

## **Rutgers University—New Brunswick Strategic Plan Proposal Submission Form**

### **Instructions**

As a critical component of the campus's strategic planning process, members of the Rutgers University–New Brunswick community—faculty, staff, and students—are invited to propose projects to advance the excellence of the campus. Each proposal should:

- align with one or more of the strategic priorities, foundational elements, and integrating themes of the University Strategic Plan;
- be cross-cutting for New Brunswick, not simply housed in or enhancing a single unit;
- have the potential for significant impact and benefit for New Brunswick and Rutgers;
- leverage existing strengths or resources;
- require limited, or phased-in, financial resources.

Please complete the form on the following page as a Word document and submit it as an email attachment to [NBStratPlanProposals@rutgers.edu](mailto:NBStratPlanProposals@rutgers.edu). **All proposals must be submitted by April 15, 2014.**

Provide your phone number and email address on the form so the Coordinating Committee or one of its subcommittees can reach you if clarification or further information is needed.

Be sure to save and print a copy of your proposal for your records.

### **Guiding Questions**

The following questions may be useful in formulating your proposal.

1. In addition to the *primary* strategic priority, foundational element, or integrating theme addressed in the proposal, are there others to which this proposal relates?
2. What needs and current trends are addressed by this proposal (e.g., diversity goals, needs and advances in instructional technology, online education, organizational streamlining, revenue enhancement)?
3. Are there similar initiatives already in place in New Brunswick? If so, how would this proposal add a new dimension to those initiatives?
4. What individuals and/or groups were involved in developing this proposal?

**New Brunswick Strategic Planning Proposal**

**Proposal Title:** Rutgers University Center for Unmanned Aircraft Systems

**Proposal Initiator:** Alberto Cuitino, School of Engineering

**Primary Contact Name and Phone Number:** Alberto Cuitino – 609 721 3940

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**Primary Strategic Priority/Foundational Element/Integrating Theme Addressed (Select one)**

**Envision Tomorrow's University**

**Proposal Abstract** (brief summary of the proposal – 250-word limit):

We propose to create the Center for Unmanned Aircraft System (UAS) at Rutgers University. This center will bring together isolated and incipient activities towards a synergistic and complementary effort, which will propel Rutgers to gain a leadership role in this emerging area by addressing multi-disciplinary UAS grand challenges. Capturing this role will allow Rutgers to compete for significant external funding, foster new partnership with industry, engage the State in economic development, and develop new educational programs. Rutgers is excellently positioned to compete for such a prominent national role but so other institutions with similar or stronger programs. Investment for seeding the UAS Center at Rutgers is critical in order to gain external visibility and to gel the internal inter-disciplinary collaborations.

UAS is an emerging area with impact in many fronts, from the technology for new aircraft system platforms (materials, controls, sensors) to new application, strategies and deployment of UAS to improve agriculture, manage and control vector diseases, monitor our civil infrastructure, deliver critical supplies and responding to disasters. It is estimated that UAS technology will create more than 100,000 jobs nationwide and generate more than \$82 billion in economic impact in the first decade, helping create lasting jobs and boost the U.S. economy.

We request funds for establishing the Rutgers UAS center aimed at given Rutgers a national voice and lead role to be a major participant in the future of civil and commercial UAS.

## **Full Proposal Description (5-page limit)**

### *a) What is being proposed?*

We propose to establish an interdisciplinary center for Unmanned Aircraft System (UAS) at Rutgers University. There is a significant opportunity for Rutgers University to become a key player in the emerging area of civil and commercial UAS. The challenges expand from advancing scientific research, to improve agriculture, to manage and control vector diseases, to monitor our civil infrastructure, to deliver critical supplies and to responding to disasters just to mention a few. The Association of Unmanned Vehicle Systems International's economic report projects that the expansion of UAS technology will create more than 100,000 jobs nationwide and generate more than \$82 billion in economic impact in the first decade following integration of UAS into our skies, which will help create lasting jobs and boost the U.S. economy<sup>1</sup>.

There is little doubt that there will be substantial growth in educational and scientific research needs in this area, the question however is what role Rutgers will play and what fraction of the funding will capture. Our proposal is aimed at positioning Rutgers as one of the leaders in the Nation on UAS, giving our University the visibility to fostering key partnership for education & research with Federal Agencies, State and with Industry. Rutgers is currently among those institutions that could jump to a dominant scientific and technological role; however capturing this opportunity will require the recognition of UAS as one of the Rutgers strategic initiatives and timely investment.

