressional delegation.

The Acquisition Management Complex, Phase 5, is a secure, modern, flexible building equipped with the latest information systems technology. It will contain administrative space and special purpose space. Constructing this building is a critical element toward ensuring that Wright-Patterson AFB is a receiver site – not a donor site – if there is another round of base closures ("BRAC"). Without this building, work could migrate to other locations with available space, even without a BRAC.

²⁰ <https://www.wpafb.af.mil/Portals/60/documents/Index/environmental/161208-1-AMC-Phase-V-Draft-Final-EA-5Dec16.pdf?ver=2016-12-08-090226-387>

²¹ <https://www.wpafb.af.mil/aflcmc/>



Recommendations

Include construction budget at the next available opportunity in the President’s Budget Request for the Air Force Military Construction Program for the construction of the Acquisition Management Complex, Phase 5, at Wright-Patterson Air Force Base.

Air Force Institute of Technology (AFIT)²²

The Air Force Institute of Technology (AFIT) is the Air Force’s Graduate School of Engineering and Management, offering specialized, defense-related masters and doctoral degrees and Technical Professional Continuing Education. The total number of AFIT faculty, staff, and resident students is approximately 1,200. (AFIT students are full-time, paid workers – for economic development purposes they are equivalent to a job slot.)

However, AFIT’s importance to WPAFB and to the Air Force is even more significant than this number suggests. AFIT is an essential pillar of the Dayton Region’s “brain power”. It employs world-renown scientists in fields such as nuclear engineering, unmanned aerial systems, cyberspace, and directed energy. AFIT works with other organizations on the base, adding to the strengths of WPAFB as a technological, research-oriented military base. Because so many up and coming Air Force personnel attend classes at AFIT, it serves as an introduction to WPAFB and Ohio for future Air Force leaders.

In fiscal year 2010, AFIT granted 289 masters degrees and 31 doctoral degrees. AFIT functions as both a fully-accredited academic and research institution and as an Air Force unit that supports the warfighter. As this role is not easily understood, AFIT has recently been threatened with closure. In the mid1990s, the Air Force decided to close the school – then reversed the decision. The 2005 Defense Base Closure and Realignment Commission also considered closing AFIT. Additional provisions should be instituted in the 2019 National Defense Authorization Act (NDAA).

- Funding: AFIT needs sufficient operational funding to maintain quality education and top instructors
- Student Load: As every Air Force officer or enlisted personnel who attends AFIT full-time needs to be temporarily replaced while the individual is at school, there is pressure to cut the student load
- Construction: AFIT has identified a need for a new research laboratory building to replace buildings with inadequate facilities for sensitive scientific experiments (\$16 Million in Fiscal Year 2010)

Recommendations

Support sufficient funding, student load, stature, and military construction for the Air Force Institute of Technology at Wright-Patterson Air Force Base.

Support the Ohio Adjutant General’s Infrastructure and Capabilities

If Ohio is to retain its aviation infrastructure and assets it is important that these assets be modernized so as to be consistent with Ohio and Department of Defense missions. Federal and State officials should

²² <https://www.afit.edu/>



support efforts by the Adjutant General of Ohio to ensure that Ohio's military personnel and facilities are modernized.

Recommendations

- State Legislature leadership should meet with the Chief of the National Guard Bureau and Army and Air Force Service Secretaries in Washington at earliest point of convenience to highlight Ohio capabilities
- Governor should meet with Secretary of Defense to promote the military capabilities across Ohio to encourage the consolidation of other missions into the state



SECTION II: SUPPORT DEVELOPMENT OF THE OHIO UNMANNED AERONAUTICAL SYSTEMS INDUSTRY

A. Target Ohio as place to test UAS, PAV, eVTOL and complex autonomous systems in parallel with ground AV/CV systems through DriveOhio.

