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In This Issue

- EDITORIAL
- ICUAS 2026 CLOSING REPORT
- ICUAS 2026 SURVEY RESULTS
- DTEVV WORKSHOP FINAL REPORT
- DOUBLE-BLIND PAPER REVIEW PROCESS
- ICUAS 2027 CALL FOR PAPERS
- EDITORIAL BOARD MEMBERS
- CONTACT INFORMATION



EDITORIAL

Dear colleagues and readers:

This third issue of 2026, Summer 2026, is my last one as Founding Editor-in-Chief of our eUAM. It is a great pleasure to report that Dr. Alejandro Suarez, University of Seville, Spain, will take over on September 1, 2026, with the goal to improve our Magazine and make it an indexed publication. He will be in complete charge, while I remain a soldier as needed and as instructed by him. Alejandro has assembled a very strong Editorial Board, which he will present in the last, Fall, issue of 2026.

In this issue, you will find the closing report for ICUAS 2026 along with the survey results, the official announcement for ICUAS 2027, and the final report of the technical workshop on DTEVV by Dr. D.H.Costello.

ICUAS 2026 - CLOSING REPORT

The 2026 International Conference on Unmanned Aircraft Systems (ICUAS 2026) took place on June 15-18, in Corfu, Greece. The Conference venue was the Divani Corfu Palace, located in Kanoni, about 3.5 Km from the Old Town.

ICUAS 2026 was Technically Supported by the IEEE CSS and RAS, by the European Control Association (EUCA), by the Mediterranean Control Association (MCA), and the ICUAS Association. The Conference was sponsored by NYU Abu Dhabi, the University of Denver and the University of Zagreb. MDPI – Drones and HERON were Platinum Sponsors, while there were two Exhibitors, TYTO Robotics and TII. The 2026 ICUAS UAV Competition was organized, as in previous years, by the

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Laboratory for Robotics and Intelligent Control Systems, LARICS, University of Zagreb, Faculty of Electrical Engineering and Computing, Croatia, through the CBRNe-HERO project.

The Conference was attended by 252 physically present participants, while 58 registered participants did not attend due to last minute conflicts. Participants represented academia, industry, government agencies, lawyers, policy makers, manufacturers, students, and end-users.

A record number of 331 contributed and invited session papers and 6 Workshop/Tutorial Proposals were received from 43 countries. The peer review process was very thorough, and, as in previous years, all papers were also checked following the iThenticate Document Viewer Guide before a final decision was made. This year, the paper review process also incorporated as a parameter the reviewers' confidence in the topic of the reviewed papers, reflected through a 'weight'. The three-day technical program was composed of 191 accepted papers from 35 countries. 173 were contributed papers, 16 were invited session papers, while two papers submitted, peer reviewed and accepted for publication in the ICUAS eUAM (the *e - Unmanned Aviation Magazine*) were transferred for presentation at ICUAS 2026. The acceptance rate was 57%, which is the lowest ever since launching the Conference in 2008.

The ICUAS 2026 Best Paper Award was given to Prof. Dr. Antonio Franchi, University of Twente and Sapienza University of Rome for the paper "Muscle Coactivation in The Sky: Geometry and Pareto

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Optimality of Energy vs. Aerodynamic Promptness, and Multirotors as Variable Stiffness Actuators".

The three Half-Day Workshops/Tutorials offered in the Conference were attended, in total, by 75 participants. The topics were:

- *When Robotics Meet Wireless Communications: A Tale of Two Interconnected Worlds*
- *Aerial Soft Robotics*
- *Modeling Navigation and Control of Multirotor UAVs: A Comprehensive Framework*

ICUAS 2026 included five Plenary Lectures, the last two of which were given during the Awards Luncheon. The Plenary Lectures were given by leading authorities in their fields, in the following sequence:

- **Resilient Multi-UAS in Complex Missions**, Prof. Dimitra Panagou, University of Michigan, USA
- **Integrating Advanced UTM Services into a Co-Simulation Environment**, Prof. Antonios Tsourdos, Cranfield University, UK
- **Flying Robots That Touch the World: Are We There Yet?** Prof. Antonio Franchi, University of Twente, Netherlands and Sapienza University of Rome, Italy
  Awards Luncheon
- **CAT-A Ground Test to Class-A Miship: Case Study of an Uncrewed Military Helicopter with Lessons Learned for the R&D, T&E, and Academic Community**, Prof. Donald Costello University of Maryland, USA
- **HERON - Hellenic Robotics Center of Excellence: Research Directions and Goals**, Prof. Petros Maragos, HERON Director and Scientific Coordinator

An integral component of the annual Conference is the UAV Competition, which is student-focused and student-centered, and offers unique opportunities for students to test and compare their skills with those of their peers worldwide.







The UAV Competition took place in two stages. The first stage was the qualifiers stage. Registered teams developed their solution in a ROS-Gazebo environment. Submitted solutions were evaluated and the 'top teams', up to six, continued to the second and final stage. In the final stage, during the Conference, teams presented and demonstrated their solution. The Competition Scenario centered around "*Multi-UAV System for Communication Network Establishment and Maintenance during CBRNe Incidents in Urban Environments*".

Following a rigorous evaluation procedure, the following teams emerged as top contenders and qualified for the finals.

- **1st Place Team: AGH Avader, AGH University of Krakow, Poland**
  Team Leader: Kamil Jędrzejko. Team Members: Remigiusz Mietła, Mateusz Gołąbek, Tymoteusz Domagała, Jan Jagodziński, Dominik Babiarczyk, Hubert Gąska, Krzysztof Jagiełło, Szymon Hołysz

- **2nd Place Team: QADT, Queen's University, Canada**
  Team leader: Ethan Milburn. Team Members: Abdullah Mohsin, Ashton Antony, Benjamin Cox, Cole Jowett, Erin Payne, Ethan Milburn, Gavin Tan, Kuzey Bilgin, Liam Shannon, Nishith Chowdary Ravuri, Purujit Kantiya, Visakan Makilrajah

- **3rd Place Team: ARRF, Kyungpook National University, South Korea**
- Team leader: Taeseung Woo. Team members: Seongjin Oh, Kangmin Kim, JinWan Kim, Jihyeong Ryu, Soyeon Park, Jiyoung Yoo

- **4th Place Team: CVRLs, Foundation for Research and Technology – Hellas (FORTH), Greece**
  Team leader: Michail Vangos. Team members: Michail Vangos, Iliana Platona, Michalis Savorianakis, Christos Trifinopoulos

- **5th Place Team: aeRAS, National Technical University of Athens, Greece**
  Team leader: Michalis Psychis. Team members: Zoi Tsouroufli, Maria-Rozina Bertou, Konstantinos Sarakis, Petros Pantazis, Elena Alevropoulou

- **6th Place Team: Aerial Robotics IITK, Indian Institute of Technology Kanpur, India**
  Team leader: Shivang Sonker. Team members: Ayush Goyal, Soumya Jhunjhunwala, Mansoju Vivekananda, Kritik Gupta, Krishna Agrawal

The UAV Competition was won by the ***ARRF, Kyungpook National University, South Korea*** team.

The Technical Conference was complemented by a social agenda that allowed the participants to interact with each other and to mix business and pleasure.

Overall, ICUAS 2026 was a successful event.



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ICUAS 2026 SURVEY RESULTS

* ONLINE SURVEY FROM JUNE 19 JULY 15, 2026
* SENT TO ALL ICUAS 2026 REGISTERED ATTENDANTS
* 13 QUESTIONS IN TOTAL
* RECEIVED 45 RESPONSES

Dr. ***Nikos Vitzilaios***, ***University of South Carolina***, is responsible for the annual survey after the Conference. He updated the questionnaire based on the previous year's results and comments. The survey included 13 questions, and it was conducted online from June 19 to July 15, 2026. We received 45 responses in total – we would have liked more responses given the number of registered participants (250+).

