Advanced Aviation Advisory Committee
Public eBook

Public eBook
February 23, 2022 AAAC Meeting • Virtual
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Virtual Meeting Logistics

- We ask that everyone remain muted during the presentations. After each briefing, there will be an opportunity for the AAAC members to engage in discussion and ask questions.

- Because of the large size of the group we ask that you first raise your hand using the Zoom command on your dashboard. An FAA moderator will be monitoring the dashboard and call on you to begin speaking.

- This AAAC meeting is being livestreamed and recorded. It will be made available for future viewing on the FAA’s YouTube channel.

- This is a public meeting and there may be members of the media viewing the livestream. They will be instructed that all discussions are for background only.

- To access the livestream links, go to either of these websites:
  https://www.facebook.com/FAA or https://www.youtube.com/FAAnews
## Confirmed FAA/DOT Attendees (on camera)

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
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<tbody>
<tr>
<td>Jay Merkle</td>
<td>Executive Director, UAS Integration Office (DFO)</td>
<td>FAA</td>
</tr>
<tr>
<td>Bradley Mims</td>
<td>Deputy Administrator</td>
<td>FAA</td>
</tr>
<tr>
<td>Laurence Wildgoose</td>
<td>Assistant Administrator, Office of Policy, International Affairs and Environment</td>
<td>FAA</td>
</tr>
<tr>
<td>Billy Nolen</td>
<td>Associate Administrator, Aviation Safety</td>
<td>FAA</td>
</tr>
<tr>
<td>Shannetta Griffin</td>
<td>Associate Administrator, Airports</td>
<td>FAA</td>
</tr>
<tr>
<td>Claudio Manno</td>
<td>Associate Administrator, Security and Hazardous Materials Safety</td>
<td>FAA</td>
</tr>
<tr>
<td>Chris Rocheleau</td>
<td>Deputy Associate Administrator, Aviation Safety</td>
<td>FAA</td>
</tr>
<tr>
<td>Winsome Lenfert</td>
<td>Deputy Associate Administrator, Airports</td>
<td>FAA</td>
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<tr>
<td>Tim Arel</td>
<td>Deputy Chief Operating Officer, Air Traffic</td>
<td>FAA</td>
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<tr>
<td>Jay Kinser</td>
<td>Manager, Strategic Programs, UAS Integration Office</td>
<td>FAA</td>
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<tr>
<td>Peter Sachs</td>
<td>Strategic Programs, UAS Integration Office</td>
<td>FAA</td>
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<tr>
<td>Alexis Morgenthal</td>
<td>Strategic Programs, UAS Integration Office</td>
<td>FAA</td>
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<tr>
<td>Gary Kolb</td>
<td>UAS Stakeholder &amp; Committee Officer, UAS Integration Office</td>
<td>FAA</td>
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## Confirmed FAA/DOT Observers

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<thead>
<tr>
<th>Name</th>
<th>Title</th>
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<tbody>
<tr>
<td>Jessica Orquina</td>
<td>Acting Manager, UAS Integration Office</td>
<td>FAA</td>
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<tr>
<td>Tonya Coultas</td>
<td>Deputy Associate Administrator, Security and Hazardous Materials Safety</td>
<td>FAA</td>
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<tr>
<td>Sabrina Saunders-Hodge</td>
<td>Director, Research, Engineering, and Analysis, UAS Integration Office</td>
<td>FAA</td>
</tr>
<tr>
<td>Abigail Smith</td>
<td>Executive Director, Aviation Policy and Plans</td>
<td>FAA</td>
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<tr>
<td>Adrienne Vanek</td>
<td>Director, International Division, UAS Integration Office</td>
<td>FAA</td>
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<tr>
<td>Joe Morra</td>
<td>Director, Safety and Integration Division, UAS Integration Office</td>
<td>FAA</td>
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<tr>
<td>Martha Christie</td>
<td>Deputy Director, Safety &amp; Integration Division, UAS Integration Office</td>
<td>FAA</td>
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<tr>
<td>Elizabeth Forro</td>
<td>Special Assistant, UAS Integration Office</td>
<td>FAA</td>
</tr>
<tr>
<td>Kamisha Walker</td>
<td>Management Assistant, UAS Integration Office</td>
<td>FAA</td>
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<tr>
<td>Jennifer Riding</td>
<td>Management Support Specialist, UAS Integration Office</td>
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Public Meeting Agenda