Joint Federal and State Request

Federal Agency Actions

- Work with the FAA and NASA to enable Ohio to perform enhanced operations for UAS, PAV, eVTOL and other advanced systems such as; Operations Beyond Visual Line of Sight (BVLoS), above 400' feet above the ground and weigh more than 55lbs
- Enable operations in the lower altitude airspace through the FAA and NASA to facilitate advanced aerial data collection, movement of goods and people

Federal Legislative Actions

- Secure necessary legislation and funding to advance joint efforts in Ohio by the Department of Defense (working through the Air Force Research Laboratory), the FAA, and NASA exploring technical issues related to the integration of UAS in the National Airspace System (NAS)
- Secure Federal funding to aid in development of autonomous systems including UAS and connected vehicles
- Secure Federal funding with mobile radar for Ground Based Detection and Avoidance (GBDAA) system to operate anywhere in Ohio
- Review the Code of Federal Regulations CFR Title 14 Part 135²³ for operating requirements: commuter and on demand operations and rules governing persons on board such aircraft to present changes to the FAA and enable the adoption and implementation of new autonomous eVTOL technologies in Ohio

State Legislative and Administrative Actions

- Support the Ohio Adjutant General's Office in implementing UAS Airspace in Ohio, in conjunction with the Air Force, FAA, NASA, State of Ohio, and DriveOhio UAS Center
- Continue support the UAS Center in the advancement of UAS and the management of the lower altitude airspace in Ohio and continue to fund GBDAA and Route 33 Smart Corridor UTM
- Begin research in a statewide preemption proposal for the management of the lower altitude airspace to present the case to the FAA to ensure the State of Ohio is able to enable advanced UAS operations

Background

Dayton Region community and economic development groups have targeted UAS research, development, and manufacture as a top long-term goal for regional economic growth and job creation. The Air Force and the State of Ohio have partnered 50/50 on a \$5 million²⁴ UAS traffic management range (GBDAA system) to test complex UAS operations in a 200sq mi area located at Springfield Beckley Airport. The GBDAA system is scheduled to be fully operational by Q4 2018. Additionally, the Ohio Department of Transportation is creating a UAS Traffic Management (UTM) system over the Route 33 Smart Corridor

²³ https://www.faa.gov/about/initiatives/atos/135_certification/

²⁴ <http://www.govtech.com/fs/news/Ohio-Wants-to-Lead-in-Flying-Taxi-Research.html>



which stretches from Dublin to West Liberty where the Transportation Research Center is located. This project will pave the way for package delivery any personal air vehicles (PAV's) to operate in Ohio. Ohio has invested in great capabilities for testing UAS and PAV.²⁵

Research and Infrastructure Development

One of the keys to better utilizing unmanned aircraft is to ensure they will not pose a threat to other aircraft traveling in the area. Therefore, the Federal Government currently restricts most drone usage to areas within the line of sight of the operator. These research projects will make the development of an air traffic safety system a priority to support future operations such as advanced data collection, ground traffic monitoring, package delivery, and air taxi services, including how systems and UAS/PAV operations can be commercialized in Ohio sooner.

Ground-Based Detect-and-Avoid

Through a partnership with the Air Force Research Laboratory at Wright Patterson Air Force Base, the State of Ohio has invested \$5 million into the development of a ground-based detect-and-avoid radar system at the Springfield-Beckley Municipal Airport. The system gives the airport the unique capability of flying drones beyond the operator's visual line of sight.

Unmanned Aircraft Systems Traffic Management

The Ohio UAS Center also recently launched a 3-year, \$5.9 million²⁶ research project to study and manage drone traffic in the lower altitude airspace along the Route 33 Smart Mobility Corridor. This study will allow activities like advanced traffic monitoring in conjunction with the state's current fixed-location traffic camera system. The project will use sensors and communication devices to ensure the drones will not collide with each other or with manned aircraft, such as small planes and helicopters, which also use the lower altitude airspace.

Private sector giants from Amazon to Uber to UPS are investing heavily in drone research to find ways unmanned aircraft can improve the efficiency and quality of the services they provide. The State of Ohio's investment in the infrastructure and research needed to allow drones to operate remotely and safely is second-to-none in the nation.

