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Industry Day

University Affiliated Research Center (UARC): Tactical Autonomy

9 August 2022

Dr. Victoria Coleman – Chief Scientist of the Air Force

Administrative Announcements

- Exits
- Restrooms
- Refreshments
- Breakout Meetings/Private Conversations

- Please ensure your microphone is muted until acknowledged
- Type questions in the chat or raise your hand (physically or virtually)

- Parking Garage closes at 7pm
- The building closes at 6pm

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Introduction of Host: Dr. Victoria Coleman, Chief Scientist of the Air Force (AF/ST)

9 August 2022

Mr. D. Tim Williams – UARC Program Manager

Dr. Victoria Coleman

- Increasing HBCU Research and Development
- Level the playing field
- Just do it!
- Plan and a leader

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Background

Identified program advocates (DAF and DoD)

SecAF approved plan on 22 Mar 2022

Developed team and began parallel efforts to build program and receive approval from USD(R&E)

Alignment:

- Program Sponsor – (AF/ST) Chief Scientist of the Air Force
- Contracting Activity – (AFRL) Air Force Research Laboratory
- Management Activity – (SAF/CDM) Air Force Concepts, Development, and Management Office

Advisors:

- Under Secretary of Defense for Research and Engineering (USD(R&E))
- Under Secretary of Defense for Acquisition and Sustainability (USD(A&S))
- Under Secretary of Defense for Personnel and Readiness (USD(P&R))

Vision

The DAF UARC is the networked national resource meeting autonomy challenges of national and global significance through autonomy research. It will be instrumental in developing partnerships between academia, government, and industry with a focus on solving challenges that are critical to our national security through tactical autonomy research.

Mission

The DAF UARC will lead, integrate, and deliver multidisciplinary research and development solutions in Tactical Autonomy. In carrying out this mission, the DAF UARC will:

1. Catalyze community growth among autonomy researchers and end-users by enabling collaboration among many autonomous research organizations.
2. Accelerate autonomy competency development through rapid transfer of its research to educators and practitioners.
3. Transform and transfer autonomy practice throughout the government by creating innovative methods, processes, and tools that address critical challenges to meet mission outcomes.

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Under Secretary of Defense for Research & Engineering (USD(R&E))

Dr. Joan Fuller – Director, FFRDC & UARCs

USD(R&E)

HBCU-UARC Industry Day

Dr. Joan Fuller
Director, FFRDC & UARC
USD(R&E)/RT&L
09 August 2022

• Washington, DC

DoD UARC Policy

- In 1994, Congress enacted Public Law 103-335, SEC. 8097A requiring a management plan for the major university-affiliated research centers (UARCs). The plan shall-
  - (1) establish annual funding and manpower ceilings for each institution, and a total annual funding and manpower ceiling;
  - (2) describe in detail what specific actions are being taken to increase management of these institutions by the Office of the Secretary of Defense, and to reduce future annual funding; and
  - (3) explain the contracting arrangement with each institution, including an evaluation of whether contracts for future efforts should be competitively awarded.
- The 2010 UARC Management Plan is the implementation of 103-335 SEC. 8097A and is the official DoD policy for DoD UARCs. https://rt.cto.mil/ffrdc-uarc/

The authority to establish and maintain a UARC…

10 U.S. Code § 3204 - Contracts: competition requirements

- **(c)**The head of an agency may use procedures other than competitive procedures only when
- **(3)** it is necessary to award the contract to a particular source or sources in order,…
- (B) to establish or maintain an essential engineering, research, or development capability to be provided by an educational or other nonprofit institution or a federally funded research and development center.

