

Agenda Item No.

## **AGENDA ITEM BRIEFING**

**Submitted by:** Flavius C. Killebrew, President/CEO  
Texas A&M University-Corpus Christi

M. Katherine Banks, Director  
Texas A&M Engineering Experiment Station

**Subject:** Establishment of the Lone Star Unmanned Aircraft Systems Center of Excellence and Innovation

### **Proposed Board Action:**

Establish the Lone Star Unmanned Aircraft Systems Center of Excellence and Innovation (LSUASC) as a joint Texas A&M University-Corpus Christi (A&M-Corpus Christi) and Texas A&M Engineering Experiment Station (TEES) center.

### **Background Information:**

A congressional mandate and compelling industrial market forces are driving development of the LSUASC. On June 27, 2013, the U.S. Senate Appropriations Committee approved the 2014 transportation funding bill (S. 1243), which included language and FY14 funding for an Unmanned Aircraft Systems (UAS) Center of Excellence. Establishing the LSUASC, by combining the research infrastructure and business-development capacities of A&M-Corpus Christi and TEES, makes The Texas A&M University System a premier competitor for this federal UAS Center of Excellence. In addition, creating the LSUASC is another powerful incentive for broadened UAS industrial growth and economic development in Texas and is supported by the state of Texas Governor's Office of Aerospace, Aviation & Defense.

The LSUASC will function in the general areas of research, development, testing and training to support safely integrating unmanned aircraft into the national airspace.

Since April 2012, A&M-Corpus Christi and TEES have collaborated with private-sector partner Camber Corporation to form a statewide team of research institutions and private-sector companies to produce a competitive proposal to the Federal Aviation Administration that Texas be designated as a UAS test site. Camber Corporation will provide operational support for the test site and will be integral in the sustainability plans for the center. Once formed, it will be open to collaborations with other centers and faculty with related interests and expertise.

### **A&M System Funding or Other Financial Implications:**

The LSUASC will be supported with startup resources contributed by TEES, A&M-Corpus Christi, Camber Corporation and the City of Corpus Christi in the amount of up to \$800,000 over the first three years after which time the center will be fully self-funded.

Agenda Item No.

**TEXAS A&M UNIVERSITY-CORPUS CHRISTI  
TEXAS A&M ENGINEERING EXPERIMENT STATION**

Office of the President/Office of the Director

September 2, 2013

Members, Board of Regents  
The Texas A&M University System

Subject: Establishment of the Lone Star Unmanned Aircraft Systems Center of Excellence  
and Innovation

We recommend adoption of the following minute order:

**“The Lone Star Unmanned Aircraft Systems Center of Excellence and  
Innovation is hereby established as a joint Texas A&M University-Corpus  
Christi and Texas A&M Engineering Experiment Station center.”**

Respectfully submitted,

M. Katherine Banks  
Vice Chancellor and Dean of Engineering  
Director, Texas A&M Engineering  
Experiment Station

Flavius C. Killebrew  
President/CEO  
Texas A&M University-Corpus Christi

**Approval Recommended:**

**Approved for Legal Sufficiency:**

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John Sharp  
Chancellor

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Ray Bonilla  
General Counsel

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Billy Hamilton  
Executive Vice Chancellor and  
Chief Financial Officer

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James R. Hallmark  
Vice Chancellor for Academic Affairs

**TEXAS A&M UNIVERSITY-CORPUS CHRISTI**  
**TEXAS A&M ENGINEERING EXPERIMENT STATION**  
Lone Star Unmanned Aircraft Systems Center of Excellence and Innovation

**EXECUTIVE SUMMARY**

**1. Rationale for the Creation of the Center**

The Federal Aviation Administration Modernization and Reform Act (FMRA) of 2012 requires the Federal Aviation Administration (FAA) to establish six test sites under agreements with public entities. The test site program is designed to establish policies, procedures, rules and regulations for integrating unmanned aircraft into the national airspace of the United States. Unmanned Aircraft Systems (UAS) test sites will focus on technological research and development, testing, data-gathering and reporting to the FAA.