Results reconfirm what is already known: Europe is the heart and soul of the annual conference! European participation was 68.9% (looking at the registrations it was more than 70%). On average, participation from Europe is more than 65% regardless of the conference location. This number offers hard evidence that the conference must be held mostly in European countries, and the plan is to follow this pattern. North America contributed 15.6% of the participants. In 2025, when the conference was held in the US, the number was 28.9%, and 12.9% in 2024! On the other hand, South America participation, because of Brazil, reached 8.9% - this number was 11.1% in 2025. These raw reflect reality and give the 'real picture' of the conference landscape.

Close to 87% of participants were either Very Satisfied or Satisfied with the conference. The same holds for the Technical Program and the Conference Organization – however we are working hard to improve and to offer an even better program in 2027.

We understand concerns related to the accept/reject numbers. We do not follow 'quota' – at least we try not to. However, the twofold aim is to: improve the paper review process (we will follow a double blinded review process starting this year), and to accept the best papers, which will easily qualify to be published as journal papers in Special Issues.

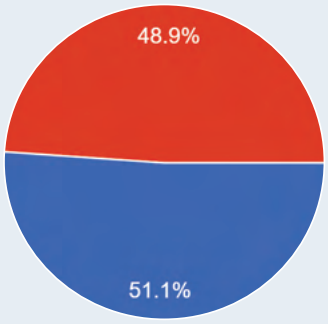
We acknowledge challenges with the venue 'size', and we do not look for excuses. The location was great, indeed. The meeting space was not optimal in terms of size, though. However, the Organizing Committee was able to negotiate an overall package that included a welcome reception with food and drinks, coffee breaks with snacks and full lunches, for the duration of the conference. This is not always possible, and it should not be overlooked.

The detailed results are shown below. They now serve as guiding points for 2027.

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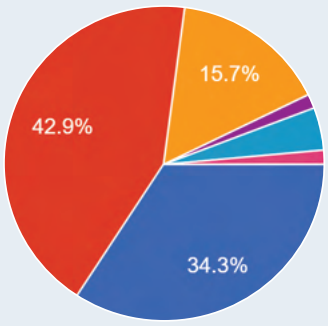
Is this the first time you attend the ICUAS conference?

45 responses



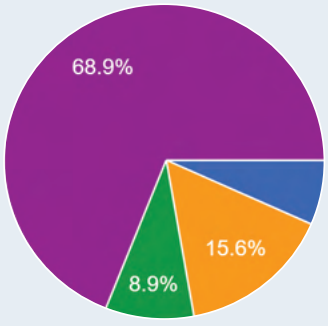
Job Role

45 responses



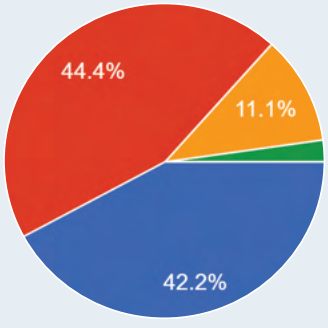
Affiliation Location

45 responses



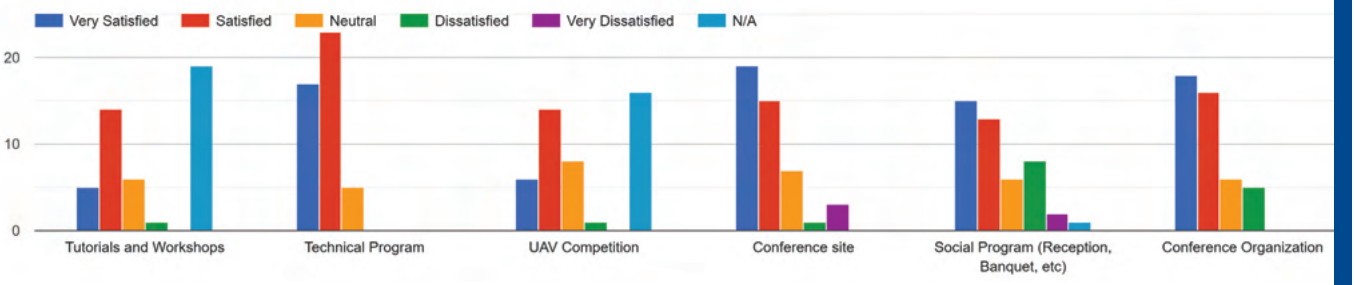
Please rate your ICUAS 2026 experience

45 responses

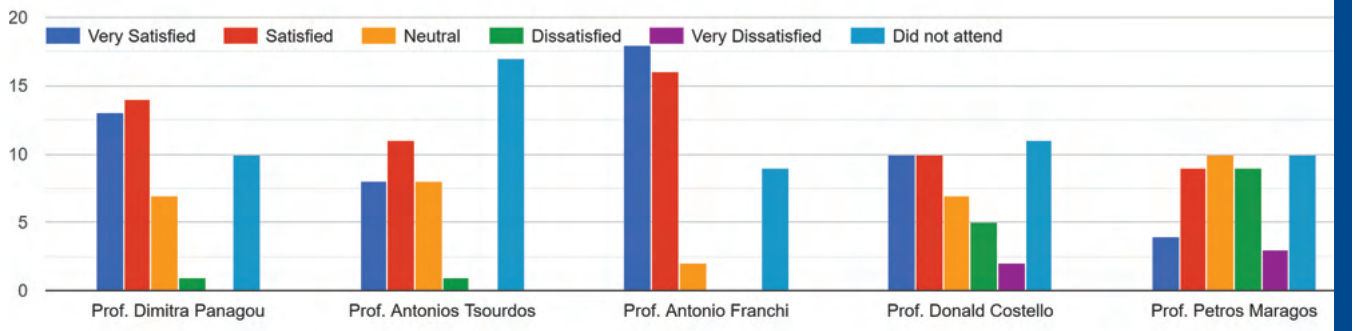


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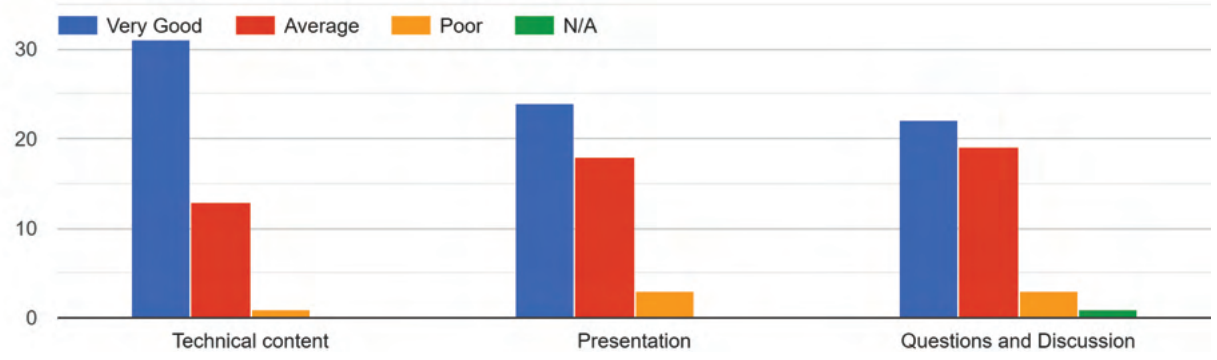
Please rate the quality of:



How much were you satisfied by the keyone and awards Luncheon talks?