²⁵ http://www.dot.state.oh.us/Divisions/Planning/SPR/Research/RFP/Documents/2019-RFPs/2019-03_UnmannedAircraftTrafficMgmt.pdf

²⁶

<http://www.dot.state.oh.us/Divisions/Planning/SPR/Research/reportsandplans/Lists/Final%20Reports%20All/Date%20Posted.aspx>

<http://www.govtech.com/fs/news/Ohio-Wants-to-Lead-in-Flying-Taxi-Research.html>



UAS Flight Operations

The Ohio UAS Center (UASC) performs flight operations primarily for the Ohio Department of Transportation/DriveOhio and acts as a shared service for other governmental entities. The UASC creates policy and sets procedures for flight operations for the State of Ohio for small UAS. This will be a continuous process as the regulatory and technological landscape changes and as part of DriveOhio's mission to lead the future of transportation with the development, testing and deployment of smart mobility technologies. By creating pathways for these alternative transportation methods transportation system reliability, increase system resiliency, and improved highway capacity in critical corridors are envisioned.

UAS Research & Development

ODOT/DirveOhio's UAS Center currently has \$2.1 million ²⁷ in research projects with the University of Cincinnati (UC) directly supporting ground transportation infrastructure. Additionally, UC has pioneered advanced technology that allows UAS platforms to perform advanced operations and data analyses. Technologies such as streaming video feeds in real-time into Ohio Emergency Management Agency (EMA) and into the ODOT traffic management center, as well as, UAS that can operate continuously for several hours and at the same time collect real-time traffic flow statistics.

Recommendations

- Unmanned Aeronautical Systems (UAS) is projected to be a \$114 Billion industry and create over 100,000 jobs by 2025. Securing additional funding for GBDAA system and other advanced programs will enable the potential to bring manufacturing, testing, and training of UAS. The UAS industry is expected to create thousands of jobs in the U.S. within five to (10) years
- Enable the lower altitude airspace in Ohio for testing new aircraft technologies attracting major investments from DOD, Amazon, Google, Uber, and others
- Partner with FAA on next generation air traffic management
- Work with other states to align UAS UTM and Urban Air Mobility efforts
- Establish best practices in the UAS, PAV and eVTOL operations
- Monitor and inform our legislature on potential regulatory changes that may have a negative impact to Ohio potential UAS industry
- Guide and inform our legislature on productive changes that will be in Ohio's best interests

²⁷

<http://www.dot.state.oh.us/Divisions/Planning/SPR/Research/reportsandplans/Lists/Final%20Reports%20All/Item/displayifs.aspx?List=47f3581d-f21c-403b-9358-fea0b008772b&ID=602&Web=3bc523de-c756-4eeb-9b6c-f24c0435d45e>



SECTION III: PREPARE EMPLOYEES TO MEET THE NEEDS OF OHIO'S AEROSPACE, DEFENSE, AND BUSINESS AVIATION SECTORS

A. Support workforce development legislation to meet the needs of Ohio's Aerospace, Defense, and Business Aviation sectors

Joint Federal and State Request

Support Federal legislation that will ensure the availability of a highly-skilled Ohio labor force that meets the needs of the aerospace, aviation, and defense sectors.

Federal Agency and Legislative Actions

- NASA and the Department of Defense Student Internship Programs and innovative preparatory programs for aerospace students
- K-12, Undergraduate, and Graduate Educational Outreach Programs
- NASA Space Grant Program
- NASA Graduate Research Fellowship Program
- Federal Funding For University Aerospace R&D
- Department of Defense R&D Funding Stabilization
- Simplify and minimize Federal regulations associated with job training dollars and block grants allowing Ohio to focus funds on best regional requirements associated with aerospace and aviation sector needs
- Research and Development Tax Credit
- H1 Visas

State Legislative and Administrative Actions

- Marketing Program
- Ohio Space Grant Program
- Statewide Internship, Cooperative Education Programs and Innovation Next Generation Aerospace Workforce Development
- Support state funding of modern undergraduate labs with remote access experiments
- Support state funding for statewide aerospace capstone design competitions
- Support the establishment of regional job-training partnerships aligned with aerospace and aviation assets and industry clusters

NASA and Department of Defense Student Internship Programs

NASA and the Department of Defense Science, Technology, Engineering, and Mathematics (STEM) student internship programs provide vital opportunities to provide experiential learning to students pursuing STEM degrees. Internships have demonstrated impact on retention of students in STEM majors, where attrition prior to graduation is a serious problem.