This congressional mandate and compelling industrial market forces are driving the development of the proposed Lone Star Unmanned Aircraft Systems Center of Excellence and Innovation (LSUASC) through a partnership of Texas A&M University-Corpus Christi (A&M-Corpus Christi) and the Texas A&M Engineering Experiment Station (TEES).

- The proposed center fulfills a regional need for Texas to capitalize on its natural assets of airspace and topography and participate fully in the emerging domestic and international Unmanned Aircraft Systems (UAS) industry.
- The proposed center addresses a national need for six UAS test sites mandated by Congress under the auspices of the FAA and supported by the state of Texas Governor's Office of Aerospace, Aviation and Defense. These test sites are key to integrating unmanned aircraft into the national airspace which will generate widespread industrial development and economic growth in the aviation industry. Formal center designation will reinforce the response made to the FAA's Screening Information Request in May 2013.
- The FAA test site program requires, and its research goals demand, concerted effort and coordination among Texas' research institutions and private-sector entities that possess UAS research and development capacities; namely, a center to manage the state's contributions to the federal agency and the UAS private sector.
- The proposed center promises to become a hub of technological research, industrial development and educational enrichment that will be not only self-supporting, but also a generator of considerable economic growth. Current FAA (and Federal Communications Commission) regulations and application procedures for UAS flight operations are a barrier to entry for many companies and non-government organizations due to the significant cost and time investment required. This routinely takes more than one year. The proposed center offers a way for these companies to quickly and affordably obtain all necessary FAA permissions to fly UAS and also provides a choice of locations to fly them that best suits their needs.

## **Vision**

The proposed center is envisioned as a partnership between A&M-Corpus Christi and TEES which have an established solid working relationship. Since April 2012, A&M-Corpus Christi and TEES have collaborated with private-sector partner Camber Corporation to form a statewide team of research institutions and private-sector companies to produce a competitive proposal to the FAA that Texas be designated as a UAS test site. Camber Corporation will provide operational support for the test site and will be integral in the sustainability plans for the center.

The FAA test site program comes at a critical moment in the development of a worldwide UAS industry. UAS capabilities are universally recognized as the next great step in aviation history with applications across numerous industrial sectors, such as agriculture, oil and gas, wildlife management, law enforcement and disaster response. Competitor nations already have integrated UASs into their airspace for a variety of industrial purposes, especially agriculture and public safety. The United States, which has a technological edge in the UAS field, will remain competitive in this market only by opening its airspace for safe and secure operation of unmanned aircraft which is the FAA's mission. The United States economy suffers measurably for every year of delay according to a UAS industry study.

A&M-Corpus Christi and TEES are committed to developing the proposed LSUASC whether or not Texas is selected as an FAA test site. A test site designation adds leverage to the proposed center's appeal to client agencies and private-sector customers; however, the center would attract government and industry clients even without the test site designation due to Texas' relatively clear airspace, diverse topography and resident research infrastructure capacities which includes urban airspace.

This proposal envisions the LSUASC headquarters to be in Corpus Christi; specifically, in A&M-Corpus Christi's Coastal Bend Business Innovation Center (CBBIC), which will house the center's command and control center, electronics testing lab and business development office. CBBIC also is designed and equipped to serve as a magnet for start-up and/or relocating UAS businesses seeking low-cost, efficient and effective access to LSUASC's services and assets. These include, but are not limited to, A&M-Corpus Christi's research strengths and affiliations with government and the private sector and TEES' partner network with a stake in UAS research opportunities.

Corpus Christi's geographic location leverages A&M-Corpus Christi and TEES into a diverse range of research and development fields -- from homeland security and range management to marine monitoring, especially with regard to oil spills which, in turn, establishes significant collaborations with A&M System entities such as Texas A&M AgriLife's Research and Extension Service, the Texas A&M Engineering Extension Service (TEEX), Texas A&M-Kingsville's Rangeland Management Program, the Bush School's Institute for Science, Technology and Public Policy, TEEX's Disaster City® and government agencies such as the Department of Defense, Department of Homeland Security and the National Oceanic and Atmospheric Administration.

