

Executive Summary

Texas A&M University-Corpus Christi requests \$4 million from the Corpus Christi Business and Job Development Corporation to expand the University's Lone Star Unmanned Aircraft System Center of Excellence & Innovation (LSUASC) and further grow economic development opportunities related to drones in Corpus Christi. LSUASC advances the integration of drone technologies across educational, public, and commercial agency interests; provides an economic stimulus to attract related industry partners to Texas; and, informs governing agencies on drone operations in the National Airspace System.

LSUASC is one of seven Federal Aviation Administration (FAA) drone test sites in the United States. The Texas A&M University System Board of Regents established Lone Star UAS in the Fall of 2013 as a research center at Texas A&M University-Corpus Christi with support from the Corpus Christi Business and Job Development Corporation. Our center is a global partner for research, development, testing and evaluation of drone technologies across educational, public and commercial agency interests. LSUASC supports the aeronautical research needs of research institutions, private-sector service providers, non-profit corporations, and local, state and federal agencies. LSUASC capabilities include:

- Five story, 320,000 cubic foot netted structure
- Fully Operational Mission Control
- Mobile Beyond Visual Line of Sight infrastructure
- ESIL – Electronic Systems Integration Lab
- Mobile Operations Center
- Radar Array Capabilities
- Custom 3D Printing
- Fleet of small UAV's
- Sensors

LSUASC also provides an economic stimulus to attract related industry partners to Texas and informs governing agencies regarding drone operations in the National Airspace System.

Texas A&M University-Corpus Christi is thankful for the Business and Job Development Corporation's generous support in the past that has allowed the University to expand research, engineering degree programs and drone-related initiatives. Most recently, support from the Business and Job Development Corporation helped with the addition of civil and industrial engineering degrees to support the growing needs of the local economy. In addition to the \$2 million in funding provided by the Business and Job Development Corporation, \$2.3 million was secured in the last legislative session to support these programs, showing confidence in Texas A&M University-Corpus Christi's efforts to meet the workforce development needs of our economy.

Proposed Programmatic Initiatives

The overall mission of this request is to strengthen and expand LSUASC and its capabilities for developing economic opportunities in the Coastal Bend.

Beyond-Visual-Line-Of-Sight (BVLOS) Study

To make Corpus Christi an approved Beyond-Visual-Line-Of-Sight (BVLOS) site that will attract more drone-related businesses to consider relocating to our city, we must first conduct an airspace study. Much of the airspace surrounding Corpus Christi is restricted for either Military or Commercial Aviation (Airport) use. The cost of this study will include partial cost of the staff time needed to conduct the study, such LSUASC personnel as the Air Space Coordinator, Program Director for Operations, Associate Director for UAS, etc. In addition, this access will fund one additional LSUASC position, an Aviation Safety Officer, creating a new job instead of simply modifying existing jobs for new purposes.

The purpose and significance of this study is to identify airspace that can be accessed by LSUASC for public or commercial use. Depending on the classification of the airspace, controlled or public, will either allow or prevent operations. LSUASC will conduct this study to find these areas where we could perform routine operations, which areas are accessible, and how to deconflict it for development. This will include contacting the proper FAA, Department of Defense, and protected infrastructure entities (Port of Corpus Christi, oil and gas companies, etc.) to identify issues and concerns with potential airspace usage. Additionally, LSUASC would also develop use cases for the BVLOS capabilities (Inter/Intrastate transport, Commercial Services, Public safety, etc.). After use case development, LSUASC would work with the FAA for permissions needed to conduct BVLOS operations. Companies would then be able to come to Corpus Christi and use our airspace rather than traveling to other major cities.

Second Mission Control Center

A second Mission Control Center (MCC) would also be located in the University's newly acquired building in downtown Corpus Christi. This second operations center will benefit from being located near and working with our center for emergency management. The vision is to create a training and development catalyst for innovative technologies, best practices and effective & efficient processes for drone operations.