An Innovation in Preparing the Aviation/Aerospace Workforce

The Battelle Center for Science, Engineering, and Public Policy at The Ohio State University has created and piloted a new career preparation program for students from any discipline who aspire to join the aviation and aerospace industries. These industries are global, dynamic, complex, and competitive, so



graduates will need to be systems-thinkers and life-long learners who are capable of creative, collaborative work, communicating across cultures and disciplines, and making decisions within an ethical framework. These skills are better learned outside the classroom, in work, play, coaching, relationships, innovation-challenges, and workshops — experiences which the Battelle Center’s novel Student Community of Practice and Engagement (SCOPE) Program integrates together for the aviation/aerospace industries’ specific needs.

Recommendations

- As deficit reduction measures are pursued, Congress and the Trump Administration should work to minimize the impact of these measures on NASA and DOD STEM student internship programs
- Congress should invest in institutionalizing the Battelle Center's innovative SCOPE workforce preparation program in order to support the growth of a large, diverse talent pool trained to contribute faster to aviation and aerospace missions

K-12, Undergraduate, and Graduate Educational Outreach Programs

Aerospace and Aviation agencies have unique opportunities to excite and inspire the next generations of scientists, technologists, engineers, and innovators and strengthen U.S. competitiveness. Early engagement of students in the excitement and wonder of space exploration and flight contributes directly to the retention and success of students in STEM disciplines, STEM majors, and STEM jobs. The pipeline of students entering the fields of aviation and aerospace must be expanded to meet the growing need for workers in all elements of aviation and aerospace. This can best be done by aggressively supporting programs structured to achieve this objective.

Recommendations

- Congress and the Trump Administration should provide support to K-12, undergraduate, and graduate educational outreach programs to the nation’s aerospace and aviation agencies
- The State of Ohio must aggressively pursue programs at the K-12 level that support an expanding pipeline. Examples of such programs that meet this need are:
 - Air Camp---An innovative, hands on, week long, overnight camp that employs the rich aviation assets of the Dayton region and inspires students to pursue advance education and careers in aviation
 - Project Lead The Way (PLTW) ---An industry sponsored national program that provides STEM curricula for K-12. The PLTW aerospace program is currently employed in only a few schools across Ohio
 - Several local school districts and career centers have aviation specific programs
- The several university undergraduate and graduate level programs that contribute to an expanding pipeline should be supported and expanded where appropriate

NASA Space Grant Program²⁸

The Space Grant program administered through the National Aeronautics and Space Administration (NASA) directly supports the recruitment, retention, and support of students pursuing higher education in STEM disciplines that are critical to our nation’s aerospace competitiveness. The Ohio Space Grant

²⁸ <https://www.nasa.gov/offices/education/programs/national/spacegrant/about/index.html>



Consortium of 23 institutions of higher education has provided over \$4 million in scholarships and fellowships to over 500 undergraduate and 150 graduate students to-date, and has impacted students from every Ohio Congressional District.

Recommendations

Congress should continue to provide strong support for the Space Grant Program administered through NASA.

NASA Graduate Research Fellowship Program

NASA's new graduate student research fellowship program encourages students to pursue careers in key engineering specialty areas important to our country's future in aerospace.

Recommendations

Congress should strongly support NASA's new graduate student research fellowship program, and increase funding for this program over the next several years.

Federal Funding for University Aerospace R&D

First-rate university research opportunities attract talented students into graduate STEM studies. University R&D dollars provide a fourfold return by supporting graduate students, generating knowledge, creating innovation opportunities for small businesses around universities, and building the next generation of talented engineers.

Recommendations

The Federal Government should invest in aerospace research infrastructure and increase R&D funding to universities.

Department of Defense R&D Funding Stabilization

The Trump Administration and Congress should stabilize the Department of Defense R&D funding at a sustainable and robust percentage of the DOD's overall budget. This will create a stable innovation economy for the Aerospace and Defense industry and foster more exciting and secure long-term career prospects for top quality engineering talent considering entering the industry. A more stable long-term industry environment offering opportunities for individuals to perform cutting edge work will enhance the Aerospace and Defense sector's ability to recruit and retain the best and the brightest scientists, engineers, and technicians.

Recommendations

The Administration and Congress should stabilize Department of Defense R&D funding at a sustainable and robust percentage of the Department's overall budget such as the three percent recommended by the American Institute of Aeronautics and Astronautics.