Rutgers has some key competitive advantages that can be exploited through strategic investment to compete for a leadership role at National level. These advantages include:

#### Competitive advantage #1: National UAS Test Site

In December 2013, the Federal Aviation Administration (FAA) announced that Rutgers partnered with Virginia Tech and the University of Maryland as one of six winning test sites to begin testing UAS. The other test sites include: Texas A&M University, the University of Alaska, the state of Nevada, Griffiss International Airport in upstate New York and North Dakota's Department of Commerce. One of the key strengths of our test site is the variety of airspace that could be used to test UAS.

This designation by the FAA has far reaching implications, as commercial and civil testing of UAS will be conducted in one of the newly designated test sites. This represents a key competitive advantage for Rutgers in developing a nationally recognized program in UAS. Our test site is receiving and will continue to receive many solicitations from companies to access its air space, from big corporations with mature programs developed for other sectors (DoD), to small companies rich in innovative applications but modest in technological development, to specialized companies serving as technology providers for new applications. Rutgers can take a lead role by providing a path forward towards addressing the needs and challenges faced by industry, from providing a UAS industrial network to identifying educational and research gaps, leading to the formulation of sponsored research proposals.

#### Competitive advantage #2: FAA Tech Center

The FAA William J. Hughes Technical Center is located 10 miles northwest of Atlantic City. With over 5,000 acres, it serves as The FAA national scientific test base for research and development, test and evaluation, and verification and validation in air traffic control, communications, navigation, airports, aircraft safety, and security. The Technical Center consists of state-of-the art laboratories, test facilities, support facilities, the Atlantic City International Airport (ACY), and a non-commercial aircraft hangar. The Technical Center is also home to the Department of Homeland Security, Transportation Security Lab,

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<sup>1</sup> <http://www.politico.com/story/2013/12/drone-test-sites-101604.html#ixzz2ys6UUqrF>

and the United States Coast Guard Group Air Station Atlantic City, as well as the New Jersey Air National Guard 177th Fighter Wing.

Having the FAA technical center in NJ, offers Rutgers a great opportunity to strengthen and develop new programs with our FAA colleagues, especially in the UAS area. In addition, it will allow developing robust interactions of FAA personnel with our students and industry partners. It will also offer our State as a great target for investment to support a new and growing industry to bring desirable jobs back to NJ.

#### Competitive advantage #3: Announcement of FAA Center of Excellence (CoE)

On March 28, 2014, the FAA released a notice of intent to establish the FAA Center of Excellence (COE) for Unmanned Aircraft Systems (UAS), which will be competitively selected within next year. According to the notice: “The COE will be a geographically disbursed consortium of the FAA, university partners and their affiliates selected by the FAA Administrator to conduct UAS related research, education and training while working jointly on issues of mutual interest and concern.”<sup>2</sup>

Our competitive advantage is complementary from the previous two. We are already forming a coalition with our test site partners to jointly propose the establishment of UAS CoE in the region collocated with the FAA technical center. The research and education portfolio of our coalition compares favorably well against the other five test sites.

#### Competitive advantage #4: Rutgers Thematic Diversity

Rutgers, one of the most comprehensive research Universities in the country, provides the advantage to a number of existing programs across several units. This advantage gives the opportunity to nucleate these efforts towards larger and more interdisciplinary challenges with higher impact and visibility. Among the existing program we can mention a couple due to space limitations, for example developing applications for scouting in agriculture such detecting disease, looking at soil characteristics as well as use of thermal sensors for detecting stress. The key advantage of UAS is the multi-temporal aspect of data collection to provide information on changes in the target on a tight time scale. Another example is UAS Swarm using multiple UAS to cooperatively execute missions while increasing reliability by redundancy of sensors, navigation with combined GPS and 3D Visual reconstruction and development of on board sensors for collecting reliability data in UAS.

### **Goals and Program Components**

To address this opportunity we request support from the NB Strategic Plan to establish the Rutgers UAS Center with the following long-term goals:

- To bring a new portfolio of educational and research activities with broad participation of industry and with significant impact to workforce development for New Jersey and the US and,
- To increase the external support to Rutgers in UAS research and education.