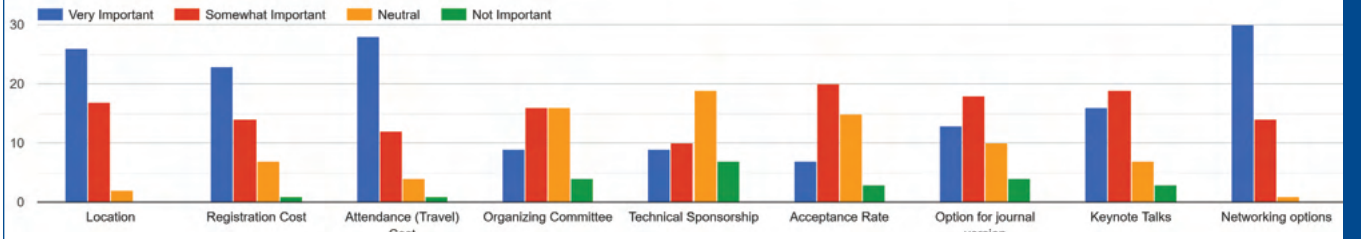


Please rate the quality of the papers:



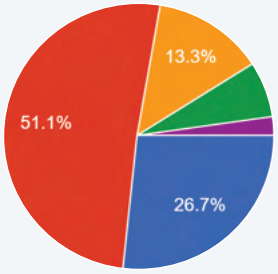
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How important are the following in your decision to attent ICUAS?



How likely are you to attend ICUAS 2027?

45 responses



- Very Likely
- Likely
- Neither nor
- Unlikely
- Very Unlikely



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DEVELOPMENT, TEST & EVALUATION,
VERIFICATION & VALIDATION

DTEVV WORKSHOP FINAL REPORT

FEBRUARY 4, 2026 | 8:30 A.M. - 5:30 P.M. | CALIFORNIA, MD



Prepared by

The University of Maryland A. James Clark School of Engineering MATRIX Lab Team (Dr. D. H. Costello)

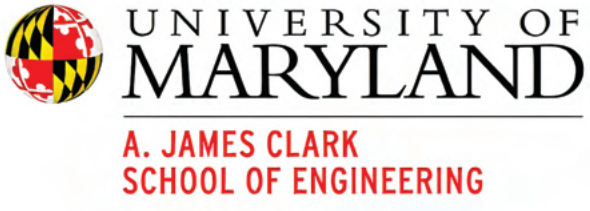
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Abstract

The future of transportation is uncrewed and ultimately autonomous. Yet, a clear roadmap does not exist on how to get there. The February 4, 2026 Development, Test & Evaluation, Verification & Validation (DTEVV) of Autonomous Systems Workshop focused on mapping out the priority research and workforce challenges that need to be addressed before it will be possible to field autonomous technology. The DTEVV Workshop brought together more than 100 attendees from academia, industry, and government who are interested in the DTEVV of autonomous systems. The attendees helped define the gaps and offer strategies that may enable the fielding of autonomous systems. The morning focused on research gaps that need to be filled to enable the fielding of an autonomous system. The afternoon focused on the needs of the DTEVV workforce as they are tasked with evaluating the risks associated with fielding these systems. Both the morning and afternoon consisted of a keynote address, an interactive panel, and a proctored roadmap development activity. In total, 40 roadmaps were developed by the workshop attendees, and they are currently being analyzed to help guide future decisions on pathways for fielding autonomous systems.







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Executive Summary

The future of transportation is uncrewed and ultimately autonomous. However, these systems will need to be analyzed through an engineering-based risk management process that can be summarized as the Development, Test & Evaluation, Verification & Validation (DTEVV) process. This process has been in place for decades and runs like a well-oiled machine. A trained DTEVV workforce evaluates a system against a set of standards to assess the risks associated with fielding the system. This workforce typically consists of professionals who possess an engineering degree (i.e., Mechanical Engineering, Aerospace Engineering, or Electrical Engineering). They are generally hired directly from universities and spend a year or two learning how to evaluate systems via on-the-job training. This system has worked well for decades, and the process is well understood. Yet, the advent of intelligent and autonomous systems is threatening to upend this established process:

- As of February 2026, standards and methods of compliance do not exist to evaluate systems to make decisions without a human in or on the loop (a truly autonomous system).
- There is a dramatic lack of research into how to properly perform test & evaluation (T&E) and verification & validation (V&V) tasks on truly autonomous systems. There is even less research that consulted the risk-averse certification community.
- The workforce that will be tasked to evaluate these systems is naive to many of the basic principles of autonomy and intelligent systems, thus making effective on-the-job training impossible.

The University of Maryland (UMD) identified this as a problem and has devoted a number of resources to help solve it. Within the University System of Maryland at Southern Maryland (USMSM) Southern Maryland Autonomous Research and Technology (SMART) building, UMD has outfitted and manned the Maryland Autonomous Technologies Research Innovation and eXploration (MATRIX) Laboratory. One of the missions of the MATRIX Lab was to develop a research and education program dedicated to fielding autonomous systems. MATRIX researchers applied for and were awarded an Office of Naval Research (ONR) Science, Technology, Engineering, and Mathematics (STEM) grant to aid in this effort.

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As part of the ONR grant, the MATRIX team planned on having multiple engagements with stakeholders to help define the research gaps and workforce development shortfalls that need to be addressed before we can field these autonomous systems in our everyday lives. The first DTEVV workshop was held on February 4, 2026 at the USMSM SMART building. It was administered by the UMD MATRIX Lab in coordination with UMD Applied Research Laboratory for Intelligence and Security (ARLIS), sponsored through the ONR STEM grant, and was supported by the UMD A. James Clark School of Engineering and the UMD Institute for Systems Research (ISR). Over 100 technology and operations experts, faculty, students, members of the DTEVV workforce, and policymakers from academia, industry, and government attended to help define the gaps and offer strategies that will enable the fielding of autonomous systems.

The workshop was structured into two parts, and this report summarizes the event in chronological order.

Morning Session

The morning session of the February DTEVV workshop focused on research gaps that need to be addressed to enable the fielding of autonomous systems. Opening remarks were given by Dr. Reza Ghodssi, the UMD MATRIX Lab's Executive Director for Research and Innovation, and Dr. Samuel Graham, Dean of the UMD A. James Clark School of Engineering. The morning keynote was given by Dr. Kamel Saidi, Program Manager and Group Leader, Intelligent Systems Division (ISD) at the National Institute of Standards and Technology (NIST). The morning panel featured 4 experts from the DTEVV research community. Following the panel, the attendees were asked to generate roadmaps that could enable us to fill the identified gaps.

Opening Remarks

Dr. Reza Ghodssi opened the event with remarks focused on UMD's commitment to advancing this critical field at the UMD MATRIX Lab.

He stressed the fact that research and education are two of the key trust areas that the MATRIX Lab focuses on. Dean Graham then added his thoughts on those of Dr. Ghodssi. In particular, Dean Graham highlighted the fact that you will not see events like this at most universities. This is because we cannot simply accomplish the goals of the workshop as a purely academic endeavor. He added, "We have to do it with the developers. We have to do it with people who have the knowledge of how these systems work, the people who are the practitioners, and the people who are invested in using this tomorrow."



Dean Graham gives opening remarks at the DTEVV Workshop on February 4, 2026.

Morning Keynote

"From 'Cool' to Confident: The Unavoidable Journey of Robot Testing and Evaluation"

Dr. Kamel "Kam" Saidi
Program Manager and Group Leader, Intelligent Systems Division (ISD)
National Institute of Standards and Technology (NIST)

Dr. Saidi began his keynote with an introduction of NIST for those unfamiliar with the agency, what their mission is, and what they do. NIST is part of the Department of Commerce. They are responsible for coordinating standardization and conformity activities across industry and government. While they do not "own" the standards, they are the experts who evaluate the standards and help ensure the relevance to the consumer.