**Time:** 12:00 pm to 2:30 p.m. Eastern Time

**Location:** Virtual Video Conference

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<tr>
<th>Start</th>
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<tr>
<td>12:00 pm</td>
<td>12:05 pm</td>
<td>FAA – Greetings &amp; Logistics</td>
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<td>12:05 pm</td>
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<td>DFO – Read Official Statement of the Designated Federal Officer</td>
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<td>12:10 pm</td>
<td>12:15 pm</td>
<td>DFO – Review of Agenda and Approval of Previous Meeting Minutes</td>
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<td>12:15 pm</td>
<td>12:20 pm</td>
<td>FAA – Opening Remarks</td>
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<td>12:25 pm</td>
<td>Chair – Opening Remarks</td>
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<td>12:25 pm</td>
<td>12:35 pm</td>
<td>FAA – Overview of AAAC Roles and Responsibilities</td>
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<td>FAA – Response to Task Group #11: Acceptable Level of Risk White Paper</td>
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<td>1:05 pm</td>
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<td>Task Group #12 -- Integrating UAS Operations into K-12 Curriculums Recommendations</td>
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<td>1:25 pm</td>
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<td>FAA – BVLOS ARC Update</td>
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<td>LA DOT – UAM Policy Framework Considerations</td>
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<td>FAA – New AAAC Taskings</td>
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<td>Chair – New Business/Future Agenda Topics</td>
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<td>2:20 pm</td>
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<td>FAA – Closing Remarks/Final Thoughts</td>
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<td>2:25 pm</td>
<td>2:30 pm</td>
<td>Chair – Closing Remarks/Final Thoughts</td>
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<td>2:30 pm</td>
<td>2:30 pm</td>
<td>Chair – Adjourn</td>
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**Questions/Comments:** Contact Gary Kolb, UAS Stakeholder & Committee Officer (gary.kolb@faa.gov or 202-267-4441).
<table>
<thead>
<tr>
<th>Stakeholder Group</th>
<th>Members</th>
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<tbody>
<tr>
<td>Designated Federal Officer</td>
<td>Jay Merkle, Executive Director, UAS Integration Office, Federal Aviation Administration</td>
</tr>
<tr>
<td>Acting Chair</td>
<td>Houston Mills, Vice President, Flight Operations and Safety, United Parcel Service (UPS)</td>
</tr>
<tr>
<td>Airports and Airport Communities</td>
<td>Seleta Reynolds, General Manager, Los Angeles Department of Transportation&lt;br&gt;Dr. Paul Hsu, Founder and Chair, HSU Educational Foundation&lt;br&gt;Jeffrey Brown, Aviation Chief Operating Officer, Port of Seattle</td>
</tr>
<tr>
<td>Labor (controllers, pilots)</td>
<td>VACANT&lt;br&gt;Joseph DePete, President, Air Line Pilots Association (ALPA)</td>
</tr>
<tr>
<td>Local, State, Tribal and/or Territorial Government or Appropriate International Entity</td>
<td>David Greene, Bureau of Aeronautics Director, Wisconsin Department of Transportation&lt;br&gt;Bob Brock, Director of Aviation and UAS, Kansas Department of Transportation&lt;br&gt;Mark Colborn, Senior Corporal, Dallas Police Department&lt;br&gt;Michael Leo, Captain, New York City Fire Department</td>
</tr>
<tr>
<td>Navigation, Communication, Surveillance, and Air Traffic Management Capability Providers</td>
<td>Mariah Scott, Executive Director, Verizon Robotics&lt;br&gt;Matt Parker, President, Precision Integrated Programs&lt;br&gt;VACANT</td>
</tr>
<tr>
<td>Research, Development, and Academia</td>
<td>VACANT&lt;br&gt;Robie Samanta Roy, Chief Operating Officer, Electra.aero</td>
</tr>
<tr>
<td>Traditional Manned Aviation Operators</td>
<td>Mark Baker, President and Chief Executive Officer, Aircraft Owners and Pilots Association&lt;br&gt;Lorne Cass, President, Aero NowGen Solutions, LLC&lt;br&gt;Molly Wilkinson, Vice President, Regulatory Affairs, American Airlines</td>
</tr>
<tr>
<td>UAS Hardware Component Manufacturers</td>
<td>Brad Hayden, Founder and Chief Executive Officer, Robotic Skies&lt;br&gt;Christian Ramsey, President, uAvionix Corporation</td>
</tr>
<tr>
<td>UAS Manufacturers</td>
<td>James Burgess, Chief Executive Officer, Wing (an Alphabet company)&lt;br&gt;Michael Sinnett, Vice President Product Development and Strategy, Boeing Commercial Airplanes&lt;br&gt;David Carbon, Vice President, General Manager, Amazon Prime Air&lt;br&gt;Adam Bry, Co-founder and Chief Executive Officer, Skydio</td>
</tr>
<tr>
<td>Corporate UAS Operators</td>
<td>Greg Agvent, Senior Director of National News Technology, CNN&lt;br&gt;Todd Graetz, Director, Technology Services, UAS Program, BNSF Railway</td>
</tr>
<tr>
<td>Citizen UAS Operators</td>
<td>Kenji Sugahara, Chief Executive Officer and President, Drone Service Providers Alliance&lt;br&gt;Vic Moss, Owner, Moss Photography</td>
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## AAAC Membership – As of 2/14/2022