A&M-Corpus Christi is less than four miles from the Naval Air Station Corpus Christi (NASCC) and has an established UAS program coordinated with the Navy base, including extensive airspace authorized by the FAA for UAS operations. The university also has established effective protocols for range control and surveillance. In addition, the NASCC is home to the

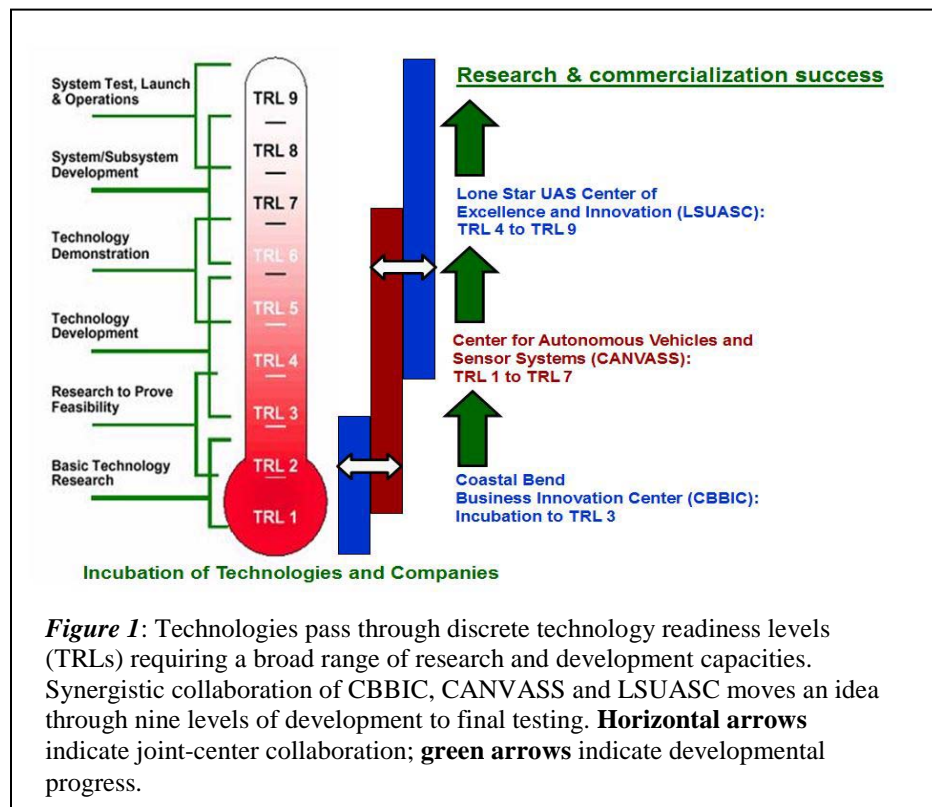
Corpus Christi Army Depot (CCAD), a helicopter-maintenance facility that has recently taken on services for unmanned military aircraft. A&M-Corpus Christi's location meets with the Code of Federal Regulations' mandate that flight testing occurs only over open water or sparsely populated areas having light air traffic, which also has made the region ideal for training Navy pilots since 1941.

A key element of A&M-Corpus Christi's capacity for UAS research is its Conrad Blucher Institute for Surveying and Science (CBI), an internationally recognized center in geographic information systems research and development of geospatial software. CBI houses the Texas Spatial Reference Center and the Texas Coastal Ocean Observatory Network. Moreover, CBI is especially qualified to design and commercialize software platforms related to UAS applications and has extensive private-sector connections in the field, including Shell, Microsoft, Leica, American Aerospace Advisors Inc. and Trimble, the world's leading provider and developer of GPS technology which recently acquired Gatewing, a world-leading producer of UAS for commercial and industrial use.