DoD UARCs – Approved Technical Competencies

University Affiliated Research Centers (UARCs)	Technical Specialization – Key Core Competencies
Navy-managed Johns Hopkins University Applied Physics Laboratory Pennsylvania State University Applied Research Laboratory University of Texas Applied Research Laboratory University of Washington Applied Physics Laboratory University of Hawaii Applied Research Laboratory	➢ Hypersonics, Cybersecurity, Spacecraft, AI, Robotics ➢ Undersea technology/systems R&D ➢ Undersea detection, sensing and C4ISR for Navy needs ➢ Oceanic environment and sensing/detection ➢ Sensors, ocean environment and renewable energy
Army-managed USC Institute for Creative Technologies Georgia Tech Research Institute MIT Institute for Soldier Nanotechnologies UCSB Institute for Collaborative Biotechnologies	➢ Developing new and improved ways to train forces ➢ Electronic Warfare, Missiles and Missile Defense ➢ Nanotechnology, materials, and their applied use ➢ Biology and related fields, and their applied use
MDA-managed Utah State University Space Dynamics Laboratory	➢ Space situational awareness and sensing
USD(I&S)-managed University of Maryland Applied Research Laboratory for Intelligence and Security	➢ Human and behavioral sciences and human-machine systems
USD(R&E)-managed Stevens Institute of Technology Systems Engineering Research Center	➢ Systems Engineering for DoD Acquisition
USSTRATCOM-managed University of Nebraska National Strategic Research Institute	➢ WMD detection and countermeasures
(DASD(TRAC))-managed University of Alaska (Fairbanks) Geophysical Detection of Nuclear Proliferation	➢ Nuclear Event Detection

Extraordinary Opportunity

- In spite of numerous requests from DoD sponsors and/or academia, the DoD has only designated 3 new UARCs since 2004.
- The approval to establish the 15th DoD UARC is indeed an unprecedented opportunity to formalize a long-term, strategic research relationship between the DoD and HBCU community.
- This will be the first Air Force managed DoD UARC and their outreach efforts are a remarkable opportunity to help shape the direction and management for the new UARC.

Little known facts on University Affiliated Research Centers (UARC)

- Only the DoD has UARCs.
- Focus is not basic research -- UARCs allow the DoD to establish long-term strategic relationship to provide and maintain advanced and sophisticated engineering, research, and development capabilities essential to the Department's mission and operations that cannot be provided as effectively and efficiently by governmental or other private sector sources.
- Ironically, focus is not workforce development – UARCs often have dedicated, full-time research staff that may even be embedded with their DoD sponsor.
- The UARC is not the university or college – each UARC is an independent, non-profit research organization affiliated with a university and sponsored by a DoD component.
- No set-aside funding – UARC funding is provided by work sponsors in support of their regular appropriations.

Attributes of a UARC require close partnership with the primary sponsor beyond what is "typical"

- Long-term strategic relationship between the DoD and the UARC
- Responsiveness to evolving sponsor requirements
- Comprehensive knowledge of sponsors' requirements
- Broad access to information, including sensitive and proprietary data
- Independence and objectivity
- Quick response capability
- Current operational experience
- Freedom from real or perceived conflict of interest
- Contributions to the body of knowledge within its domains of expertise

IT'S ALL ABOUT THE RELATIONSHIP!

Establishing, Building, and Maintaining the Relationship

- A successful UARC requires an effective relationship with the primary sponsor (and other DoD sponsors!).
- The relationship between the university, government sponsor(s), and the research center necessitates a unique governance or management model.
- Management topics often involve very nuanced DoD acquisition policy expertise, access to unique data-sets, and/or technical resources to fully realize the benefit of being a designated DoD UARC.
- If the UARC wishes, the Air Force Institute of Technology (AFIT) has offered to assist with navigating these topics.

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Under Secretary of Defense for Research & Engineering (USD(R&E))

Ms. Evelyn Kent– Director, DoD HBCU/MI Program and Outreach

USD(R&E)

Department of Defense (DoD) Historically Black Colleges/ Universities & Minority-Serving Institutions (HBCU/MI) Program

Mrs. Evelyn Kent
Director, DoD HBCU/MI Program and Outreach

Office of the Under Secretary of Defense for Research and Engineering (OUSD(R&E))
Deputy Chief Technology Office for Science and Technology

Washington, DC
09 August 2022

Mission: HBCU/MI Program

The HBCU/MI Program provides support to covered educational institutions to assist the Department in defense-related research, development, testing, and evaluation (RDT&E) activities. The Program is established by 10 U.S.C. Section 4144 and uses the statutory authorities to pursue four objectives:

Enhance the research and educational capabilities of institutions in science and technology areas of importance to national defense

Encourage the participation of institutions in RDT&E programs and activities of the DoD