Research and Development Tax Credit

Congress should pass legislation to make the R&D tax credit permanent – providing stability to corporate fiscal policies and thereby extending a critical technology and engineering research environment that attracts the best and brightest into the technology and engineering fields.

Recommendations

Congress should pass legislation to make the R&D tax credit permanent.

H1 Visas

The Trump Administration and Congress should increase the number of H1 Visas available to highly-skilled foreigners, thus allowing an adequate supply of foreign students who were trained at U.S. universities to remain and contribute to U.S. needs.

Recommendations

The Trump Administration and Congress should increase the number of H1 Visas available to highly-skilled foreigners.

State Agency and Legislative Actions

Aerospace Marketing Program

The State of Ohio, through joint effort between JobsOhio, the Ohio Department of Development, and the Ohio Board of Regents, should support and participate in the development of effective marketing materials that communicate the range of training and education resources available to employers within Ohio at Ohio's institutions of higher learning and through state-supported programs.

Recommendations

The State of Ohio should support and participate in the development of effective marketing materials that communicate the range of aerospace training and education resources available in Ohio.

Ohio Space Grant Program²⁹

Through the Ohio Board of Regents, Ohio should provide strong support for the Ohio Space Grant Program administered through NASA as it directly supports the recruitment, retention, and support of students pursuing higher education in STEM disciplines that are critical to the nation's aerospace, aviation, and defense competitiveness. The Ohio Space Grant Consortium of 23 institutions of higher education has provided over \$4 Million in scholarships and fellowships to over 500 undergraduate and 150 graduate students to-date, and has impacted students from every Ohio County.

Recommendations

Ohio should provide strong support for the Ohio Space Grant program administered through NASA.

²⁹ <http://www.osgc.org/>



Statewide Internship, Cooperative Education Programs and Innovative Next Generation Aerospace Workforce Development

The State of Ohio should continue to support implementation of strategically-selected, sector-focused, aerospace and aviation vocational programs and statewide internship and cooperative education programs designed to provide students with work experience at Ohio employers and Federal Laboratories and educational institutes such as the Air Force Research Laboratory, the Air Force Institute of Technology, and the NASA Glenn Research Center, beginning as early as the summer prior to their entry to enrollment in higher education in a related discipline at an Ohio institution of higher learning. Aerospace, aviation, and defense should represent such a strategic area of investment. This will enable Ohio graduates to graduate with a significant amount of work experience, and better able to serve the needs of Ohio employers. This will also contribute significantly to retention of Ohio students in STEM disciplines and allied fields since STEM work experience is a powerful factor for retention of students in STEM majors up to graduation. The Battelle Center for Science, Engineering, and Public Policy at The Ohio State University offers an innovation course, “Solving Real Public Agency Problems” that permits students from any discipline to grapple with actual, complex problems facing aviation and aerospace agencies and industries in their missions. Agencies and companies interact directly with students who bring creative approaches to problem-solving.

Recommendations

- The State of Ohio should support the implementation of strategically-selected, sector-focused, aerospace and aviation focused vocational programs and statewide internship and cooperative education programs designed to provide students with work experience at Ohio employers and Federal Laboratories and educational institutes such as the Air Force Research Laboratory, the Air Force Institute of Technology, and the NASA Glenn Research Center
- Congress should invest in institutionalizing Battelle Center’s “Solving Real Public Agency Problems” course so that more aviation and aerospace agencies and companies can innovate at low-risk and low-cost with the next generation workforce

State Funding Modern Undergraduate Labs with Remote Access Experiments

Support higher education efforts to provide outstanding learning through hands on experience in labs with modern equipment and the latest software. Funds are needed to bridge the gap generated by declining state funding and capping state university tuition. Undergraduate labs equipped with modern equipment and software offer students unique learning experience through:

- Operation of modern equipment and use of modern software
- Learning about safety measures and requirements

Recommendations

Federal and state officials should develop competitive funding opportunities for developing and updating undergraduate laboratories with modern equipment and software. Support competitive proposals that demonstrate how to effectively:

- Integrate the experimental learning into the educational program
- Share the educational benefits with other institutions through remote experiments



UAS Initiatives and Capabilities at Ohio Academic Institutions³⁰

Over 25 Ohio higher learning institutions have active UAS programs and projects in work. These opportunities attract talented students into graduate STEM studies and prepare Ohio's youth to be engaged participants in a critical emerging industry. University R&D dollars provide a fourfold return by supporting graduate students, generating knowledge, creating innovation opportunities for small businesses around universities, and building the next generation of talented engineers.