There is a long history of T&E at NIST. Items are

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evaluated against a standard that may or may not be relevant to the consumer. Robot performance evaluation is often treated as an afterthought when designers are heads down, working on something new and exciting. Innovation is often driven by passion and an extraordinary vision of making the impossible possible. Methodical performance evaluation can sometimes slow down this process of discovery. Nevertheless, NIST will eventually have to test (formally or informally) whether the thing that was conjured up can accomplish the difficult task that drove its developers to work on it in the first place. The fast evolution of robotics is a prime example of where the standard does not fully capture the requirements of the system in actual use. For instance, early bomb diffusing robots were fielded to help prevent a human from going in harm's way. However, early models required a human to open a door to enable the robot to access a space.

How a system will eventually be used by the consumer is a key component for how it should be evaluated before fielding. As we evolve from simple robots that are an extension of a human, into intelligent systems that will complete tasks based on what they find in their operating environment, T&E will become much harder to complete. Intelligent systems are hard to evaluate because the environment in which they will be used is unstructured. The non-deterministic environment that they will operate in means that a complete test of permutations is virtually impossible.



Dr. Saidi delivers the DTEVV Workshop morning keynote address.

NIST is technology agnostic. The tests they are developing for intelligent systems are going to be designed to exercise the capabilities of the system and to find its weaknesses. However, the vast array of areas where intelligent systems will be used makes it difficult to evaluate them. Industry does not typically show the general public what it is working on. This is because they want to protect their IP before it hits the marketplace. This makes it difficult for NIST to help evaluate these new technologies.

Eventually, if the goal is to deploy the system into production environments or into operational missions, we must "bite the bullet" and implement a rigorous testing, evaluation, verification, and validation program that can provide a certain level of confidence about how well our "baby" will do when we unleash it into the real world. This will be critical for intelligent and autonomous systems.

Morning Panel

"Priority Research Directions for DTEVV"

*Moderated by **Dr. Brian A. Weiss***
Research Engineer
University of Maryland Applied Research Laboratory for Intelligence and Security (ARLIS)

The workshop's morning panel discussed testing, but also the ideas of risk and trust. The panelists provided insight and recommendations for navigating these territories. The panel included:

- **Mr. Christopher C. Collins**, Retired Director, Developmental Test and Evaluation and Assessments, Office of the Under Secretary of Defense (now known as the Office of the Under Secretary of War)
- **Dr. George Hwang**, Chief Technologist, AI/Autonomy Division, Advanced Development Department, Naval Air Warfare Center Aircraft Division (NAWCAD)
- **Dr. Jeremy Marvel**, Computer Scientist, National Institute of Standards and Technology (NIST)
- **Dr. Charles Rea**, Chief Technologist and Division Head for Autonomy and Artificial Intelligence, NAWCAD

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The DTEVV Workshop morning panelists address attendees.

In the introduction, panelists stressed the importance of DTEVV, saying new technologies require new evaluation approaches, and appropriate and effective DTEVV will lead to further tech development and timely fielding of new, reliable, and trusted systems.

"Our trust in these systems ultimately impacts how effective they're going to be. The things that actually impact that trust are the performance issues, the safety issues, and anything that can and should be verified and validated, tested and assessed. Being able to actually have a marketplace where consumers are not only trusting of the technology but also aware of the issues and able to understand what the limitations and capabilities are ultimately comes down to metrics and tests that are not only effective but also understandable," noted Dr. Marvel.

Kicking off the question portion, an attendee asked about cyber attacks and new technologies. Dr. Rea said there is research looking into applying AI to combat cyber attacks, such as internal memory inspection. Mr. Collins said he's observed that a lot of cyber focus has been on the controls perspective and less on the mission context. He recommended taking time to fully understand the mission, incorporating the cyber element into testing, and ensuring that it's really capable of accomplishing the mission.

Another attendee questioned how much testing is enough before deploying a system. Mr. Collins pointed out that the decision to field is going to be a risk-based decision, and Dr. Hwang followed up.

"Test and evaluation is not one size or one type of data. It's a continuous process, and over time, that evolution of what you learn may stabilize," Dr. Hwang said. "I would assert that you will learn enough over time, and then you will have a regime of things that you use to validate and verify the next generation of systems."

Testing means nothing if the people using a system don't trust it. Another attendee asked about building trust. Dr. Marvel suggested allowing someone who will actually be interacting with the system to define the level of risk they're willing to accept, and considering that level when deciding if or when to deploy the system. He also recommended being transparent about the motivations for adopting the technology and helping users understand how the system works and how it was trained. Dr. Hwang echoed this, saying developers should be able to define, understand, and explain the actions of a system. Dr. Marvel pointed out that regulations may help with the trust issue, but also make it difficult to protect proprietary technology.

One of the final questions centered around dealing with multidisciplinary systems. Dr. Hwang suggested distributing the necessary knowledge to each part of the team so every member has a general understanding of the system.

Looking to the future, panelists said that effectively modeling fully autonomous systems is one of the main areas that needs improvement.

"Test and evaluation is not one size or one type of data. It's a continuous process, and over time, that evolution of what you learn may stabilize."

Dr. Hwang, Morning Panelist

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Morning Roadmap Development Activity

Following several hours of listening to and engaging with the morning speakers, the 100+ attendees were given a chance to provide their input on what was needed to fill the research gaps required to field autonomous systems. They were provided with a roadmap template (Figure 1). On it, they were asked to provide a title, barriers, approaches, a rough timeline, identify stakeholders, identify success factors, and provide tiered benefits/impacts. During the 75-minute activity, the attendees broke themselves into multiple small groups clustered around their tables to generate the various roadmaps. The roadmaps were captured via handwritten notes on the papers provided. Some were completely flushed out by the small group (Figure 2), while others contained high-level thoughts.

In total, 23 Roadmap worksheets were submitted to the workshop organizers. After an initial scrub, they were separated into five general categories for this report. The following categories are presented in no particular order and contain notes generated from the supplied roadmaps.

Category 1: Modeling and Simulation

The decision space for autonomous systems is extremely vast. If there is a requirement to obtain data from all possible perturbations of a system using real-world data, the resources required to obtain the data would be prohibitive. With this in mind, Modeling and Simulation (M&S) will be a crucial part of any DTEVV effort. This area has been clearly defined as an area of interest for research that will be needed before we can field autonomous systems. During the workshop, the following research questions were identified through the roadmap exercise relating to M&S:

- Can we certify models that will be used for fielding autonomous systems? A certified baseline needs to be established that can be used by the end users, which can replace data derived from real-world testing. This baseline needs to be agile to enable changes to be modeled as issues are identified.