Increase the number of graduates from such institutions engaged in disciplines important to the national security functions of the DoD

Encourage research and educational collaborations with other institutions of higher education, Government defense organizations, and the defense industry

Priorities: HBCU/MI Program

- **In addressing the objectives set forth in 10 U.S.C. Section 4144, the HBCU/MI Program executes several types of programs**
  - Research grants focused on science and technology areas important to the defense mission
  - Equipment grants to build HBCU/MI research and education capabilities
  - Establishment of Centers of Excellence focusing on DoD modernization priorities
  - Summer internships for students and faculty fellowships
- **The HBCU/MI Program also implements Congressional direction in Authorization and Appropriations language**
  - Congressional adds that supplement existing programs and create new initiatives
  - Conduct studies, develop and implement strategic plans
- **HBCU/MI Program Collaboration with White House Initiatives Authorized by Executive Orders**

Priorities: HBCU/MI Program contd.

- **Current HBCU/MI Programs using Congressional adds include:**
  - HBCU/MI SMART Scholarship Pilot
  - Naval HBCU/MI STEM Scholars Program
  - Office of Naval Research Distinguished Faculty Fellows
  - Air Force Research Laboratory Minority Leaders Program
  - Carnegie Classification Elevation Program
  - FY 2023 HBCU/MI Research and Education Program
    - Funding opportunity for research closes August 12, 2022
    - Research grants up to $800K with 4-year period of performance

Recent Accomplishments: HBCU/MI Program

- **Awarding 60 equipment/infrastructure grants to HBCUs/MIs totaling $28.5 million**
  - Awards represent 17 HBCUs, 41 MIs, and 2 Tribal Colleges/Universities
- **Conducted a competition for R2 HBCUs/MIs** with high potential to elevate research activity in science and engineering disciplines critical to the national security functions of DoD and attain R-1 status on the Carnegie Classification scale
- **Submitting FY20 NDAA Sec 262 report to the President and Congress on the National Study on Defense Research at HBCUs and other MIs**
- **Established two new Centers of Excellence in the USD(R&E) priority areas of Biotechnology and Materials Science**
- **Placed 52 interns at 10 defense laboratories as well as OSD organizations,** to receive hands-on research experiences and foster interest in DoD careers
- **Submitted DoD Agency Plans to Congress** in response to two distinct Executive Orders (E.O.) and White House Initiatives:
  - White House Initiative on HBCUs (E.O. 14041)
  - White House Initiative on Asian Americans, Native Hawaiians, and Pacific Islanders (E.O. 14031)

Mrs. Evelyn Kent and Army Research Office personnel pictured with principal investigators and students at Alabama A&M University during the March 2020 site visit. Alabama A&M University is an HBCU located in Huntsville, AL.

Pictured Above: DoD Summer researchers presenting during the virtual 2021 HBCU/MI Research Symposium.

HBCU/MI Program Success Story: Prairie View A&M University wins AI Naval Competition

Big Data Solutions: PVAMU center of excellence research team tops 31 universities to win Navy's national competition

Competition Description: The AI Tracks at Sea Challenge competition led by the Naval Information Warfare Center Pacific challenged university student teams to develop software solutions to real-world technical challenges faced by U.S. Naval researchers in the area of maritime contact tracking capabilities for unmanned surface vehicles.

PVAMU's CREDIT team from left to right: John Olamofe, Yuzhong Yan, Brandon Williams, Omobayode Fagbohungbe, Damilola Adesina, and Sheikh Reza.

Impact: Introduced undergraduate and graduate students to the unique S&T challenges the Navy faces, as well as the opportunity to further develop their STEM skills while working collaboratively to solve a real-world naval problem.

Of the challenge teams, **26% were comprised of students from HBCUs and 16% of the teams attend HSIs.** Collectively, the student submissions for the challenge represent various types of STEM research institutions, Ivy League Schools, HBCUs, and HSIs.

"This is a great win for the CREDIT center and Prairie View A&M University. This again demonstrated the strong research capability and excellent student training in AI of the CREDIT center."
Professor Lijun Qian, Ph.D., COE Director.