LSUASC complements plans for a proposed TEES Center for Autonomous Vehicles and Sensor Systems (CANVASS) and its state of the art UAS test facility called the Riverside Range at Texas A&M University's Riverside Campus. CANVASS is being designed to address difficult research issues and problems requiring realistic, outdoor

laboratory environments from a network of affiliated laboratories and researchers. Leveraging LSUASC and CANVASS capacities offers an orderly progression from indoor labs to initial test-readiness to full-scale test ranges to commercialization. Figure 1 (pg. 3) illustrates how interlocking capacities at A&M-Corpus Christi, CBBIC and CANVASS efficiently and effectively advance the development and commercialization of UAS technologies.

LSUASC complements the existing collaborative small UAS research and exercises for public safety uses held by the TEES Center for Robot-Assisted Search and Rescue (CRASAR), TEEX and Texas Task Force 1. Small UAS protocols developed in part at the Disaster City® sites were used for the UAS flights inspecting damage at the Fukushima Daiichi nuclear accident and have been adopted by Italian and German response agencies. Research capabilities include human-robot interaction and human factors testing through the \$2M RESPOND-R mobile distributed



*Figure 1:* Technologies pass through discrete technology readiness levels (TRLs) requiring a broad range of research and development capacities. Synergistic collaboration of CBBIC, CANVASS and LSUASC moves an idea through nine levels of development to final testing. **Horizontal arrows** indicate joint-center collaboration; **green arrows** indicate developmental progress.

test instrument, funded by the National Science Foundation and TEES. The resources and experience of CRASAR are included in CANVASS.

A&M-Corpus Christi will establish the Lone Star UAS Command and Control Center at CBBIC. This facility will house a control system for managing 14 proposed Texas test ranges as proposed to the FAA (Appendix A), including mobile command units dispatched to remote test range locations. CBBIC also will house a business development office and electronics testing lab to provide pre-flight services to public- and private-sector clients. The control center will coordinate and manage the LSUASC integrated data environment (IDE) which is essential to reporting flight and test data to clients and the FAA. The IDE will ensure that proprietary data is secure and that data required by the FAA is readily accessible.

### **Faculty Experience and Expertise**

A&M-Corpus Christi's School of Engineering and Computing Sciences, the CBI for Surveying and Science, the Center for Coastal Studies (CCS) and the Harte Research Institute for Gulf of Mexico Studies (HRI) engage in multidisciplinary research efforts across the A&M-Corpus Christi campus. UAS research in engineering, GIS mapping and environmental monitoring has supported the university's Unmanned Aerial Systems Initiative which has been authorized since 2011 to fly RS-16 aircraft over 450 square miles of the Texas Gulf Coast. The following table indicates the range of research interests among faculty that will expand current research and support LSUASC through public and private-sector funding for either primary UAS research or the use of UAS technologies to support research interests.

To further build academic and research strengths in UAS technologies, the A&M-Corpus Christi School of Engineering and Computing Sciences plans to advertise a cluster hire in the area of unmanned systems development. Six faculty will be sought with UAS and Autonomous Underwater Vehicle expertise in sensors, autonomous navigation, guidance and control, multi-dimensional signal processing, signal compression and reconstruction of large datasets or multiple target tracking, energy and power sources for unmanned systems and automation, ergonomics and cognitive UAS resource management.

Beyond A&M-Corpus Christi, the center will be supported by strategically selected team members from TEES and multiple Texas public universities and research facilities that are already committed to the initiative under teaming agreements established under the FAA proposal application. All have current and/or proposed UAS sponsored research, broadening Texas' reputation for innovation of emerging technologies.

## **2. Impact on Education and Training of Students**

The LSUASC will support development of a multidisciplinary UAS track under A&M-Corpus Christi's traditional degree programs of engineering, computer science and geospatial science. The mechanical engineering program at A&M-Corpus Christi has initiated development of a multidisciplinary elective UAS track into the curriculum as technical electives for its students. Curriculum currently includes aircraft aerodynamics and performance, UAS guidance and controls, and policy and environmental assessments. The Mechanical Engineering UAS technical elective track will be expanded to other disciplines to include cloud computing, sensor development and implementation, imagery, sense-and-avoid, human-computer/UAV-interface and ergonomics and cognitive UAS resource management from computer science, geospatial

information science and future engineering programs. The UAS track courses, as well as the graduate-level UAS courses to be developed, will utilize the LSUASC resources as a laboratory component.