The UAS center will be able to address multi-faceted project such the integration of UAS with the global fleet of autonomous underwater vehicles. We envision numerous synergies between our autonomous underwater vehicles and unmanned aircraft systems (UAS). The first application would be a high bandwidth and low cost databus for the retrieval of data from the gliders. The gliders currently use the Iridium satellite network with a baud rate of 4 Kbits/s at a cost of \$0.75/min. The gliders utilize approximately 150 minutes per day of connection time to send back the most essential and down sampled data. Having a high bandwidth solution would enable several opportunities. The aerial vehicle could offload all of the data from the glider at speeds of 115 Kbits/s. We have had the unfortunate luck of not recovering a vehicle after deployment. Having this high bandwidth solution would eliminate the

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<sup>2</sup> <https://faa-uas-coe.net>

possibility of any data being lost for failing to recover the glider. This would also allow the scientist to receive the data after a storm without the need to bring the glider back to shore to recover the high-resolution data.

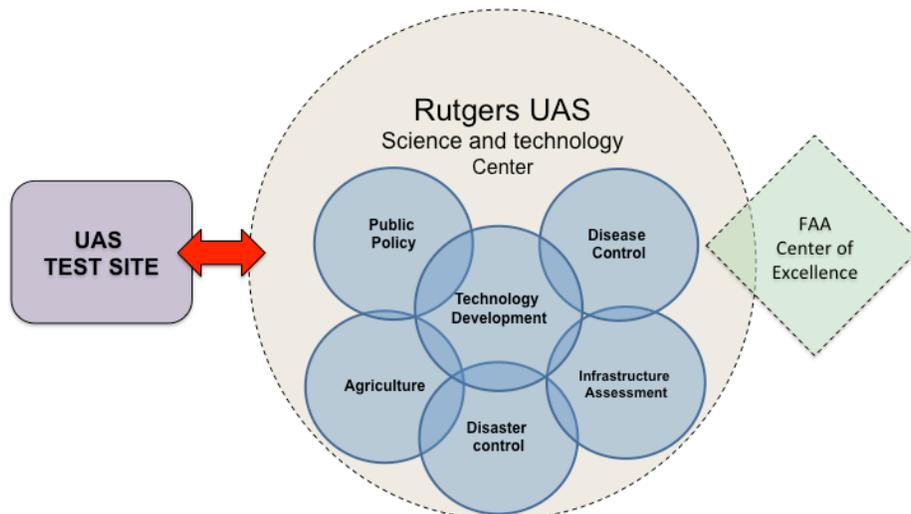


Figure 1: Schematic Center Structure and connectivity with existing (solid lines) and expected (dash) programs

Our key short-term priorities are:

- 1) **Establishing an identity for Rutgers UAS.** A key element towards capturing a lead role is to create a Rutgers' identity encompassing all thematically diverse activities (see Figure 1 for center's structure) and
- 2) **Building interdisciplinary UAS teams.** Addressing the large-scale needs in this domain will certainly require amalgamation of talents from different disciplines; we thus need to develop the collaboration fabric to successfully compete for external funding.

To enable these priorities we have identified the following Center elements:

*Element 1 – Center Staff*

The Center will need the full-time dedicated support of 2 people. The first position will be a business manager responsible for business development, grant facilitator and day-to-day management operations and coordination with the UAS Test Site. The second position will be an administrative assistant providing the support to the business manager and the UAS research and education team.

*Element 2 – Seed Funding for interdisciplinary projects*

The Center will provide support through Fellowships and equipment as cost sharing for projects that utilize synergistic and complementary expertise across NB. The Rutgers UAS community will provide this support to foster the collaborations and to strengthen the incipient across unit initiatives. It is envisioned that the Center will provide support for one year and the newly funded project will commit to subsequent funding. During the first year (Fall 2014), allocation of support will be directed to existing projects that are interested in introducing an additional multi-disciplinary component and will commit to subsequent funding.

### *Element 3 – Rutgers UAS Visibility*

The Center will host National Symposia to address several key aspects of the UAS current and future agenda. During the first year, the center will host a National Symposium to delineate the science and technology roadmap for 2020 and beyond. We plan to invite i) key industry leaders across the nation with competence in UAS, which are also among our current and expected employers of our UG students such as Boeing and Lockheed Martin; ii) Federal and State officials from NASA and FAA who will have the responsibility to draft the national agenda as well as future regulations, iii) Small-business entrepreneurs, iv) academic leaders with significant programs in UAS and v) professional organizations. Following years, the scope will shift to Industry Partnerships (2015) and UG/G Education (2016).