Place	Team	Amount	School
First winner	CREDIT	$55,000	Prairie View A&M University
Second winner	ASG Auto	$45,000	FAMU-FSU College of Engineering
Third winner	AiDA	$35,000	University of West Florida
Fourth winner	TrojanOne	$30,000	Virginia State University
Fifth winner	Argo Tracks	$20,000	University of West Florida
First runner-up	The Huskies	$6,000	Michigan Technological University
Second runner-up	510 Captains	$6,000	Christopher Newport University
Third runner-up	AIMS Lab	$3,000	Purdue University

STEM Pipeline: Eight Ph.D. and 27 master's students who conducted research in the center have graduated with expertise in artificial intelligence.

Questions

Thank You!

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Department of the Air Force (DAF)

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University Affiliated Research Center (UARC): Tactical Autonomy

9 August 2022

Mr. D. Tim Williams – UARC Manager
Dr. Juan Vasquez – Technical Lead
Dr. Cindy Achat-Mendes(CTR) – Education Lead
Mr. Justin Woodworth– Contracting Officer

Overview

- Industry Day Purpose
- Background
- Requirements
  - Technical
  - Consortium
  - STEM
- Broad Agency Announcement & Contract Requirements
- Panels
- Questions

Industry Day Purpose

Purpose:

Outline the Broad Agency Announcement (BAA), requirements, and selection process

- "BAA Preflight briefing"
- This discussion is market research, the BAA will contain final requirements and selection process. The BAA takes precedence over anything discussed.
- Questions are welcomed, we'll answer!
  - Q&As will be officially documented and distributed to registered attendees

Background

For decades, Congress has recognized the need to develop a diverse national science, technology, engineering, and mathematics (STEM) workforce. While federal agencies provide significant opportunities for underrepresented racial and ethnic minorities in these fields, the national STEM workforce remains less racially and ethnically diverse than the U.S. general population. As the largest federal R&D funding agency and the largest employer of federal STEM professionals, the U.S. Department of Defense (DoD) plays an essential role in the U.S. science and technology ecosystem and can greatly expand opportunities to diversify the STEM workforce. To this end, the DoD operates under a department-wide STEM strategic plan, with the following :

Inspire community engagement in DoD STEM education programs and activities to provide meaningful STEM learning opportunities for students and educators.	Attract the Nations' and DoD's current and future STEM workforce through multiple pathways to educational and career opportunities.	Increase participation of underserved and underrepresented groups in STEM education and workforce development programs, activities, and outreach.	Advance the efficiency and effectiveness of STEM education and workforce development programs, activities, and outreach through evaluation and assessment

Background – Why Tactical Autonomy

Despite the autonomy advances in the last decade, several factors continue to impede the deployment and adoption of autonomous systems:

1. Trust in Mission Autonomy: Machine learning techniques widely used today are inherently unpredictable and lack the necessary mathematical framework to provide guarantees on correctness, while DoD applications that depend on safe and correct operation for mission success require predictable behavior and strong assurance. Additionally, if we assume autonomous systems are capable of moral agency, then the goal of machine ethics is to enable machines to reason ethically.

2. Collaboration between Platforms: Achieving higher levels of autonomy in uncertain, unstructured, and dynamic environments, increasingly involves data-driven machine learning techniques with many open systems science and systems engineering challenges.

3. Human-Machine Teaming: In the absence of an adequately high-level of autonomy that can be relied upon, substantial operator involvement is required, which not only severely limits operational gains, but creates significant new challenges in the areas of human-machine interactions and mixed initiative control.