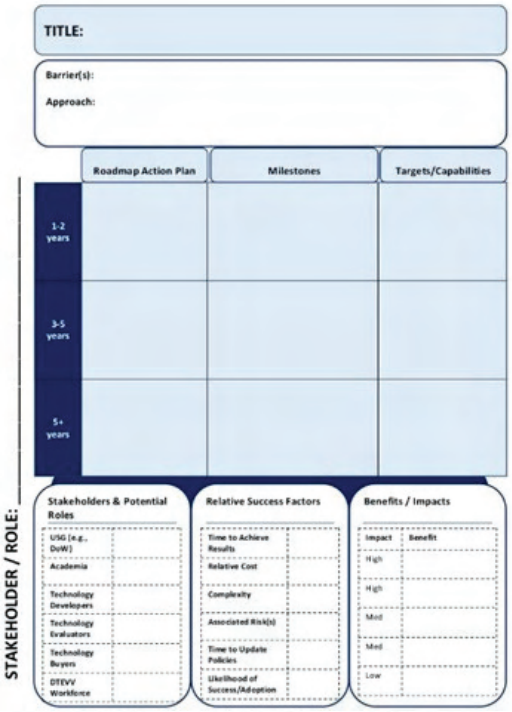


Fig. 1: Example of a Research Roadmap template

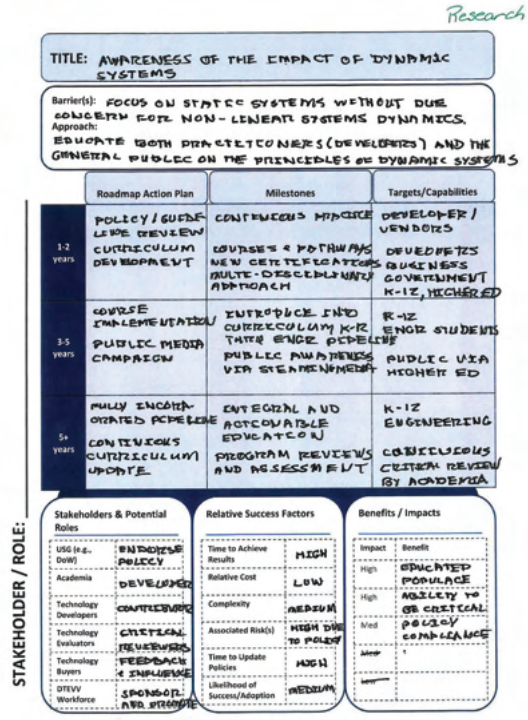


Fig. 2: Example of a completed Research Roadmap

- Do autonomous systems degrade gracefully? As autonomous systems suffer degradations, will those degradations result in predictable faults/discrepancies? Can those faults be programmed into the models that are used in simulation during failure analysis?
- What are the standards that can be used for validating a model of an intelligent system? A process needs to be established by which a model can be verified for use in the DTEVV process when evaluating an intelligent system.
- What is the best simulation environment for DTEVV of an autonomous system? Current policy is inconsistent when it comes to which software can be used in the DTEVV process. Can a standard be identified to aid in the DTEVV of autonomous systems?

Category 2: Risk Assessment

The main purpose of the DTEVV process is to identify the risks associated with a new product or system. These risks will then be either mitigated or accepted at the appropriate level prior to fielding. Traditional DTEVV uses established standards and methods of compliance to assess the risk of a new system or product. With the advent of intelligent and autonomous systems, a new challenge will be faced by the DTEVV community. What are the standards by which a system can take safety-critical actions without a human in or on the loop? How can that standard be evaluated to enable the DTEVV community to assess the risks of these new systems? The following research questions were identified during the morning roadmap exercise for this category:

- What are the standards by which a system can be evaluated against to replace a human for safety-critical actions? Existing standards and methods for risk determination rely on deterministic systems with a human ultimately responsible for making the final decision. Research needs to be completed to determine what those standards are and how they can be evaluated.
- How do we assess/quantify the risk in a system without a human in or on the loop during testing? The research question goes back to the issue of the lack of standards and methods of compliance for autonomous systems. The DTEVV community will develop various test hazard analysis (THA) items when looking at the risk during testing.
- Is the general public supportive of autonomous systems if we field them? This goes to the need for autonomy. Assuming the technology is mature enough for autonomy, and there is a policy in place for fielding these systems, does the public actually want it? Is there a market for it?
- What is the risk of supply chain corruption? Many of the systems we are discussing for fielding will be reliant on supply chains that may or may not contain components that may corrupt the ultimate product. How do we guarantee the supply chain when these critical components may make the entire system unsafe?

Category 3: Human Autonomy Integration

As long as humans are involved, then human factors need to be considered. Additionally, autonomy brings new questions that need to be answered. Several of the roadmaps developed by the attendees related to this category, and the following research questions were identified:

- What is the optimal interface for a human to use when dealing with autonomy in their system? As autonomy is developed and installed on systems, there needs to be extensive research on the interface, and more than one roadmap identified this as an open research question.
- Can we standardize the process for giving the operator situational awareness of what is happening with a highly automated system during operation? As systems become more and more automated, and eventually autonomous, there needs to be research conducted to help the operator gain better situational awareness of what is happening.
- Is there a standard test bed that can be used for autonomous control? What are the benchmarks for performance? With

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multiple levels of autonomy being developed and researched, benchmarks are needed to assist in the efforts.

Category 4: Use Cases for DTEVV of Autonomy

As previously stated, the future is unmanned and ultimately autonomous. However, to enable the evaluation of these new technologies, use cases need to be identified that will allow researchers to explore these new technologies. This will facilitate out-of-the-box thinking with the limited resources available. The following research questions were identified during the morning roadmap exercise for this category:

- Can we use autonomous aerial refueling as a possible use case? Aerial refueling is an unclassified task that will require a system to use its onboard sensors to accomplish the task. This is because the task requires split-second maneuvers that may result in a mishap if a delay occurs between an anomaly and a human (if their actions were required). This task has multiple components that can be used by the research community.
- Can we use visual sensors to control a UAV during the autonomous landing task? The use case of having a fully autonomous UAV complete an autonomous landing may be a prime one for DTEVV. The UAV will be required to identify the landing ship, navigate to the landing area, and then complete the landing task only using its onboard sensors.
- Can we use autonomous UAVs for surveillance missions? The 5 Ds (dull, dangerous, dirty, difficult, dollars) are often considered when deciding if a system should be uncrewed or autonomous. One example of a dull mission is surveillance - one of the attendees mentioned the DHS border patrol mission. Another surveillance task might include fire detection using autonomous drones. Can we use either of these tasks as a use case for autonomous systems?
- Would humanoid robot testing make sense? Following the keynote discussion of NIST testing, one of the roadmaps that was talks about using humanoid benchmark testing as an autonomy use case.



Workshop attendees work on their Research Roadmap worksheet.

Category 5: Methods for Performing DTEVV on Autonomous Systems

Methods for DTEVV have existed for decades. However, the advent of autonomous systems brings new challenges. Without a human in or on the loop, the current methods may not provide the necessary data for leadership to make informed risk-based decisions. Therefore, new methods of compliance need to be developed to enable this process. The following research questions were identified during the morning roadmap exercise for this category:

- Can we use cyber-physical systems to determine how various processes flow through the autonomous system? One issue with autonomous systems is that they are considered to be largely black box systems. Additionally, the output of the autonomy will likely have an impact on the mechanical system. The understanding of that interaction will be critical to making risk-based decisions. Some of the attendees wanted to see if we could use a cyber physical system approach to break down the black boxes.
- Can we integrate developmental and operational testing in the same dynamic environment to determine issues early in the DTEVV process? Developmental testing is typically scripted, and operational testing allows for a more dynamic environment for the system under test. However, changes to

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the system are much harder once a system enters operational testing. The purpose of this research question is to discover issues sooner which may enable us to address them early in the DTEVV process.

- How do we deal with the large amounts of data? An autonomous system will rely heavily on data. How much data needs to be available for DTEVV? How much of the data will be proprietary, and how much does the government need to see/own to make appropriate decisions? Can we use AI tools to assist with the DTEVV of autonomous systems, especially where large amounts of data are involved?

Afternoon Session

Following a short break, the afternoon kicked off with a lunchtime keynote by Mr. Stephen Cricchi. At the time of the event, Mr. Cricchi was the Executive Director of NAWCAD. His organization is responsible for the DTEVV of all naval aviation systems. Following the keynote, the attendees were given an update on the education program being established at the UMD MATRIX lab to support the DTEVV of autonomous systems. Next, the attendees were given an opportunity to engage with six professionals from industry and government who highlighted workforce development needs. The final event of the day consisted of the attendees developing roadmaps to help fill workforce development gaps to enable the fielding of autonomous systems.



Afternoon keynote speaker Mr. Cricchi takes questions following his presentation.

Afternoon Keynote

"The Naval Aviation DTEVV Workforce"

Mr. Stephen Cricchi
Executive Director
Naval Air Warfare Center Aircraft Division (NAWCAD)

For the afternoon keynote, Stephen Cricchi, then-Executive Director of NAWCAD and now the Naval Air Systems Command (NAVAIR) Deputy Commander, focused on the Naval Aviation DTEVV workforce and how this workshop marked a pivotal milestone in shaping the future of the community by laying the foundation for innovation and excellence in naval aviation and aerospace. He thanked the attendees for their shared commitment to advancing the future of naval aviation and the industry as a whole.

