



Chief Scientist of
The Air Force



Industry Day

University Affiliated Research Center (UARC): Tactical Autonomy

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Overview

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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

Identified program advocates (DAF and DoD)

SecAF approved plan on 25 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))

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

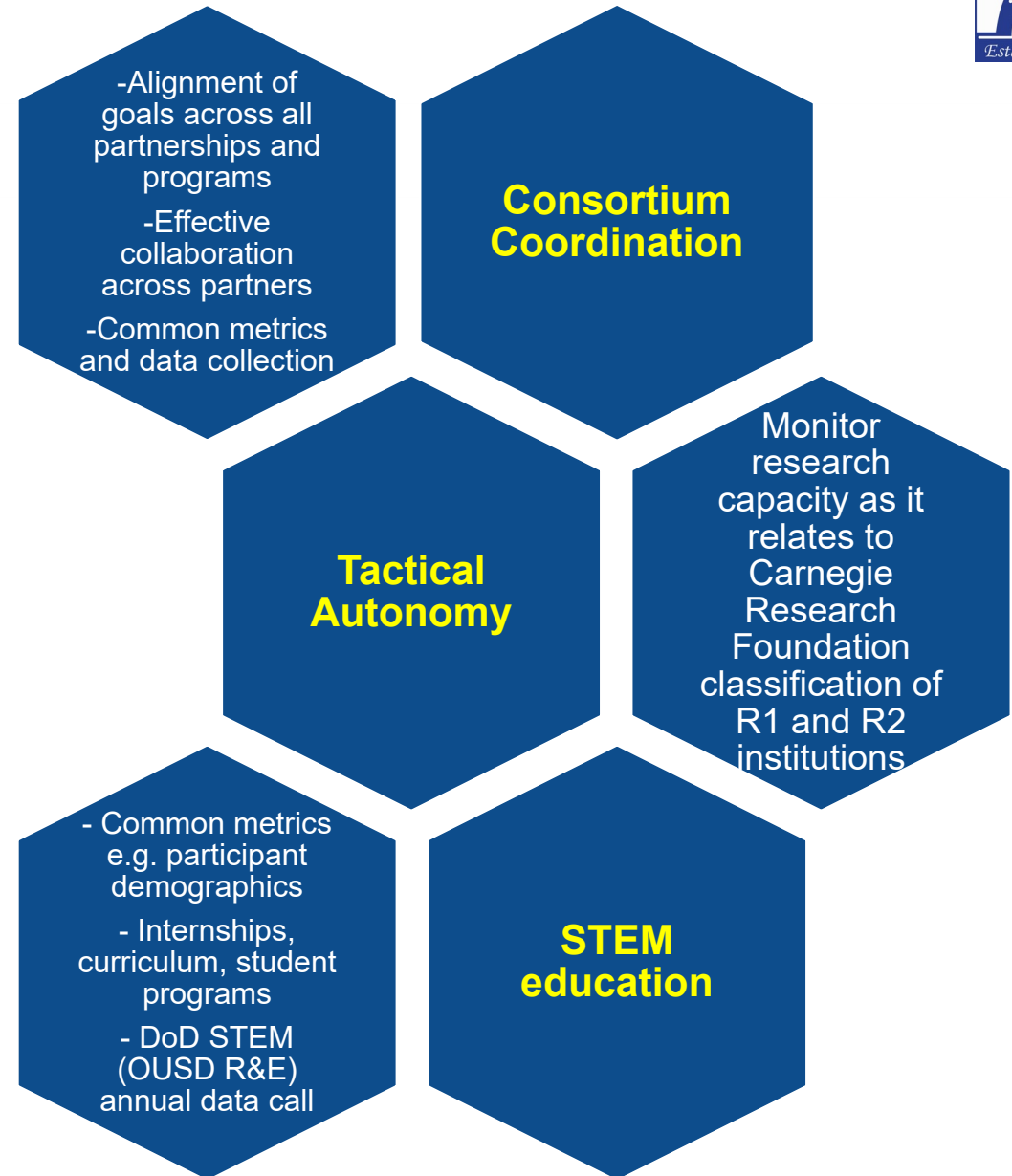
Establish an Historically Black Colleges and Universities (HBCU) led University Affiliated Research Center (UARC) consortium to execute research focused in Tactical Autonomy (TA) that will aid in the transition of research into practical applications.