<table>
<thead>
<tr>
<th>Stakeholder Group</th>
<th>Members</th>
</tr>
</thead>
</table>
| UAS Software Application Manufacturers | **Jaz Banga**, Co-Founder and Chief Executive Officer, Airspace Systems, Inc.  
**Chris Anderson**, Chief Operating Officer, Kittyhawk |
| Agricultural Interests | **Brandon Torres Declet**, Chief Executive Officer, Meteor  
VACANT |
| Advanced Air Mobility | **Dr. Jaiwon Shin**, Chief Executive Officer, Supernal  
**Dr. Catherine Cahill**, Director, Alaska Center for Unmanned Aircraft Systems Integration (ACUASI)  
VACANT  
VACANT |
| Community Advocate | VACANT |
| Industry Associations or other specific areas of interest as determined by the AAAC DFO | **Brian Wynne**, President and Chief Executive Officer, Association for Unmanned Vehicle Systems International  
**Thomas Karol**, General Counsel, National Association of Mutual Insurance Companies  
**David Silver**, Vice President for Civil Aviation, Aerospace Industries Association  
**Lee Moak**, Founder & Chief Executive Officer, The Moak Group |
FAA – RESPONSE TO TASK
GROUP #11: ACCEPTABLE
LEVEL OF RISK WHITE
PAPER
Advanced Aviation Advisory Committee (AAAC)

Recommendations & Interim Responses

1. **Clearly establish rate-based safety targets that are relevant for all UAS operations for air and ground risk.**

   **Interim Response:**
   The FAA agrees that the acceptable level of risk (ALR) posed by UAS should be appropriate to the type of operation being performed. We are reviewing the BVLOS ARC recommendation that the ALR should be based on the risk to human life due to collision with traditional manned aircraft or collision with a person on the ground. We further agree that applicants should be able to use a combination of qualitative and/or quantitative methods to demonstrate their adherence to the acceptable level of risk. The FAA is continuing to research and determine the most appropriate ALR values for UAS operations based on proximity to traditional manned aircraft operations (general aviation and air carrier) as well as overflown populations.