Mr. Cricchi touted the SMART Building and MATRIX Lab as a place of innovative ideas that transform the future of aerospace and defense, in part through workforce development. He said the workforce tasked with testing and evaluating advanced technologies needs to be equipped with the skills, knowledge, and expertise necessary for the job. For decades, the developmental test professionals have relied on on-the-job training to learn the skills needed to evaluate naval systems. This approach has served NAWCAD well, but the landscape is changing. Autonomous systems and artificial intelligence are introducing complexities that cannot be addressed through traditional training methods alone. The average developmental test professional has little to no experience with autonomous systems. Yet, these systems are becoming integral to naval aviation technological advancement. Mr. Cricchi said NAWCAD is taking steps to address this by working with the University of Maryland to offer a groundbreaking graduate education program focused on the DTEVV of autonomous systems. It's a first-of-its-kind for the United States and will provide foundational knowledge in autonomy, artificial intelligence, modeling and simulation, and system evaluation. Mr. Cricchi said it will prepare professionals to tackle the challenges of testing and fielding

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autonomous systems without human oversight.

To help develop this program, Mr. Cricchi challenged the workshop attendees to help identify what the DTEVV workforce needs to enable them to evaluate the risk associated with fielding autonomous systems. He said we need a workforce that is trained to ask the right questions, to assess risks, and to ensure that these systems operate as intended, and workshop attendees can help build that workforce. He encouraged every attendee to listen, ask questions, and share ideas.

Following his remarks, Mr. Cricchi opened the floor for questions. Several took this opportunity. Questions ranged from policy inquiries to what Mr. Cricchi felt the future would hold for naval aviation.

Afternoon Presentation

"UMD DTEVV Graduate Education Program"

Dr. Donald "Bucket" Costello III
Director of Test and Evaluation of Autonomous Systems
University of Maryland MATRIX Lab

Over the past few years, the UMD MATRIX Lab has been in contact with Department of War (DoW) professionals who have highlighted multiple issues with the proposed fielding of truly autonomous systems (systems that take safety-critical actions without a human in or on the loop). In particular, UMD has focused on engagements with NAWCAD leadership for defining the workforce development gaps that could be filled by a traditional education program based out of the UMD MATRIX. The MATRIX Lab is located just 6 miles north of NAS Patuxent River, home of NAWCAD and the majority of the naval aviation DTEVV workforce. Multiple technical exchanges have taken place to define the curriculum of an eventual graduate program between UMD and DoW/industry stakeholders. A definite need was defined, and eventually articulated to ONR to justify the awarding of a multi-year grant to establish the education program. The need was clear. Leadership desired a formal education program that provided in-person instruction geared towards the needs of their workforce and for working professionals. NAWCAD then identified a small cohort of students that could be the first to take part in this first-of-its-kind program: Development and Certification of Autonomous Systems. The initial cohort of students started taking classes at the UMD MATRIX Lab in the Fall of 2025.

In parallel to offering the classes, UMD MATRIX Lab educators started the process of getting a four-class graduate certificate in Development and Certification of Autonomous Systems formally approved by UMD. The program was approved at the university level in February 2026, and by the University System of Maryland Chancellor in May 2026. As part of the program, the initial four classes were formally approved under the ENTE identifier:

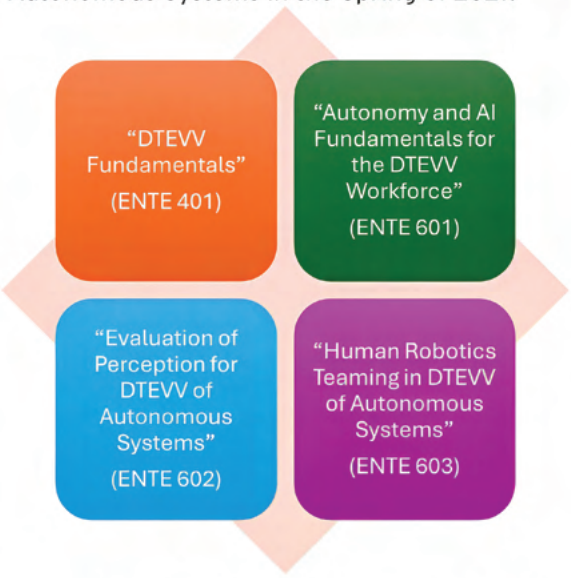
- ENTE 401 DTEVV Fundamentals: This course is designed to give the student a basic understanding of the DTEVV process used to produce new aviation systems. While the course will mainly focus on DTEVV of aviation platforms/systems, the basics taught can be applied to any domain. Through the coursework (i.e., readings, discussion, assignments, and seminars), the student will be familiar with: the history and development of DTEVV; basic DTEVV concepts and ways to approach DTEVV; issues relating to various forms of DTEVV (i.e. contractor, government, developmental, and operational); common tools used in the test and evaluation community; the role of DTEVV during a systems lifecycle; and the engineering rigor that is applied to DTEVV to properly assess risk prior to fielding. This course will give the student a solid foundation to join the DTEVV community upon completion.
- ENTE 601 Autonomy and AI Fundamentals for the DTEVV Workforce: The future of aviation is unmanned, and ultimately autonomous. In order for these systems to be fielded, they will need to go through a risk mitigation and acceptance process that is managed by professionals both in and out of the government. This course is designed to give the student the skills

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required to evaluate autonomous aviation systems during this DTEVV process. While the course focuses on aviation systems, the skills learned during the course work (i.e. readings, discussions, assignments, hands-on in-class exercises, and seminars), will enable students to apply the knowledge to other domains. The course will cover the basic concepts and challenges faced by the DTEVV community when evaluating aviation systems that contain Autonomous/AI functionality. It will examine classical and state-space-based control methods that are commonly faced in the DTEVV community. The course will also provide practical experience for the students in evaluating these systems through formal methods analysis, reinforcement learning, and programming these systems to perform perception tasks required within the aviation DTEVV community. This course will give the student a solid understanding and the skills needed to perform DTEVV on autonomous/AI systems in aviation.

- ENTE 602 Evaluation of Perception for DTEVV of Autonomous Systems: This course provides a comprehensive and rigorous introduction to computer vision principles and their application in the DTEVV of autonomous systems. Students will explore the entire computer vision pipeline, from the physics of image formation to the implementation and validation of state-of-the-art deep learning models. The course is grounded in the theoretical foundations of machine learning and deep learning, while also emphasizing the practical challenges of building robust and reliable systems. A significant portion of the course will be dedicated to hands-on labs and a final project where students will develop, train, and rigorously evaluate a computer vision model for an object tracking task, simulating real-world DTEVV scenarios by analyzing performance against both nominal and disturbed data.
- ENTE 603 Human Robotics Teaming in DTEVV of Autonomous Systems: Human Teaming with Robotic Systems is slowly becoming a reality in multiple industries. As more of these systems deploy, a broad question arises about how to complete the DTEVV process for these systems. This course will address this broader question by asking students to develop a simulated Human Robotics System to gain an intuitive understanding of how these systems work. Furthermore, we will use the developed Human Robotic System to illustrate the usage of different algorithmic DTEVV techniques. The outcome of this course is a broader understanding of the challenges of testing Human Robotics Teaming from a variety of different perspectives (e.g. developer, tester, safety engineer).

All four courses were developed using resources made available through the ONR STEM grant. ENTE 401 was offered as a UMD Aerospace Experimental course in the Fall of 2025 (ENAE 788F), and ENTE 601 was offered as a pilot course in the Spring of 2026. Both courses are currently incorporating lessons learned from the initial offerings before they will be offered again in AY 27 to the next cohort of students. ENTE 602 and 603 are currently in development and are slated to be offered to the first cohort of students during AY 27. UMD anticipated awarding the first Graduate Certificates in Development and Certification of Autonomous Systems in the Spring of 2027.