The MCC will include a Thales USA, Inc. designed and LSUASC equipped, purpose-built state-of-the-art Operations Center to support research, development, routine and emergency response operations, testing, and evaluation of UAS technologies. Given the dynamic nature of the UAS industry, this center will need to be modular, remotely accessible, secure, resilient, and scalable. Thales' Operations Center design for LSUASC, illustrated in Figure 1, is predicated on deployed, operationally proven components engineered to provide advanced autonomous services, systems monitoring, test and validation, and operations support. The design and operations of the Operations Center includes:

- A decomposition of the system architecture into fundamental components, major hardware, and software components
- Interrelationships between major hardware and software components
- A service-to-function mapping
- An approach to interfacing with other systems and communications requirements

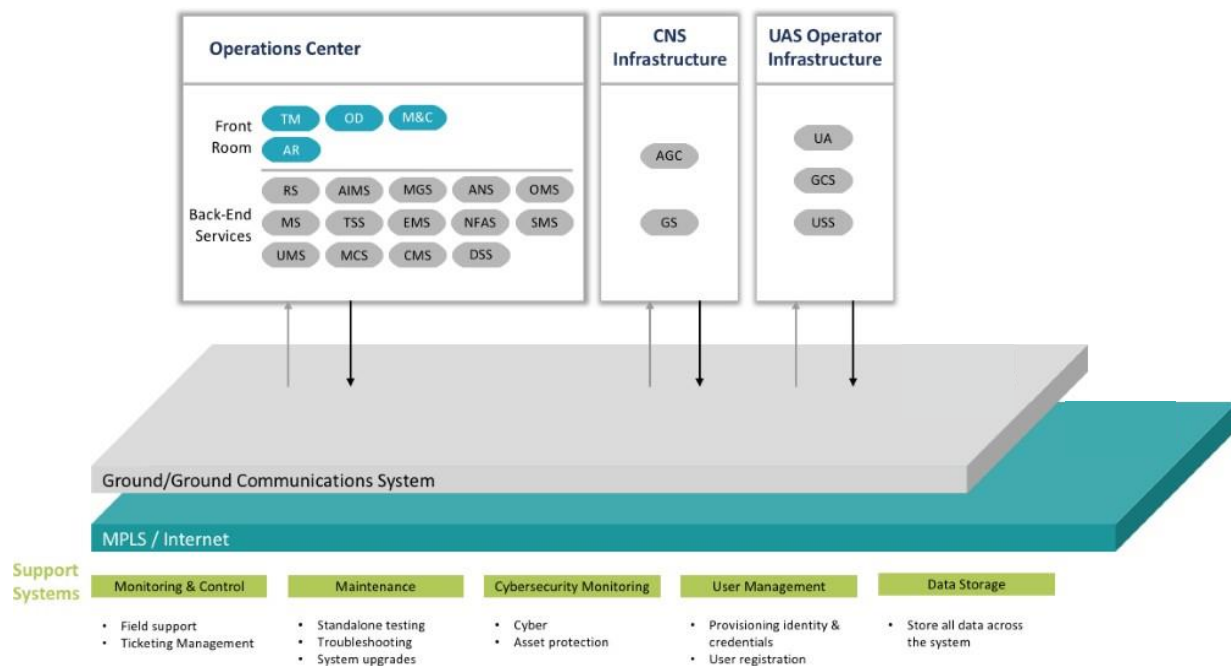


Figure 1 – LSUASC MCC System Architecture

The MCC system architecture features four operational capabilities to provision traffic management services, support, and logistics. They are interconnected via a communication backbone to help real-time and near real-time data exchanges between the systems. These include the Operations Center, CNS Infrastructure, UAS Operator Infrastructure, and the Support Systems.