2. **Develop an emergency use provision where the risk-based requirements can be waived or lowered for emergency and/or life-saving operations.**

   **Interim Response:**
   The FAA agrees and has provided means for enacting TFRs and other emergency use provisions for rapid UAS response. The FAA has a process in place to enable approval of tactical BVLOS waivers and emergency authorizations when first responders contact the FAA’s SysOps Support Center. The FAA also has the Special Government Interest (SGI) process. This process enables response to an emergency with UAS in an expeditious manner by allowing public safety agencies to apply for expedited airspace authorizations. The SGI process, depending on the nature of the operation, can be completed in a matter of minutes.
3. Require risk-appropriate qualification and approval of aircraft and systems that account for the significant role of the UA during BVLOS operations, without defaulting to Type Certification as the only regulatory pathway.

Interim Response:

The FAA allows applicants to follow several regulatory pathways for approval of aircraft and systems. These include Public Aircraft Operator (PAO) for self-certification of aircraft and Title 49 U.S.C. Section 44807 utilizing a risk-based approach to determine whether an airworthiness certificate is required for a drone to operate safely in the national airspace system (NAS). Additionally, applicants may utilize the Durability and Reliability (D&R) process to demonstrate suitability of UAS based on defined test criteria with corresponding operational limitations placed on the use of such aircraft. Finally, OEMs may leverage the FAA’s Associated Elements process, which scopes Type Certification, including D&R, to the airborne elements of the UAS. Other components (such as GCS, launch and recovery systems, etc.) need only meet performance requirements specified by the OEM. This provides flexibility to industry by enabling use of tablets and other devices that would not otherwise be approvable under TC processes.

4. The highest level of rigor of aircraft, systems, and equipment scrutiny is appropriate for high-risk operations using higher risk UA (examples may include: higher weight, kinetic energy, size, etc.) and/or higher risk operating areas.

Interim Response:

The FAA agrees that the highest standards must be upheld for those high-risk operations which utilize higher risk UA.

5. Accept and adopt a SORA-like risk-based approach to UAS approvals outside of 107 operations or new regulations, including a set of standard scenarios or pre-defined risk assessments (PDRA’s) for common scenarios/operational characteristics.

Interim Response:
The FAA agrees that tools such as PDRAs are useful for streamlining and standardizing certain kinds of operational approvals. The FAA is exploring the feasibility of recognizing common scenarios for operators who are seeking approvals in low-risk settings, but that cannot be accommodated without a waiver from existing regulations.

6. **Do not adopt a cumulative risk approach.**

Interim Response:

Cumulative risk is just one of many tools the FAA uses to assess risk in the NAS. When an operation does not comply with FAA policy, a formal safety analysis enables the examination of all available resources and techniques. This process has often allowed the FAA to permit some operations that would otherwise not meet the agency’s existing policies. It would not be prudent to remove such a tool from the FAA toolbox.

7. **Recognize and accept performance standards from accredited standards development organizations (SDOs), such as ASTM or RTCA, in developing comprehensive, industry vetted safety performance standards that can be used as a means of compliance with FAA safety regulations.**

Interim Response:

The FAA works collaboratively with Standards Development Organizations in developing and incorporating industry vetted recommendations within its regulations. In general, a standards-based means of compliance must reference an existing regulation, not a waiver or exemption to that regulation. Therefore, formally accepting many emerging standards requires that enabling regulations be promulgated through the formal, public rulemaking process.

8. **Adjust the current operational approval process to minimize duplication of effort wherever possible.**

Interim Response:
The FAA continually reviews its processes and procedures to make them more efficient for the agency and applicants, and we agree that this work must continue in the future to enable the current approval processes to scale to meet increasing industry demand.

9. **A risk-based quality system for production of aircraft and replacement parts should be included in qualification and approval processes for aircraft and systems. The requirements of a quality system should be proportional to and appropriate for the risk level of the aircraft and operating environment.**

Interim Response:

For Type Certification (TC), Production Certification (PC), and certification management, risk-based approaches are currently being applied. Deviation memo AIR600-21-600-DMO1 is foundationally risk-based and provides relief from the certification and oversight rigors traditionally applied to manned aircraft. Additionally, 14 CFR 21.137 allows each Production Approval Holder (PAH) to develop a quality system that meets both the needs of the PAH (size, scope, criticality, and complexity) and the rule. As such, PAH quality systems are scalable to the size and complexity of the product/article being produced. Finally, rulemaking is underway (RIN 2120-AL60) that would expand SMS requirements under Parts 21, 91, 135, and 145. The NPRM is anticipated to be released in late calendar year 2022.