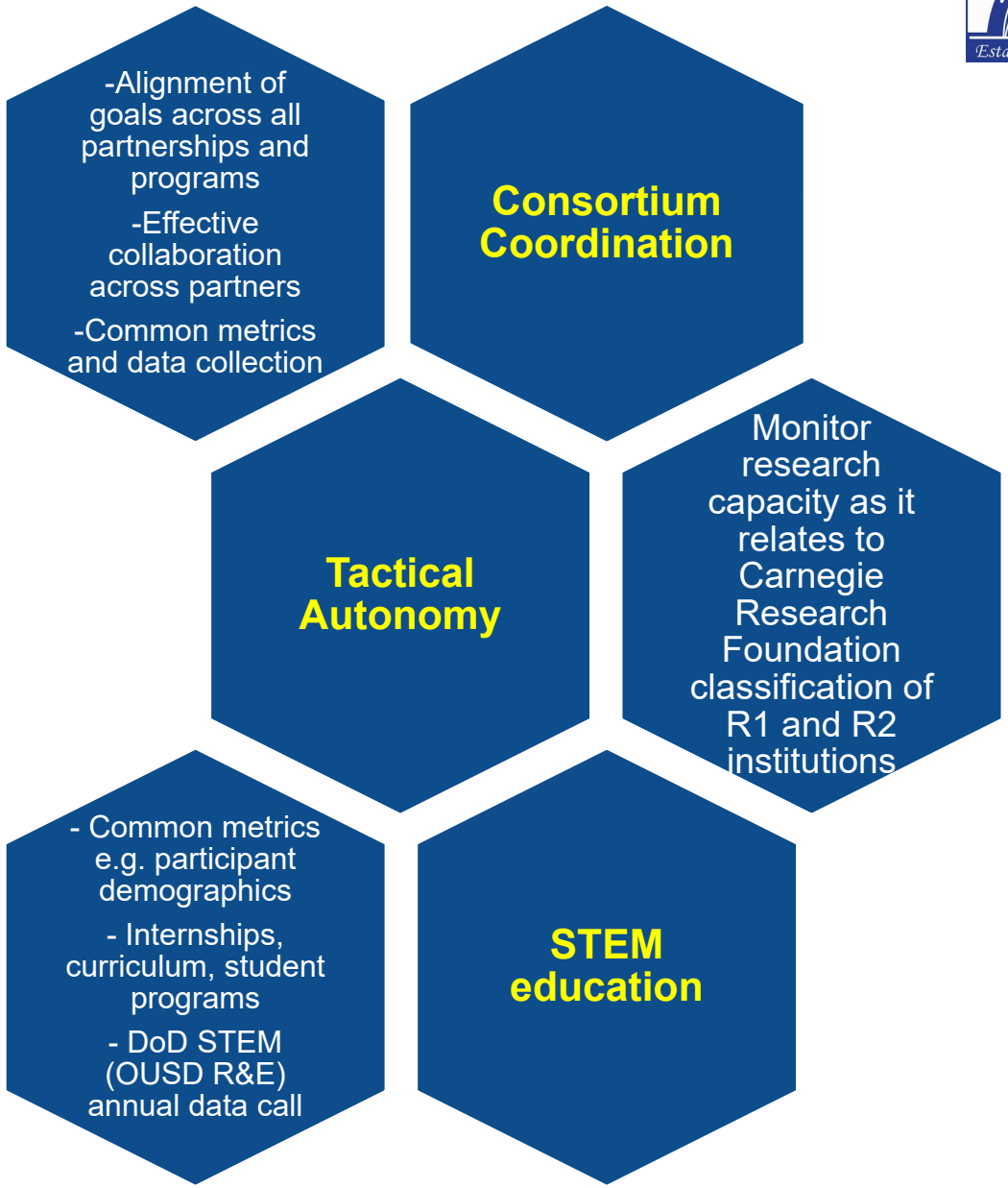
Program Description

Establish an Historically Black Colleges and Universities (HBCU) led University Affiliated Research Center (UARC) consortium to execute research focused in Tactical Autonomy (TA) that will aid in the transition of research into practical applications.

NATIONAL ACADEMIES Sciences Engineering Medicine

"Develop Metrics to Evaluate, Track & Improve Institutional Growth and Competitiveness"

NASEM – DoD study
"Defense Research Capacity at Historically Black Colleges and Universities and Other Minority Institutions: Transitioning from Good Intentions to Measurable Outcomes", Spring, 2022



Objective

The program objective is to:

- Foster creative autonomy research in science and engineering; technologies to enable DAF / DoD mission sets; minimal supervision from humans; operations in complex and unpredictable environments; with applications in Air, Space, Cyberspace, Ground, and Sea.
- Enhance early career development of outstanding STEM professionals to ultimately increase and diversify the pool of STEM talent to fulfill the Department's missions; and
- Increase opportunities for HBCUs and students to engage with the Air Force, Space Force and DoD missions and related challenges in science and engineering.