The LSUASC also will serve as a laboratory and proving ground for thesis and dissertation research in current graduate programs in computer science and geospatial surveying engineering, the proposed Ph.D. program in geospatial computing sciences and future graduate programs in engineering. Undergraduate UAS track and graduate thesis/dissertation research will provide opportunities for faculty to mentor and train students to pursue careers in UAS-related industries and to contribute to workforce development of this emerging industrial sector.

### **Training Programs**

As commercial use of UAS technologies expands, the need for personnel trained in operations and maintenance will be vital to commercial success. A&M-Corpus Christi, in collaboration with TEES and other institutions within the state, will create workforce development programs to support UAS operations including components such as UAS mission planning, risk assessments and mitigation, operation, data security archiving and reporting, and maintenance and repair. On-line options of selected components, in conjunction with the LSUASC's modeling and simulation resources, will be developed to deliver training cost effectively.

### **3. Sources and Future Expectations of Financial Support**

A&M-Corpus Christi, in collaboration with TEES, has submitted a competitive proposal to the FAA for a contract program that carries no funding. The university expects to be one of six UAS test sites designated among 50 applicants across the United States. It is likely that research will be funded at these sites by the FAA to assist the agency in reaching its overarching goal.

There is, however, a well-developed budget and business plan for the LSUASC supporting four major sustainable revenue sources: (a) federal and state funding to directly support the LSUASC command and control center; (b) federal and state sponsored research through team member projects; (c) consortium fees; and (d) private industry flight testing fees for companies that wish to commercialize their products. LSUASC team members have accumulated more than \$11M in funded or proposed sponsored UAS research with the National Aeronautics and Space Administration, the National Science Foundation, the Air Force Research Laboratory, the Office of Naval Research, the Army Research Office, the Defense Advanced Research Projects Agency, Los Alamos National Laboratory, the Office of the Secretary of Defense, the Department of Commerce and aerospace industry-sponsored research. As the FAA begins to integrate UASs into the national airspace, a significant increase in UAS research funding is anticipated. Start-up funding will be provided by TEES, A&M-Corpus Christi, Camber Corporation and the City of Corpus Christi in the amount of up to \$800,000 over the first three years after which time the center will be fully self-funded.

### **4. Governance and Advisory Structure**

Figure 2 illustrates the organizational structure of the LSUASC. An Administrative Council consisting of A&M-Corpus Christi's Vice President for Research, Commercialization and Outreach, A&M-Corpus Christi's Dean of Science and Engineering and TEES's Deputy Director will oversee the LSUASC. The council will be supported by TEES's Assistant Agency Director for Operations. The council will formally meet once a year and is charged with the overall

conduct of the center, appointing and ensuring the director is carrying out his/her responsibilities to meet center goals and comply with FAA UAS regulations.

The External Advisory Board will meet biannually. The board's responsibility will be to identify research opportunities and actively seek vendors with projects appropriate to the research and development capacities of the center. The Administrative Council will vet nominations to the board for final approval by the chief executive officers of A&M-Corpus Christi and TEES.

The LSUASC director's primary responsibility will be to oversee the administration of the test site assuring a safe facility that complies with FAA regulations and procedures. The LSUASC director will ensure that range-user objectives contribute to FAA focal areas and safe integration of UAS into the national airspace. Moreover, the director will provide open communication to participating center partners and the public in an appropriate and timely manner.