10. **Encourage commercial Part 135 operators to track UAS safety events (i.e., loss of control) in a Safety Management System (SMS) and compare the actual rate with the expected rate. The UAST SMS Recommendations should be used as a guide to align scope of the SMS with the risk of the operation.**

Interim Response:

We agree with this recommendation. Rulemaking is underway (RIN 2120-AL60) that would expand SMS requirements under Parts 21, 91, 135 and 145. The NPRM is anticipated to be released in late calendar year 2022. Additionally, any commercial operator may voluntarily comply with the existing provisions of 14 CFR Part 5.
11. Using a data driven approach based on traditional piloted aircraft traffic, structure and class of airspace, create and publish a map of airspace risk class levels for piloted aviation for the entire US that all UAS operators can use as a baseline for the application of suitable mitigations.

Interim Response:

The FAA is in the process of researching, validating and implementing a variety of data-driven approaches to airspace characterization and risk assessment. The FAA agrees that making this data available in the appropriate form to external stakeholders is beneficial and will consider the appropriate means of releasing such information as these tools, techniques, and policies mature.

12. Do more outreach to educate operators on the UAS safety reporting capabilities within the Aviation Safety Reporting System (ASRS) and create a portal that allows all UAS operators to voluntarily report hours flown. Data from this reporting system should be made available to industry/regulatory groups like the UAST to help offer guidance to improve safety for the industry.

Interim Response:

The FAA has a continuing commitment to the education of drone operators. The Drone Safety Team (DST) promotes NASA’s ASRS program on its homepage and has access to the information that is provided by the ASRS program. The ASRS submission portal provides the reporting party the opportunity to voluntarily submit the total time to date in all UAS Make/Models, time last 90 days, and time to date in UAS make/Model involved in event. The FAA conducts regular public outreach and promotion of education through a variety of events, including its yearly UAS Symposium. Anyone can query the ASRS portal to review de-identified reports or to generate a variety of aggregate statistics on the reports collected and the data they contain.
Introduction

We are honored to submit the Advanced Aviation Advisory Committee Task Group 12 Report, providing specific recommendations to accomplish the following tasking as initiated in the official meeting of the Federal Aviation Administration Drone Advisory Committee (DAC) on June 23, 2021:

DAC Tasking: Integrating UAS Operations Into K-12 Curriculums

Opportunity: Leverage expanding interest in AAM and UAS into K-12 curriculums. Develop the next generation of innovative thinkers, leaders and operators. Encourages investments and continued education in STEM related fields.

Tasking: DAC to develop recommendations on how to integrate Advanced Air Mobility and Unmanned Aircraft Operations into K-12 curriculums.

Per an amended charter on October 25, 2021, the Drone Advisory Committee's official designation is the Advanced Aviation Advisory Committee (AAAC).

AAAC Chairman Houston Mills/ Vice President UPS requested the Task Group 12 Co-Leadership of Members Dr. Paul Hsu / President, HSU Educational Foundation and Mr. Brian Wynne/ President, Association for Unmanned Vehicle Systems International. Both heartily accepted this significant responsibility with a collaborative spirit of dedication to this matter of national importance, which will help shape the development of the next generation’s workforce. Fellow members of the AAAC and subject matter experts shared in the gravity of this opportunity, contributing diverse scope of backgrounds from industry, academia, non-profit, manufacturing, advocacy and government. In joining the effort, members dedicated their time and attention over the next six months to a three-prong methodology for identifying objectives, conducting discovery research, and finally, forming the recommendations of this report.