“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

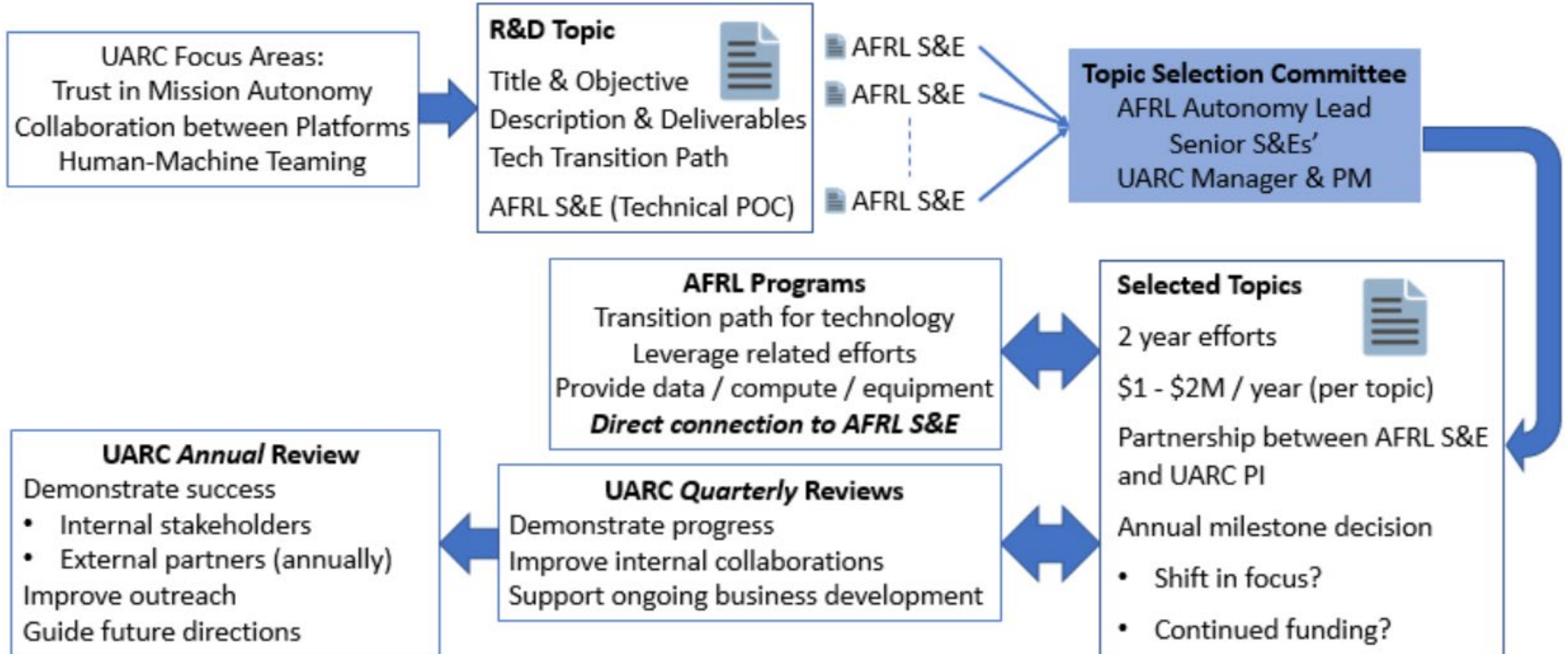
- Study interaction between various autonomous agents to determine feasibility. To achieve mosaic warfare requires disaggregation / distribution across manned and unmanned platforms. The composition of legacy solutions with new systems/platforms can create an adaptive kill web but should not be overly costly to develop.