Recommendations

- The State Government should invest in UAS programs at all state higher learning levels, support inter-scholastic cooperative research, increase academic/industry partnerships, and increase R&D funding to state higher learning institutions

Fund Statewide Aerospace Design Competitions

Capstone Design Competitions enhance student learning through:

- Multidisciplinary project designs under realistic technical, economical, and environmental constraints
- Teamwork, project planning, and technical presentations
- Learn diverse approaches through watching other competing teams' presentations

Recommendations

- Reinstate Capstone design competitions through funding from Ohio Federal Laboratories

³⁰ Chancellor John Carrey, Ohio Department of Education. *UAS Initiatives and Capabilities on Institutions Campuses*. April 2018.



SECTION IV: MAINTAIN AND IMPROVE THE NATION'S AIR SERVICE INFRASTRUCTURE AND THE ATTRACTIVENESS OF OHIO AS AN AIR SERVICE LOCATION

A. Ensure stable funding for maintenance of the Nation's air service infrastructure and implementation of the Next Generation Air Transportation System (NextGen).

Joint Federal and State Request

- Federal and State Officials should work with the private sector and local communities to retain and expand domestic and international commercial air services at airports serving Ohio's major metropolitan areas
- Federal and State Officials should support the addition of an Ohio NextGen operational performance location
- Federal and State Officials should work to support all major Ohio Airports (i.e. Cleveland, Columbus, and Cincinnati) and implement the NextGen Data Communications program to allow pilots and air traffic controllers to communicate enhanced air traffic information
- Support the funding provided in the FAA Reauthorization Act to enable continued deployment of the NextGen air control system, including development of a demonstration project at one of Ohio's airports

Maintaining Ohio's Commercial Air Services and Extending International Service

Efficient and competitive air service benefits all of Ohio. Retaining and expanding highly sought international airline routes will enable Ohio to effectively compete in the global economy. With an annual economic impact of \$4 billion, the United Airlines Cleveland Hopkins International Airport hub, Ohio's only remaining international air service hub, is critical to the Ohio's economy, economic development, leisure travel, and tourism.

Recommendations

Federal and State Officials should work with the private sector and local communities to retain and expand domestic and international commercial air services at airports serving Ohio's major metropolitan areas.

Federal Legislative Request

Federal Aviation Administration Modernization and Reform Act of 2012³¹

The Federal Aviation Administration (FAA) provides services and funding essential to the commerce of the Nation, the safety of the public and critical investments in the Nation's air service infrastructure.

Passage of the FAA Modernization and Reform Act of 2012, provides \$63.4 billion to fund the agency through 2015. This new law includes approximately \$11 billion towards the FAA's proposed NextGen air traffic control system.

³¹ <https://www.congress.gov/bill/112th-congress/house-bill/658/text>



NextGen is a wide ranging transformation of the entire national air transportation system in order to meet future demands and avoid gridlock in the sky and in the airports. NextGen moves away from legacy ground-based technologies to a new and more dynamic satellite-based technology. These new capabilities, and the highly interdependent technologies that support them, will change the way the aviation system operates, reducing congestion, and improving the passenger experience.

The President and Congress are to be commended for passage of a long-term funding act that will allow investment in the nation's air service infrastructure, and most particularly NextGen, to proceed in an efficient and businesslike manner.

Recommendations

- Federal Legislators should continue to support of funding for the modernization of the nation's air infrastructure through deployment of the NextGen air traffic control system and exercise appropriate oversight of the FAA to ensure that the NextGen system is deployed in a timely and efficient manner
- Ohio's Congressional Delegation along with FAA officials, State and Local elected offices should support an Ohio NextGen Demonstration project at one of Ohio's General Aviation Airports
- The Ohio State University Airport, for example, could be the site for such NextGen Demonstration and tie it to an educational program on NextGen operation for their Flight School

Oppose the \$100 Per-Flight Fee as Detrimental to Ohio's Commercial and General Aviation Industries

A bipartisan group of members from both houses of Congress sent letters to President Obama opposing his advocacy of a \$100-per-flight fee on turbine-powered aircraft that fly in "controlled airspace". The current system of ticket and fuel taxes is an appropriate mechanism for the industry to fund its use of our national air system. Moreover, the aviation industry is one of the most highly taxed industries in our economy. Now is certainly not the time to consider additional taxing measures when the industry is struggling to recover from the recent economic downturn.