Requirements

TECHNICAL

- Provide basic and applied research to advance the field of tactical autonomy and transition research into practical application in the below focus areas, while utilizing 10 initiatives, as referenced in the *DoD Better Buying Power 3.0: Achieving Dominant Capabilities Through Technical Excellence and Innovation*:
- Focus Areas:
  - Trust in Mission Autonomy
  - Collaboration between Platforms
  - Human-Machine Teaming

CONSORTIUM

- Create and lead a consortium of HBCUs to achieve the stated objectives to include increasing Carnegie Research Foundation Classification(s) from R2 (high research) to R1 (very-high research) for at least one of the consortium schools. As well as, develop an ecosystem in autonomy related disciplines, between academia, the DAF/DoD, small businesses, and the local/regional community.
- Establish a domestic, state of the art research facility(s) dedicated to tactical autonomy research,
- Assemble, foster, and support a world-leading team of autonomy faculty and researchers,
- Increase the quality and quantity of job candidates in this area of military need, and
- Support an ecosystem of business and government partnerships to transition autonomous technologies to the warfighter

STEM EDUCATION

- Develop STEM education research, development and related activities to support K-12 and postsecondary education programs and activities, including workforce training and career and technical education programs and activities, undergraduate, graduate, and postdoctoral education, and informal education programs and activities related to autonomy.

Requirements: Technical

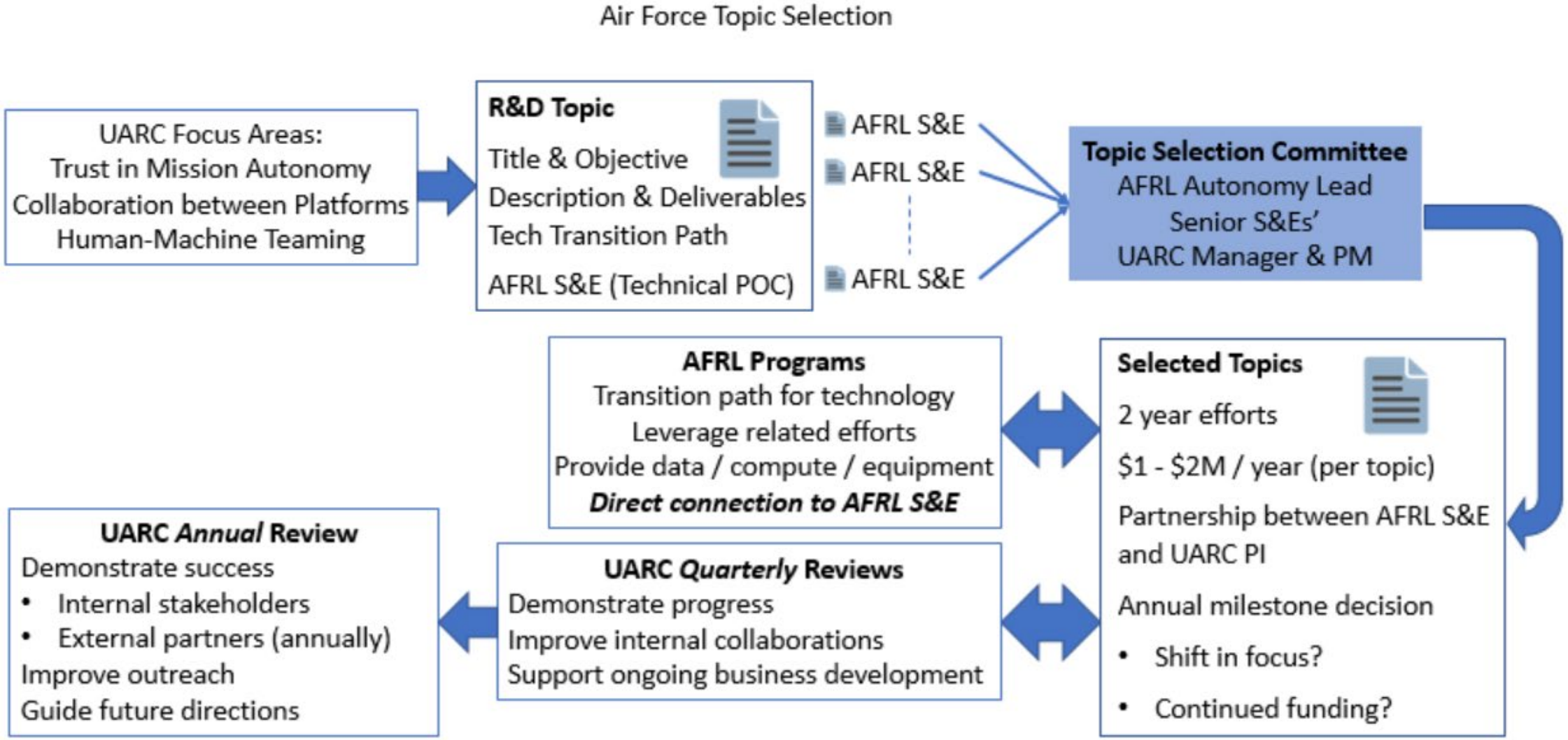
Definition:

- Tactical Autonomy is defined as autonomous systems acting with **delegated and bounded authority** of humans in support of tactical, short-term actions associated with a longer-term strategic vision.

Requirements: Technical

Trust in Mission Autonomy	• Systems will behave as expected when exposure to the operators or “users” results in behavior expectations (a mental model of what the system will do) and users are willing to be vulnerable to the actions taken by the autonomous solution.
Collaboration Between Platforms	• Study interaction between various autonomous agents to determine feasibility. To achieve mosaic warfare requires disaggregation / distribution across manned and unmanned platforms. The composition of legacy solutions with new systems/platforms can create an adaptive kill web but should not be overly costly to develop.
Human-Machine Teamng	• Hybrid teaming where individuals have different roles. Roles need to be flexible – subordinate, peer, and supervising/tasking. • Identify levels of acceptance, failure, etc., for approval. Describe and develop assessments to define levels of success.

Requirements Technical



Requirements: STEM Education

Develop workforce training, career and technical education programs to support K-12 and postsecondary education programs and activities

- Build an autonomy pipeline with training programs for undergraduate, graduate, and postdoctoral opportunities
- Increase awareness of potential ethical, social, safety, and security risks of autonomous systems
- Create curriculum for teaching topics autonomy-related topics to new and skilled workers
- Support equitable access to K-12 autonomy education for populations historically underrepresented in science & engineering
- Promote widespread understanding of autonomy principles and applications to societal and economic needs

Broad Agency Announcement (BAA)

- BAA: FA9550-22-S-0001
- Will be posted to https://sam.gov/content/opportunities
- Anticipated Release: Aug 2022
- Anticipated Proposal Due Date: Oct 2022
- Anticipated Grant/Contract Award: 8 Dec 2022
- Anticipated Performance Start: 1 Feb 2023
- Questions can be sent to: afrl.hbcu.msi@us.af.mil

Broad Agency Announcement (BAA)

Anticipated Award:	• 1 Contract to 1 University • Consortium managed by the 1 awarded University
5 Year Contract:	• Anticipated Period of Performance: • 1 Feb 2023 – 31 Jan 2028 • UARC re-certification occurs every 5 years to determine continuation
Estimated Value:	• $60,000,000 ($12M per year) • Ceiling estimated at about $90M
Contract Type:	• Contract: Indefinite Delivery, Indefinite Quantity (IDIQ) • Cost Plus Fixed-Fee

Broad Agency Announcement (BAA)

Eligibility:	• Historical Black Colleges and Universities and • Carnegie Foundation Classification of R2 or higher • Responsible based on FAR 9.1 • At a minimum, we'll check FAPIIS and SAM.gov
Fund Types:	• Predominantly 6.2 Applied Research • May utilize 6.1 Basic Research
Selection Process:	• Proposal Merit • Cost realism and reasonableness analysis

Questions

All Q&As were documented for the record & future distribution

Verbal answers were provided to the best of our knowledge

After the conference, the UARC Manager/Contracting Office validated the answers

Official Q&As were distributed via UARC website

Points of Contact

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https://www.afrl.af.mil/tactical-autonomy-UARC/

Break