### *Element 4 – Undergraduate Education*

The Center will support curricular development attending to future needs in this emerging area. In addition of hosting a national debate about UG education, the center will provide seed funding for the development of classes and laboratories with impact in multiple units. Students from different academic units in NB will be able to work side-by-side on UAS focused programs, strengthening their skill set and opening new opportunities to better compete for future jobs.

### *Element 5 – Industrial Internships*

The Center will support industry internships through companies seeking access to the UAS test site. Each program will be able to consider the incorporation of these internships in their UG or G degree requirements. For example, at SoE an internship will be part of the graduating requirements for a Master of Engineering with concentration on UAS. We foresee this internship as a distinctive component of our Center; where intern will serve as a dedicated resource pairing industry to our Rutgers UAS Center.

### *Element 6 – Outreach (building the workforce pipeline)*

The Center will host a 2-week summer program for HS students; the program will include a series of lectures from industry and academia in addition to hands-on activities formulated by the project leaders at UAS center.

### *b) How the initiative aligns with the University Strategic Plan?*

This initiative addressed the challenges Tomorrow's University built on a strong sense of partnership between industry, government and academia. The main goal is to educate and develop the workforce of tomorrow in emerging areas of growth and need.

### *c) Any additional themes, priorities, and elements addressed*

This initiative touches upon other themes of our University Strategic Plan, including

- *Build Faculty Excellence.* A lead role in the area of UAS will allow us to attract the best and brightest faculty candidates from academia and industry. The designation of the UAS test site has already played an important role in attracting junior faculty (Dr. Bai, Fall 2014, SoE).
- *Enhance Our Public Prominence.* Commercial and Civil UAS applications have the potential to save time and resources but most importantly save lives. This initiative has the opportunity to open a new facet to highlight Rutgers prominence.
- *Transform the Student Experience* through relevant internships with companies in UAS domain.
- *Improving the Health and Wellness of Individuals and Populations* by helping agriculture and control diseases.

### *d) Who will be involved?*

Our initial contributors and participants are listed below. Our goal is to have a inclusive center to broad participation across many units. Xiaoli Bai (Mechanical and Aerospace-MAE, SoE), Javier Diez (MAE, SoE), Elsayed Elsayed (Industrial and Systems Engineering-ISE, SoE), John Grande (Snyder Research

Farm, SEBS), Peter Oudemans (Plant Pathology, SEBS) Randy Gaugler (Vector Biology, SEBS), Cliff Lacy (Center for Disaster Preparedness and Emergency Response), Jim Luxhoj (ISE, SoE), Ali Maher (Civil and Environmental-CEE, SoE), Hugh Roarty (Coastal Ocean Observation Laboratory, SEBS) and Jingang Yi (MAE, SoE).

*e) Desired outcomes.*

The main outcome of this initiative is to position Rutgers as one of the scientific and technological leaders in the area of Unmanned Aircraft Systems, to allow Rutgers talent to contribute to NJ and US to address emerging areas of societal needs.

*f) Anticipated resources to support this initiative.*

We anticipate the Center will require support for a period of 3 years to address the short-term goals of this initiative. Once the Center is established, we expect the center will generate resources from external sources to support individual research and center level initiative. We provide an approximate budget for the first year per program element.

Element 1 – Center Staff

Business manager: \$125,000 (including benefits)

Administrative assistant: 55,000 (including benefits)

Element 2 – Seed Funding for interdisciplinary projects

3 Fellowships: \$150,000

Element 3 – Rutgers UAS Visibility

Symposium: \$15,000

Element 4 – Undergraduate Education

Curricular Development: \$10,000

Element 5 – Industrial Internships

Supported by industry

Element 6 – Outreach (building the workforce pipeline)

UAS summer School: \$15,000

Year 1 budget: \$350,000

We expect a similar level of resources needed for year 2 and 3. However, the revenue from new external grants will cover an increasing fraction of these needs. Accordingly, we expect: Year 2 budget: \$200,000  
Year 3 budget: \$50,000. The total anticipated budget is \$600,000

**Proposed Measures to Mark Progress or Determine Success**

*[Please explain, in one or two paragraphs, how progress toward achievement of the initiative will be measured and how overall success will be determined.]*

Several measures will be considered to track progress and success of this initiative. Key measures or progress: 1) the number of industrial partners engaged with the UAS Rutgers Centers, 2) level of UAS center funded proposals, 3) multi-discipline publications, 4) student placement, 5) availability of new educational program. One key measure of success will be that our team will be among the top contenders for the FAA Center of Excellence on UAS.

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