Subgroup leads were established in the areas of: Establishing Learning Goals; Associating Topics to Core Classes; Researching Existing Curriculum; Integration Approach into Core Classes and Exams; Matters of Adoption of Standards Across National, State and Local Agency; Non-Traditional Learning Environments and Outreach; and Financial Business Justification. A midpoint update was provided to the AAAC at the meeting on October 25th, 2021 which produced ample enthusiasm and dialogue with questions and further suggestions for discovery. Following an extensive discovery phase, TG12 members began forming recommendations tailored to initiate and carry out over a proposed three phase, ten year plan and grouped under the following focus areas: Gathering Resources; Organization and Governance; Standardization, Certification and Curricula Delivery; and Spread the Word – Outreach.

In developing this series of recommendations, members considered:

- The diversity of America’s classrooms and communities, including differences between rural and urban schools, socio-economic and cultural backgrounds, and demographics of gender, race, and religion,.
● The relevancy of modern tools and techniques of education in a dynamic digital age where students are exposed to new information through increasingly technological and social platforms.

● Differences between traditional and non-traditional settings of learning from kindergarten to grade 12. With respect to evolving educational environments, interviews were conducted to discern a barometer of the climate of education for students, teachers, faculty administrators and school district superintendents today.

● How recommendations connect students to careers.

In pursuit of this tasking, TG12 members discovered examples of excellence in teaching as reflected through ‘Success Stories’ in aviation and UAS training and curriculum. The task group eagerly expressed praise for programs that embodied quality applications for science, technology, engineering, and math which also inspired an interest in aviation careers and emerging technology innovation. The discovery phase revealed feedback from a wide array of successful organic programs that were stretched for funding but found success, namely through the inspired advocates and dedicated volunteers who could see the impact of mentorship and applying STEM to the exciting world of uncrewed aircraft systems and advanced air mobility. Program leaders and educators alike expressed frustration at barriers to formalize their unique aviation and UAS applications through access to resources, funding, places to fly or certifications. TG12 members rooted on the teachers who employed hands-on experiential learning techniques and especially those connecting underrepresented or disadvantaged youth with mentors, resources, and opportunities for scholarships or internships that could be transformative towards accomplishing their future career goals.

As Task Group 12 conducted this research, there was healthy dialogue on the challenges of governance and bureaucracy. Members reached a shared resolve to provide this body with a set of implementable recommendations that would not seek to solve all the challenges of education nationwide, but to strictly adhere to the language of the Opportunity and Tasking and appreciate what the Federal Aviation Administration is able to accomplish within the scope of its clearly defined mission, vision and values. https://www.faa.gov/about/mission

A common theme throughout this effort, as it was conducted largely by virtual meetings, was learning of diverse impacts of the COVID-19 pandemic on classrooms, communities, afterschool programs and the workplace nationwide. As the nation grappled with how to educate a child from a social distance, virtually or from behind a mask, the youth of this country discovered newfound resolve and independence, forming new skills with online tools and perhaps a global awareness of the importance of balancing both safety and rapid innovation. As app deliveries became a routine household tool, so too came the consideration of what AAM might one day provide in touchless delivery of medications and products to their door. While there is no sure way to navigate what the future will hold next for this generation, one assurance is clear – our Nation will continue to rely on a thriving pipeline of talent with the ability to solve hard problems.

Number of technicians and pilots required over the next ten years:
The Task Group projects the number of students needed to graduate high school and enter into the workforce in the U.S. as UAS technicians or UAS pilots is approximately 56,000 individuals in 2022 or
1.5% of the graduating class. This number grows to approximately 85,000 students or 2.3% of the graduating class in 2030. These projections are based on 2021 Bureau of Labor statistics\(^1\), FAA’s U.S. Civil Airmen Statistics\(^2\) and the FAA’s Administrator’s Fact Book\(^3\) and the National Center for Education Statistics\(^4\). From these sources, our projections made these assumptions:

- Industry growth in jobs for UAS pilots and UAS technicians is 11% compound annual growth rate 2020-2030.
- In 2021, of the ~500,000 part 107 pilots, 200,000 are working as UAS pilots
- For every UAS pilot there are 1.1 UAS technicians

The development of tomorrow’s innovative thinkers, leaders and operators must be today’s priority if the FAA hopes to accomplish a vision for a better, stronger, safer nation. Not unlike the rocky innovation history of aviation, the future integration of UAS into K-12 Curriculums will have some exhilarating leaps and some miscalculated landings. However the spirit of discovery appreciated through this endeavor has only further confirmed this group’s passionate resolve in the importance of this mission and tasking. TG12 thanks the FAA for its support of our Nation and consideration of these recommendations on behalf of the Advanced Aviation Advisory Committee.