The initial four UMD DTEVV Graduate Education Program classes were formally approved

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As part of the ONR grant, UMD is in the process of developing a full Master of Science in Development and Certification of Autonomous Systems. As part of the February DTEVV workshop and future workforce-focused events, UMD hopes to define exactly what that program may entail. We anticipate the first MS degree to be offered in the Spring of 2029.

Afternoon Panel

"Immediate DTEVV Workforce Needs"

*Moderated by **Dr. Donald "Bucket" Costello III***
Director of Test and Evaluation of Autonomous Systems
University of Maryland MATRIX Lab

The workshop's afternoon panel identified the expected workforce skills that will be needed to develop, implement, and assess the technologies of tomorrow. The panel included:

- **Mr. William Becker**, Principal Engineer, Forterra
- **Dr. Mauricio Castillo-Effen**, Fellow, Lockheed Martin Advanced Technology Laboratories
- **Mr. Wayne Dumais**, Deputy Director DOT&E, Department of Homeland Security
- **CAPT Daniel Kitts**, USN, Commodore, Naval Test Wing Atlantic, NAWCAD
- **Dr. Theresa Shafer**, Chief Technology Officer, NAWCAD
- **Ms. Leslie Taylor**, Retired Vice Commander, NAWCAD



The DTEVV Workshop afternoon panelists answer attendee questions.

In the introduction, panelists stressed the importance of the workforce in fielding systems and the importance of understanding the risk that is associated with evaluating new technologies. Panelists agreed that new technologies will require innovation in how we train the workforce and how we maintain talent in their organizations. Panelists felt that everyone needed to have a basic understanding of autonomy, and there needs to be experts who can help define the knowledge that needs to be instilled in each member of the workforce beyond the basic level of knowledge.

The panelists felt that there is a lot of theory in formal education, but T&E requires a more application-oriented approach to be properly accomplished. Dr. Castillo-Effen noted that he is concerned about the variability of the systems that will be evaluated. They will range from "systems that are attritable and systems that will be flying for the next 50 years."

Commodore Kitts stated that his organization relies on the workforce to accomplish its mission. He stressed that we need to find ways to integrate autonomy onto manned systems, not just completely autonomous systems. "We've gone through other transitions of technology and introductions of technology, design of fly-by-wire systems. Places where we could not rely strictly on our historical flight test knowledge, but where we had to further develop that and refine it to figure out where we could take our historical lessons learned and make sure that they're being translated to that new frontier."

Autonomous systems require a whole new level of trust and understanding, as well as updates to the information and software. From a T&E standpoint, how do we know what we're putting out there, and do we do it at a pace and at scale today? We take way too long and take a very linear process to be able to find a lot of these systems and the progression of the technology into systems. So we need to get to a place where we can rapidly ingest those changes and adapt to the need as the pace improves, and where we can continue to learn. A properly prepared workforce is key to accomplishing the challenging tasking to assessing the risk associated with fielding

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autonomous systems. Ms. Taylor felt strongly that we must give the workforce the knowledge, abilities, and skills they will need to accomplish these challenging tasks.

One of the longest discussions during the question-and-answer session was what should be taught in the classroom and what needed to be learned on the job. Commodore Kitts felt that there were limited academic environments that could help the flight test community, and he would love it if there were more. Dr. Shafer felt that it is "Not just the depth of knowledge that they obtain in formal education, but that they can then take that knowledge, apply it, innovate on it, and build on it in a constant learning environment, is really that synergy between on-the-job training and formal academic environment."

"It's not just the depth of knowledge that [people] obtain in formal education, but that they can then take that knowledge, apply it, innovate on it, and build on it in a constant learning environment."

Dr. Shafer, Afternoon Panelist

Afternoon Roadmap Development Activity

Following the afternoon panel, the attendees were asked for their input on workforce development. As with the morning session, they were provided with blank roadmaps and asked to break into small groups. As a workforce example, the workshop organizers provided the attendees with a complete roadmap for the UMD DTEVV education program (Figure 3). Over a 75-minute working session, 17 roadmaps were produced by the

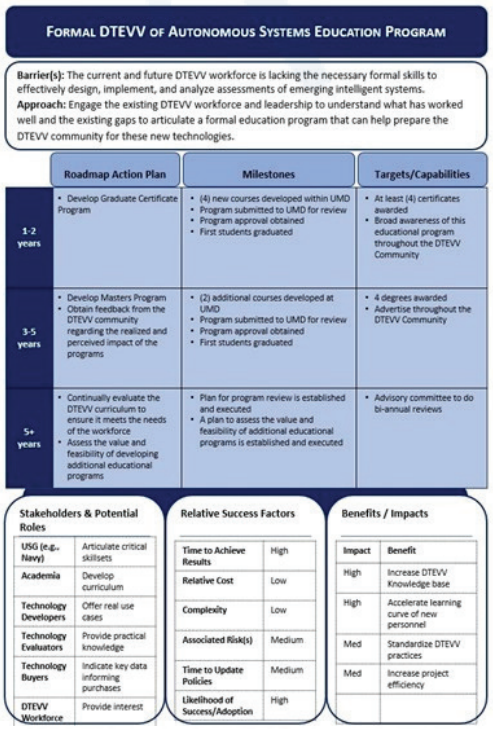


Fig. 3: Complete Roadmap for the UMD DTEVV education program



Fig. 4: Example of a completed Education Roadmap

attendees. Some of the roadmaps were fully filled out (Figure 4), and a handful contained only one line to indicate the participants' intended message.

Unlike the research roadmaps, the workforce roadmaps were not categorized. Workshop organizers binned them into 9 workforce gaps:

- Can we identify foreign nations that can join the government DTEVV workforce? Currently, it is extremely difficult for the US government to hire foreign nationals. This is especially true when they are going to be working on evaluating programs of record that are part of the DoW. Yet, some nations are our close allies. Can we hire them to help bolster the DTEVV workforce?
- Can we develop a multi-faceted, layered approach to workforce development? Currently, there is a problem with recruiting, training, and retaining a quality DTVV workforce. How can we improve our recruiting program to get the prime talent? How can we provide adequate compensation over the course of their careers to ensure we can retain that talent? How can we improve the education program associated with this workforce? Can relationships between the industry and the government help expose the workforce to other ways to accomplish tasks?
- While it is important to expose the DTEVV workforce to a formal education program at the graduate level, can we expose undergraduates to the process to help recruit the future workforce? The UMD graduate program is designed to educate the current workforce and possibly some of the future workforce. If we are able to expose undergraduate students to the process, it may help in recruiting talent for the future.
- How can the education of the workforce keep pace with the shifting in technology? The pace at which technology is advancing makes it extremely difficult for the DTEVV workforce to maintain the necessary skills to properly evaluate the risks associated with fielding these systems. The advent of AI and other machine learning algorithms makes it extremely difficult for the workforce to properly complete their job.
- Can we increase the number of internships/apprenticeships to help expose the future workforce to DTEVV? Recent years have seen a dramatic decrease in the number of internships/apprenticeship opportunities in DTEVV. This has traditionally been how future employees were exposed to the field. How can we revitalize this critical tool?
- Can we help increase the critical thinking skills of our DTEVV workforce? Critical thinking is potentially the most valuable skill that can be bolstered in the DTEVV workforce.
- How do we bolster the "soft" and transferable skills of the DTEVV workforce? The DTEVV workforce needs to be well-rounded, and they need to bring training back to their organizations. Can we develop learning opportunities that encourage the DTEVV workforce to leverage soft skills and expose them to different applications?
- Can we build the bench in the DTEVV workforce? Over the last few years, many of the government DTEVV workforce decided to depart for other options. The current government DTEVV community is a single point of failure in many fields.
- How do we increase the knowledge of autonomy and the related technologies in the DTEVV workforce? Many of the new systems that are coming online are extremely software-intensive. Unfortunately, the knowledge in the DTEVV community on software intensive systems is lacking.