Recommendations

- Ohio's Congressional Delegation should oppose the \$100 per-flight fee as detrimental to Ohio's Commercial and General Aviation industries, and urge President Trump to support this opposition



SECTION V: LEVERAGE OHIO'S FEDERAL AND STATE AEROSPACE AND AVIATION RESEARCH AND DEVELOPMENT ASSETS

A. Leverage Ohio's Unique Aerospace R&D and Testing Capabilities

State Request

Actively market Ohio's aerospace R&D and testing capabilities including industry and university assets to the global aerospace industry through JobsOhio

Leveraging Ohio Aerospace R&D and Testing Capabilities

Ohio is extremely fortunate to have a large number of organizations performing or managing world-class aerospace R&D, including:

- Air Force Research Laboratories at Wright-Patterson Air Force Base
- NASA Glenn Research Center
- General Electric Aviation
- Battelle Memorial Institute
- The University of Ohio System
- Ohio Edison Technology Centers

Further, as indicated earlier, many of these installations have unique, world-class R&D and testing capabilities. Attracting use of these facilities by the global aerospace industry would benefit Ohio in many ways, including:

- The creation of jobs in the aerospace R&D sector
- Generation of revenues for the support of Ohio's R&D providers, particularly in the government and non-profit research centers
- Enhancement of Ohio's capabilities and attractiveness as an aerospace research and manufacturing center

To encourage the utilization of Ohio's R&D and testing capabilities, Ohio should actively market JobsOhio, Ohio's aerospace R&D and testing capabilities, including industry and university assets, to the global aerospace industry.

Recommendations

- JobsOhio should actively market Ohio's aerospace R&D and testing capabilities, including industry and university assets, to the global aerospace industry



Glossary of Acronyms

AFB – Air Force Base

AFIT – Air Force Institute of Technology

AFPSL – Air Force Primary Standards Laboratory

AFRL – U.S. Air Force Research Laboratory

AMC – Acquisition Management Complex

ARMD – Aeronautics Research Mission Directorate

ASC – Aeronautical Systems Center

BCA – Budget Control Act

BMATF – BRAC and Military Affairs Task Force

BRAC - Base Realignment and Closure

BVLoS – Beyond Visual Line of Sight

COATC – Central Ohio Aerospace and Technology Center

DOD – Department of Defense

DOT – Department of Transportation

EMA – Emergency Management Agency

EP – Electric Propulsion

eVTOL – Electric Vertical Take-Off

FCF – Fluids and Combustion Facility

FAA – Federal Aviation Administration

FY – Fiscal Year

GBDAA – Ground Based Detection and Avoidance

GRC – NASA Glenn Research Center

GREAT – Global Reach to Engage Academic Talent

HQ - Headquarters



HRP – Human Research Program

ISS – International Space Station

JSMC – Joint Systems Manufacturing Center

LEO – Low Earth Orbit

MEO – Medium Earth Orbit

MRO – Maintenance, Repair, and Overhaul

NAS – National Airspace System

NASA – National Aeronautics and Space Administration

NDAA – National Defense Authorization Act

NextGen – Next Generation

NRO – National Reconnaissance Office

OAAC – Ohio Aerospace and Aviation Council

OAATC – Ohio Aerospace and Aviation Technology Committee

ODOT – Ohio Department of Transportation

PAV – Personal Air Vehicles

PBS – NASA Plum Brook Station

PLTW – Project Lead the Way

PPE – Power and Propulsion Element

RDT&E – Research, Development, Test and Evaluation

R&D – Research and Development

SCaN – Space Communications and Navigations

SCOPE – Student Community of Practice and Engagement

SLS – Space Launch System

STEM – Science, Technology, Engineering, and Mathematics

UAS – Unmanned Aircraft Systems

UASC – UAS Center



USA – Universal State Adapter

UTM – UAS Traffic Management

U.S. – United States

WPAFB – Wright Patterson Air Force Base