- The Operations Center is the core of the MCC. It consists of the Operations Room which hosts the physical components that allow users to monitor and control all aspects of the system, and the Cloud Services which are implemented using a proven cyber-secure cloud infrastructure.
- The UAS Operator Infrastructure includes all air/ground communications equipment enabling the communication between UAV and its ground control station, the ground infrastructure (which provides the backhaul network), and the surveillance infrastructure (which provides detection and tracking of aircraft).
- UAS Operator infrastructure is composed of the UAS, AUS Traffic Management, and other services used to run a mission and includes all LSUASC, emergency

response/public safety, or research customer aircraft and equipment.

- Support Systems makes up all applications to monitor, control, and test the Operations Center and are co-hosted by the same cloud infrastructure as the Cloud Services.

In addition, this access will fund one new LSUASC position, a Senior Software Developer instead of simply changing an existing job for new purposes. This person will handle working day to day with Thales during the installation and implementation of MCC Systems Architecture and maintenance, once installed.

Along with a BVLOS study allowing more airfield access near the Flour Bluff location, this development would directly correlate with the newly acquired airfield access and allow for more extensive research and expansion.

Supporting Centers with Drone-Related Activities

While LSUASC is the lead center responsible for the integration of drone technologies across educational, public, and commercial agency interests and the economic development opportunities related to drones, several other centers at Texas A&M University-Corpus Christi support LSUASC by providing additional expertise. A portion of each of the following center's time and effort will be directed at drone-related innovation, technology and economic development.

Office of Economic Development and Industry Partnerships

The Office of Economic Development and Industry Partnerships, a part of the Division of Research and Innovation at Texas A&M-Corpus Christi, will serve as a catalyst for economic development with a focus on drones and autonomous systems. It will act as an innovation and technology transfer hub for South Texas. Its mission is to cultivate a market-translatable culture of innovation promoting business development and an entrepreneurial workforce. This office will facilitate partnerships with the private sector and will complement LSUASC's efforts to attract drone-centered businesses to Corpus Christi. This work will be the seed for a drone innovation district (i.e. a collaborative industry/research work environment); the first of its kind in South Texas. The office will work closely with regional economic development agencies to accelerate job creation and to help small businesses and young entrepreneurs through the:

- 1) fostering of research and development activities by identifying, evaluating, protecting and managing intellectual property for commercialization and start-up purposes,
- 2) development of industry partnerships around new product development programs, and
- 3) development of proven-to-work training programs for local entrepreneurs including, but not limited to, coaching, networking and product pitching.

Innovation in Port Studies (iPORTs)

The mission of the Innovation in Port Studies Institute (iPORTs) is to promote the economic development of the region around port-related industries and the development of a skilled workforce for such businesses. LSUASC and iPORTs will work jointly on developing and deploying drone-related technologies for relevant industries. From drone-based fog navigation to security and surveillance, the innovation and economic opportunities are unlimited. iPORTs will advance, develop and disseminate knowledge in port-related sciences and technologies. With a strong commitment to excellence and international leadership in education, training, research and commercialization of related port studies, iPORTs will become a multidisciplinary catalyst for related domains. Working closely with the Port of Corpus Christi and relevant industries, iPORTs will actively engage in the following:

- 1) engineering and development of innovative technologies related to air, land and seaports; particularly the Port of Corpus Christi,
- 2) port-inspired business development in Corpus Christi and the South Texas region leading to increased job opportunities and economically sound businesses,
- 3) training and education of the workforce of the future, including certifications, in port-related fields, and
- 4) commercialization and new venture development of intellectual property.

Center of Innovation in Emergency Management (CIEM)

Texas A&M University-Corpus Christi and the Texas Division of Emergency Management (TDEM), in collaboration with the City of Corpus Christi and Nueces County, are partnering to establish a one of its kind CIEM. In addition to an Emergency Operations Center (EOC), this innovative facility will include a research and development center for emergency management and will be located in the downtown building to capitalize on its central location, sturdy structure, and the proximity of LSUASC and its MCC. LSUASC has been actively participating in emergency response and recovery efforts since its founding. This includes joint drone missions with TDEM and Texas Task Force One.