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Conclusions

The February 2026 DTEVV workshop was an extremely successful event. It brought together over 100 members of the DTEVV community from government, industry, and academia. Over the course of the day, keynote speakers and panelists helped focus the attendees on the gaps present in both research and workforce development. The roadmaps that were developed will help shape the future of DTEVV, especially in Southern Maryland.



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2027 INT'L CONFERENCE ON UNMANNED AIRCRAFT SYSTEMS

ICUAS 2027

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ICUAS 2027

The 2027 International Conference on Unmanned Aircraft Systems, **ICUAS 2027**, will take place in **Fortaleza**, **Brazil**, at the **Gran Mareiro Hotel**, on June **14-17**.

ICUAS 2027 centers around a wide spectrum of topics that relate to unmanned aviation. The main theme of ICUAS 2027 is AI-Based Aerial Robotics and Ethical AI.

The timetable with key dates for the 2027 Conference is as follows:

February 5, 2027: Full/Invited Papers, Invited Session Proposals, Workshop/Tutorial Proposals, Due
February 5, 2027: UAV Competition: simulation-based scenario
April 23, 2027: Acceptance / Rejection Notification
April 23-30, 2027: Early Registration and Upload Final, Camera-Ready Papers

Starting this year, the paper review process will be double-blind. Authors must follow the rules provided when submitting their papers.

DOUBLE-BLIND PAPER REVIEW PROCESS

ICUAS'27 will employ a double-anonymous peer review process, also called double-blind review, for all submitted (contributed, invited) papers to the conference. The rules to be followed will be the same with those followed by the IEEE Robotics and Automation Society, see https://**www.ieee-ras.org/publications/rules-for-the-double-anonymous-review-process/**.

This double-blind review aims to eliminate biases related to factors such as gender, seniority, reputation, institutional affiliation, and to maximize paper review objectivity.

However, it is recognized that it may be essential to include in submitted (contributed and invited) papers images, figures and diagrams, robot platform prototypes, and other pictorial and multimedia (video clips) material that may be unique to a specific lab and/or research group. For these reasons, authors are allowed to include essential images or videos of robot platforms, devices, or setups that are critical for understanding the research and its scientific evaluation.

The guidelines for double – anonymous submissions, following IEEE RAS are listed below – please follow all rules when submitting your paper(s):

1. Names and affiliations should not be included anywhere in the manuscript, appendix, and supplementary material.
2. Acknowledgments to people or funding agencies should only be included after acceptance of the manuscript.
3. When self-citing their own previous work, authors should avoid expressions such as "In our/the authors earlier work...". They should rather use neutral expressions such as "In previous work..." or "In related work..." so that one cannot distinguish their own work from the work of others just based on the formulation.
4. The authors should remove any author/affiliation/lab names and logos from figures and videos.
5. The authors should blur faces of people in videos and pictures.
6. The identities of robots do not need to be hidden for unique robots. They are allowed to appear in pictures and videos. However, the individual names of the robots should be hidden from the paper except if it is a widespread robot name (e.g., Nao, Spot,...).
7. The authors should abstain from adding any author information from the submitted files' metadata. This information is often added automatically from the identity information and can be found in "properties" under the "File" menu in word processors and PDF readers.
8. There should be no links to external websites that reveal identity (e.g., YouTube, GitHub, or authors' institute pages).
9. Self-citations should be reduced to a minimum.
10. Authors are allowed to use tools such as arXiv. Reviewers should not actively search for those articles to identify authors.

If/when the submitted paper is officially accepted, then, the above-mentioned information can be added to the paper during its final upload.

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2027 INTERNATIONAL CONFERENCE ON UNMANNED AIRCRAFT SYSTEMS (ICUAS '27)

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The **2027 International Conference on Unmanned Aircraft Systems**, **ICUAS '27,** will take place in Fortaleza - Brazil, on June 14-17, in the luxurious Gran Mareiro Hotel, which is located at Rua Osvaldo Araújo, 100, on the vibrant Praia do Futuro beach in Fortaleza, Ceará. Fortaleza, the fourth-largest city in Brazil, is a top tourist destination, it is the capital city of Ceará state in Northeastern Brazil, and it is famous for its warm tropical weather, urban beaches, bustling arts scene, and rich seafood culture. It is also a major economic hub.

ICUAS '27 centers around a wide spectrum of topics. However, emphasis is given to: Soft aerial robots; Cooperative aerial manipulation; Bio-inspired aerial robots; Aerial robot aerodynamics; Reconfigurable UAVs; Multi-mode unmanned platforms; Learning-based perception, navigation and control; Online autonomy; Real-time applications; Human factors and ethical AI for aerial robots; Regulations, policies and safety. Round table discussions will complement the technical sessions.

In addition to the technical sessions, a twofold objective is: i.) Industry and company participation for registrees to find out about the current state of technology and of commercially available products for civil and public domain applications, and ii.) Understanding technical requirements and standards that are prerequisite to UAS full utilization and integration into the national airspace.

Part of **ICUAS '27** is the **UAV Competition**. The Competition is student-focused and student-centered, offering unique opportunities for students to test and compare their skills with those of their peers worldwide. The competition is organized in two stages: simulation qualifiers and in-person finals. The finals will take place during the conference, allowing students to meet and participate in the conference, too. Details on how to participate in the UAV Competition are available on the conference website.

ICUAS '27 offers unique opportunities to meet, interact and shape the future of unmanned aviation, worldwide, bringing together technical, regulatory, and legal communities. Details and logistics about the conference can be found at **http://www.uasconferences.com** and related links. The conference is fully sponsored by the **ICUAS Association, Inc.**, a non-profit organization, see **www.icuas.com**.

CONFERENCE STRUCTURE

ICUAS '27 is a 'physical presence only' four-day event. June 14 is reserved for Workshops and Tutorials, while June 15-17 spans the three-day technical conference and the UAV Competition.

IMPORTANT DUE DATES

- **February 5, 2027:** Full/Invited Papers, Invited Session Proposals, Workshop/Tutorial Proposals, Due
- **February 5, 2027:** UAV Competition: simulation-based scenario
- **April 23, 2027:** Acceptance / Rejection Notification
- **April 23-30, 2027:** Early Registration and Upload Final, Camera-Ready Papers

SUBMISSIONS

All contributions (papers, invited papers, proposals for invited sessions, proposals for workshops and tutorials) must be submitted electronically through **https://controls.papercept.net** by the due date.

PAPERS: Paper format (two-column) follows IEEE guidelines. Electronic submission will be handled through PaperCept - details are available on the conference web site. Submitted papers should be classified as Contributed or Invited Session (max. 8 pages) papers. Accepted papers only will be allowed up to two additional pages for an extra charge per additional page.

INVITED SESSIONS: Proposals for invited sessions should contain a summary statement describing the motivation and relevance of the proposed session, the invited paper titles, and the names of the authors. Authors must submit FULL invited papers. Each paper must be marked as "Invited Session Paper".

WORKSHOPS AND TUTORIALS: Proposals for workshops and tutorials should contain a title, the list of speakers, and extended summaries (2000 words) of their presentations.

PAPER REVIEW PROCESS: All submitted papers will undergo a thorough peer review (blind review) process coordinated by the Program Chairs, IPC members, Associate Editors, and qualified reviewers. Each paper will be reviewed by (at least) three qualified reviewers. Each Associate Editor will make recommendations. The Program Chairs will finalize and announce decisions by the due date. Each submitted paper will be checked for originality through the iThenticate Plagiarism Detection Software. The paper review process will be observed by the supporting technical society representatives.

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