Human-Machine Teaming

- 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

Air Force Topic Selection



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 will be documented for the record & future distribution

Verbal answers will be provided to the best of our knowledge

After the conference, the UARC Manager/Contracting Office will validate answers and revise, if needed

Official Q&As will be distributed to all registered parties via email in approximately 1 week



Points of Contact

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



AFRL



Backup

Q&A 20 July 2022 (1 of 8)

1. Does the Department of Defense currently have a UARC that is organized in a consortium fashion?

Yes, the Stevens Institute of Technology Systems Engineering Research Center (SERC) based in New Jersey

2. Does the recipient organization have to demonstrate financial administration of security requirements such as CUI or classified?

The primary recipient will be responsible for financial and security requirements. Those specific requirements will be covered in the BAA. Submitters will be responsible for writing to those requirements. Requirements could flow down to consortium members. For example, if a university requires access to classified information, they must obtain appropriate clearances.

3. Will people who work on projects in the UARC consortium have to have United States citizenship?

A: UARC principal investigators (PI), as well as, any non-lead consortium members PIs, must be U.S. citizens, or permanent residents at time of proposal submission; employed on a full-time basis and holds a permanent position. Any one working on classified work requires U.S. Citizenship.

Q&A 20 July 2022 (2 of 8)

4. Could the lead institution contract out financial and security requirements as long as they meet the National Industrial Security Program Operation Manual (NISPOM) and Defense Federal Acquisition Regulation (DFAR) requirements?

A: The awarded university is responsible for financial and security requirements. Ultimately, it is a business decision how to meet requirements.

5. Can non-HBCUs including MSIs and R1 institutions participate in the consortium?

A: Any funding from the DAF UARC must go directly to an HBCU. Non-HBCU institutions can be brought on by utilizing an already existing award or relationship with the University, however, DAF UARC funds cannot be used for it.

6. Given the focus on transition, will industry partners be accepted as well?

Yes, in fact, one of the things available for the consortium's utilization, although not directly tied to the UARC's BAA, is the Mentor Protégé Program (MPP). It is a DoD program sponsored by OUSD(A&S). It takes local or regional small businesses that may not have experience working with DoD, and partners them with a larger contractor within the defense industrial base, to ensure they have the right skill sets, and certifications to be better able to compete for DoD awards.

Q&A 20 July 2022 (3 of 8)

7. What is the expected relationship/collaboration between the DAF, AFRL, and the consortium?

A: The lead institution will interact with the Government Program Manager and his team. The DAF Chief Scientist will enlist a Board of Advisors that meet quarterly to provide valuable advice, expertise, and strategic insight. The program management team will facilitate two-way information flow between the consortium, the government board of advisors, the government S&E teams, and the PI Teams, as required.

8. After the award has been made, can institutions be later added to the consortium?

A: Yes, at any time, other institutions can be identified and recommended for inclusion by the consortium. Recommendations should be sent to the UARC's DAF management team who will then request Chief Scientist approval thru the Contracting Officer. Alternatively, the consortium coordination plan should include the process by which an institution can be removed for performance failures after completing a performance improvement plan.

9. Can the lead include and share funds with HBCUs that are not R2 classified?

A: Yes, as long as they are HBCUs, they may participate and receive funds.

Q&A 20 July 2022 (4 of 8)

10. Can R3 and lower HBCUs connect with multiple R2 institutions to be included in more than one proposal?

Yes, it is allowed and encouraged that institutions communicate what they have to offer to the R2 institutions.

11. Does the recipient institution have to include people who hold clearances?

It is not a requirement initially. The government will sponsor the awardees facility and personnel clearances to support classified research. There may be additional requirements in the future depending on the types of projects selected and the government will support the consortium in those efforts.

12. Will showing there are faculty who hold tickets (clearances) be helpful in the proposal?

It is helpful, but it won't preclude anyone from potentially being accepted.

13. Is the funding \$12 million per year or \$12 million plus \$2 million from other agencies? The total is \$12 million per year.

Q&A 20 July 2022 (5 of 8)

14. Will a Business Development Strategy need to be included in the Proposal?

The Consortium Coordination Plan (CCP) planning requires identification of Business Development.