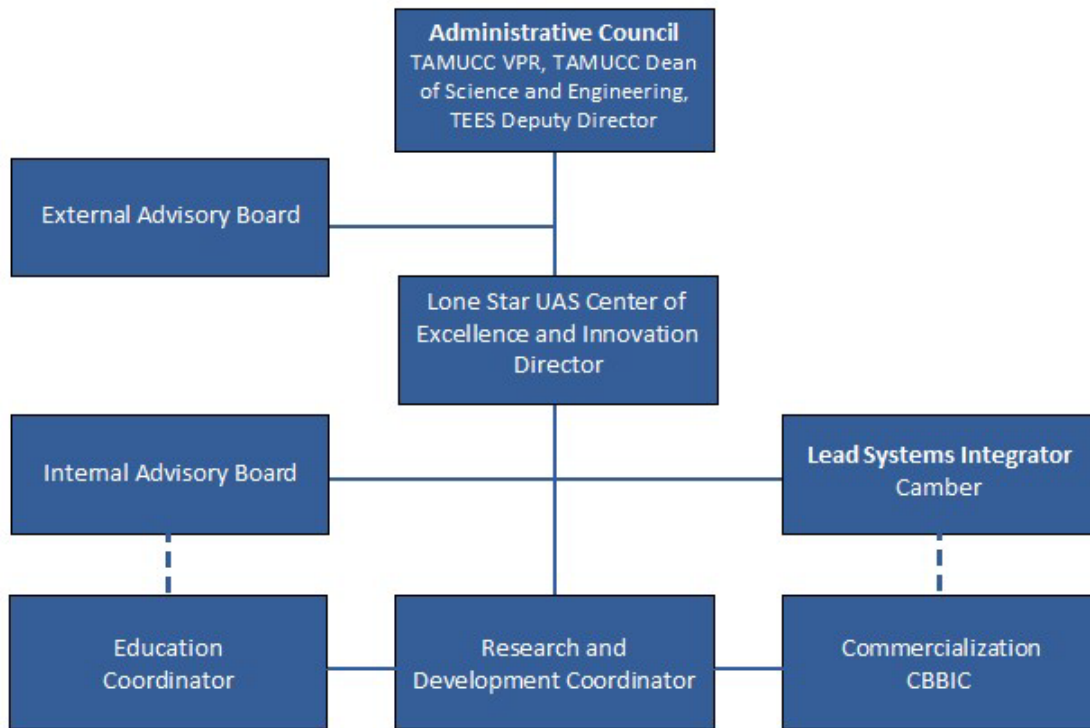
The Internal Advisory Board will consist of appointed A&M-Corpus Christi faculty and TEES researchers with academic and applied research interests in UAS technologies. The Internal Advisory Board will be nominated by A&M-Corpus Christi's Dean of Science and Engineering and TEES's Assistant Agency Director for Strategic Initiatives and Centers, vetted by the Administrative Council and approved by the President/CEO of A&M-Corpus Christi and the Deputy Director of TEES. This board will provide direction to ensure the center is addressing the needs of industry, students and research faculty. The Lead Systems Integrator will provide site management, site operations, mission and safety assurance research and development and outreach, and commercialization. An Education Coordinator, who will be appointed by the LSUASC director and approved by A&M-Corpus Christi's Dean of Science and Engineering, will assure A&M-Corpus Christi students and faculty have access to research and applied opportunities and coordinate opportunities to engage students with industry partners when appropriate. A Research and Development Coordinator, also appointed by the LSUASC director and approved by A&M-Corpus Christi's Dean of Science and Engineering and the Deputy Director of TEES, will provide administrative support for research activities affiliated with the LSUASC. Finally, the CBBIC will provide linkages for students to collaborate with industry partners to facilitate the commercialization of products through CBBIC.

## **5. Mechanisms for Periodic Review**

The LSUASC will be reviewed in accordance with the policies established for A&M System/TEES institutes and centers. In addition, there will be a special review conducted every five years. In addition to these reviews, LSUASC-associated institutes, centers, departments and specific funded programs routinely undergo formal periodic reviews by their various funding and accrediting agencies.



**Lone Star UAS Center of Excellence & Innovation  
Organizational Chart**



**Figure 2:** Lone Star UAS Center organizational structure

## Appendix A

### Lone Star UAS Center of Excellence and Innovation Test Sites Across Texas