Presented Sincerely,

Members and Subject Matter Expert Contributors of TG12


\(^2\) U.S. Civil Airmen Statistics, 2020 Active Civil Airmen Statistics, faa.gov/data_research_data_statistics/civil_airmen_statistics/

\(^4\) National Center for Education Statistics, 2021, nces.ed.gov
## Tasking Group # 12 Leadership:

<table>
<thead>
<tr>
<th>Tasking Group Leaders</th>
<th>Tasking Group Leaders</th>
<th>Chairman, HSU Educational Foundation</th>
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<tbody>
<tr>
<td>Paul Hsu</td>
<td>Brian Wynne</td>
<td>President and CEO - Association for Unmanned Vehicle Systems International (AUVSI)</td>
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<tr>
<th>SG1 Establishing Learning Goals</th>
<th>SG1 Establishing Learning Goals</th>
<th>Sr. Regional Dir. / Regulatory Affairs - Aircraft Owners &amp; Pilots Association (AOPA)</th>
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<tr>
<td>Chris Cooper</td>
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<th>SG2 Associating Topics to Core Classes</th>
<th>SG2 Associating Topics to Core Classes</th>
<th>President/ Moss Photography</th>
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### TG12 Members and Subject Matter Expert Contributors

Emily Rice/ Academy of Model Aeronautics AMA, Mario Werth/ Director of Unmanned Training - HSU Educational Foundation, Josh Bixler / President - Flite Test, Bob Brock/ Director of Aviation - Kansas DOT, Alex Suarez/ Global Drone Academy, Lorne Cass/ President, Aero NowGen Solutions LLC, Mark Reed/ Air Line Pilots Association Intl (ALPA), Zackary Nicklin / UAS Director - National Center for Autonomous Technologies, Northland College, Catherine Cahill /Director - Alaska Center for Unmanned Aircraft Systems Integration
Task Group 12 Recommendations

Make Content and Resources Readily Available

Recommendation #1: Expand access to resources for teachers and students by leveraging existing tools that are offered by FAA, are nationally-reaching, and are publicly-available – including website tools, sample lessons, FAA educational safety week initiatives and utilization of TRUST for outreach to all classrooms.

FAA has an opportunity to leverage existing resources that would serve valuable to educators and students alike. Resources could be accessed through a more centralized campaign that not only encourages exploration of UAS and AAM, but also empowers self exploration due to ease of implementation at little or no cost. As an example, FAA would establish a dedicated segment of the FAA website (an FAA K-Career UAS Explore Dashboard) for teachers and students with sample lesson plans and educational video segments. It would also provide ‘success stories’ from educational programs, increase awareness of upcoming outreach campaigns and suggest the best ways to engage the classroom. To be most successful, a central dashboard would encompass social sharing plug-ins, simulator links, routine access to live feed drone competitions, student led Q & A panel podcast links, and a portal to request regionalized mentor resources from established network of safe (background checked) volunteers with professional aviation / UAS industry experience (see recommendation #2). As
part of the dashboard, teachers would access online continuing professional education course opportunities to earn a badge or certification. Students would do the same and that ‘digital badge’ would become a source of confidence or meet a requirement for an extracurricular or scholastic expectation. For example, a Boy Scout badge would be satisfied by earning the Level 3 FAA Safety Certification aimed at the middle school level.

FAA also has an opportunity to leverage National Drone Safety Awareness Week by suggesting ways that a teacher can incorporate lessons or experiences across a wide segment of core subject areas as a tie to this national event. Three basic examples: 1. Design and build your own small UAS from recyclable materials and discuss B4uFly concepts; 2. Learn to 3D print a payload attachment and discuss how weight is a factor in safe remote pilot operations; or 3. Write a story about an innovative application for drones to serve as an aid during a natural disaster and discuss use of drones for public safety.