15. In our rates can we include cost of money?

The cost of money cannot be included in the Facilities & Administrative (F&A) rates and exclusively putting it in to the proposal is **not allowed**. As a separate cost it **cannot** be included in the grant. The BAA will address this based on the contract type selected.

16. Are you considering a third agreement as a CRADA?

If the university determines they have a need for a CRADA it will be incumbent upon the university to coordinate with the government laboratory to establish the CRADA. There will not be substantial involvement by the government outside of guidance and program reviews. There will be extensive communication where the university provides information; however, the university will manage the research effort.

Q&A 20 July 2022 (6 of 8)

17. How will the operational (shared governance) directly linked to the mechanism of the contract/grant operate? Didn't understand the negotiation component of this award; assumed it would be an IDIQ w/TO. Grants require a different management mechanism, Management TO and Workforce Development TO. Grants will increase the management responsibilities of the university to build a budget and determine how much it will cost.

The award will be a contract with the potential for grants or cooperative agreements in the future. The BAA will specifically address this issue.

18. The contract would allow other services to add funding. How will other services add funding if the funding vehicle is a grant? Too many degrees of freedom requiring various and sundry permutations and difficult for the universities to propose. The ability to grow and shape should have the maximum flexibility to grow. Is it harder for other agencies to MIPR funding via grant.

The MIPR process is the same whether it's a grant or contract.

Q&A 20 July 2022 (7 of 8)

19. How do we relate the money to the consortium? There is concern tied back to the funding as it relates to fairness and equitability. Universities interested in hearing DAF thoughts regarding funding. How the money flows needs to be clear.

The DAF will declaratively state in the BAA which funding mechanism will be used.

20. Will the consortium drive the agenda around Tactical Autonomy? Can each university have their own research around this agenda or one agenda around the consortium or a central driver and each member completes a piece of the requirement?

The university recommends an answer to the identified problem set, which is the purpose of a BAA, unlike a Request For Proposal (RFP) solicitation (the BAA is seeking answers to a problem a Contract directs the development of a thing or research in support of a problem). As the university recommends a solution, the DAF will provide coordinated and approved research topics, likely during the contract kick-off.

Q&A 20 July 2022 (8 of 8)

21. In trying to align AF Science Strategy broadly and specifically the Autonomous Horizons V1 and V2 documents, the AF guidance seems to be focusing on Human Factors and Industrial Engineering. However, the broad conversation about the UARC seems to be more focused on engineering and things like sensing and control.

The short answer is both areas of research are within scope of the UARC. The intent of the findings in V2 go beyond the Human Factors and Industrial Engineering in the following way. They include knowledge as a fundamental concept, and in the AI world, knowledge comes from Human Factors, Industrial Engineering, Automated sensing and control. In addition, the 3 technical focus areas of the UARC can be loosely mapped to these areas as follows:

Human Factors and Industrial Engineering: Trust and Human-machine teaming
Sensing and control: Collaboration between platforms

All of these areas are in play within the UARC. I would encourage you to think of the R&D space to include every mission aspect of an autonomous system. That includes traditional automation (think robotics) along with significant focus on the human aspect. The current AF strategy does not assume autonomous systems will operate open loop without a human in the system. The level of human oversight is very much a part of the R&D (trust and human-machine teaming being the keys). Given this rather large breadth, I believe a successful UARC will come from a combination of experience within the lead institution augmented by the partners of the consortium.

Broad Agency Announcement (BAA)

Authority:

- 10 U.S.C. 3204(a)(3)(B) implemented by:
 - FAR 6.302-3 Industrial mobilization; engineering, developmental, or research capability; or expert services.
- 10 U.S.C. 3204(a)(5) implemented by:
 - FAR 6.302-5 Authorized or required by statute, specifically 10 U.S. Code 4144 The Secretary of Defense may establish procedures under which the Secretary may limit funding to Research and educational programs and activities to historically black colleges and universities under title III of the Higher Education of 1965

• * Formerly 10 U.S.C. 2304(c)(3)(B)