The vision is to create a training and development catalyst for innovative technologies, best practices and effective & efficient processes for emergency management. This will include resiliency, preparedness, response, recovery and mitigation. The EOC will feature state of the art infrastructure. CIEM will host and facilitate the interaction among experts from different fields and community sectors with a special focus on:

- 1) developing skills for workforce and professionals: Real-world hands-on training curricula will be developed targeting different audiences including first responders, city & county officials, etc.
- 2) building a robust and resilient community for strong economy: Given the geographic location of the region and its vulnerability to natural emergencies, it is critical to ensure that resiliency is interwoven into all levels of the society for economic

stability and growth. CIEM, through research, development and outreach, will promote and support the resiliency of the Coastal Bend.

Needs Statement

Texas A&M University-Corpus Christi requests that the Business and Job Development Corporation support modernization and infrastructural needs related to the expansion of LSUASC and drone-related efforts of the Office of Economic Development and Industry Partnerships, iPORTs, and the Center of Innovation in Emergency Management to contribute to the expansion of economic development opportunities related to drones in Corpus Christi. Growing this program and its operations is a direct investment in the economic development of the Coastal Bend, as well as its attractiveness to a growing business market in drone research and innovation.

1. Beyond-Visual-Line-Of-Sight (BVLOS) airspace study [\$250,000]
 - One new position (~\$116,000 annually salary and benefits)
2. Second Mission Control Center in newly acquired University building in downtown Corpus Christi [\$2.13M]
 - Two years of Thales support (\$1.5M)
 - Implementation of system architecture and supporting labor
 - Provision of back-end services
 - Support services applications and two-year support agreement
 - Purchase of hardware (computers, monitors, displays, etc.), software and licenses (~\$120,000)
 - One new position (~\$130,000 annual salary and benefits)
 - Space renovation and buildout in the downtown building for 2,500 square feet at \$152/square foot (\$380,000)
3. Supporting centers with drone-related activities will be established within the downtown building to facilitate collaboration and integration with LSUASC's efforts [\$1.62M]
 - Costs include renovating space, buildout needs and a prorated portion based on anticipated square feet of addressing IT/AV, electrical, plumbing, roof and elevator requirements within the downtown building estimated at \$152/square foot
 - Dedicate the University's building in the Flour Bluff district to drone-related business incubation and move non-drone-related business incubation to downtown building
 - Establish the Office of Economic Development and Industry Partnerships, iPORTs, and the Center of Innovation in Emergency Management within the downtown building to provide additional expertise for drone-related technology, innovation and economic development

Economic Impacts

The grant will support a BVLOS airspace study and the development of a second LSUASC Mission Control Center in downtown Corpus Christi, which includes the Office of Economic Development and Industry Partnerships, iPORTs, and the Center of Innovation in Emergency Management. The new downtown facility will support UAS testing exercises held mostly within the region of Corpus Christi.

Currently, most of LSUASC's larger flight operations take place at Port Mansfield in Willacy County. Those flights, operated by a staff of 24 personnel, are supported by an average \$2 million federal award annually.

The BVLOS study would act as a springboard for an FAA Certificate of Authorization (COA) to conduct BVLOS operations in Nueces County. Drawing on LSUASC's current flight operations at Port Mansfield, a successful FAA certification would potentially generate approximately **\$2 million annually** in federal awards.

In addition, drawing on a \$2.1 million NASA award for UAS Traffic Management's (UTM) Technical Capabilities Level (TCL) 4 testing activities in 2019, a BVLOS COA approval would potentially generate similar UAS testing exercises annually:

- One major exercise, involving about 36 participants for 4 weeks (about \$1.5 million award)
- Up to four smaller exercises, each involving about 6 participants for one week (about \$0.5 million total awards)

The UTM program would generate a total of **\$2 million annually** in federal funding for TCL 4 testing activities in the region of Corpus Christi.

Among others, an FAA COA following a BVLOS study is expected to potentially generate **\$4 million in federal funding each year** for UAS testing exercises within the region of Corpus Christi.