FAA can utilize the The Recreational UAS Safety Test (TRUST) as a recognized nationwide entry point from all classrooms, which would provide an easy first connection with students and teachers to provide them with valuable resources that will support their ongoing exploration. In addition, TRUST would inform students about how to stay knowledgeable on new educational resources, regulatory updates and FAA communications. Just like Red Ribbon Week became a national campaign, TRUST could be adapted into FAA National Drone Safety Awareness Week. Students of a certain level, such as all 4th graders, could take the test and be introduced to both the FAA K-Career UAS Explore Dashboard and a host of tools as part of the experience to better inform and empower deeper exploration.

As part of creating a central repository of aviation resources, Tasking Group 12 also recommends the FAA provide endorsement of existing educational platforms that meet or exceed FAA’s standards. Endorsing existing resource providers provides a standardization and credibility that will help school districts to incorporate these curricula into their classrooms as they align with providing proper training on FAA approved concepts and topics. Providing scaled down standards for the exploration of UAS and aviation concepts in the elementary and middle school years will encourage students who want to progress their climb into the more rigorous and structured Career and Technical Education pathway opportunities offered in upper middle to high school years. By starting with lower level years with lower level “youth certification,” there is a greater opportunity for retaining students’ attention and confidence.

The Tasking Group discussed the benefit of hosting nationwide challenges as large scale expos that include contributing support of public and private partners.

Recommendation #2: Guide the development of a Formal Network of UAS Educational Volunteer Mentors and Flying Sites.

The TG12 discovered that a barrier to UAS program expansion appeared to be a lack of access to or difficulty vetting subject matter experts. Educators need mentors who can provide volunteer hours in guidance, training and inspirational encouragement. In addition, some educators lack access to open space to conduct safe operations and administrators expressed liability concerns. Educators often lack
the confidence to bring new technology applications into the classroom setting without additional technical training or secondary support.

A model example for establishing a professional network of subject matter experts exist in the long successful Air Force Association CyberPatriot program. By pooling the talent of cyber professionals regionally and drawing especially on membership or Air Force installation base and community partners, the AFA has established a highly successful program that provides programs and schools across the nation with a network that is trained, voluntarily background checked and region-specific. Once matched and invited, the mentor is encouraged to continue to participate and build a record of service year after year in contributing to quality cyber educational programs. This can be replicated in UAS education. If the teacher is providing feedback about the mentor experience, a quality program can also serve as an added credential for the mentor. A quality mentor program also reflects the importance of screening and online child safety training which further provides confidence to schools, educators and parents.

● TG12 recommends the FAA consider some of the following volunteers and resources:
  o The FAA Safety Team Drone Pros are UAS regulatory and policy experts and are located across the USA and already tied into the FAA’s education infrastructure.
  o Nationwide Community-Based Organizations identified through FAA’s Advisory Circular 91-57C and defined in the FAA Reauthorization Act of 2018 (U.S.C. 44809) can provide training, access to safe airspace at FAA Recognized Identified Areas (FRIAs).
  o Two potential pools of resources to teach the Teachers and administer testing and certification for Continuing Education is the FAA Safety Team and the group of existing private organizations administrating The Recreational Unmanned Aircraft Systems Safety Test (TRUST). Both pools are volunteers and have knowledge in the areas of UAS safety and regulations. Teachers want to earn badges. FAA can utilize TRUST partners for administration of the training and testing.

Recommendation #3: Provide collected National & State/Regional Existing Resources libraries to FAA in appendix of the recommendation. Propose that the FAA continue to collect these resources and build them into an online repository that can be accessed by educators to research and leverage for building curricula.

TG12 discovered numerous great examples of aviation-specific STEM programs across the country. The lists included in this report are not all-inclusive. The Tasking Group included a representative listing to reinforce that teacher organizations will benefit from a central consolidation of contact points and links to resources so local STEM instructors and content creators may more easily access people and resources.
The Tasking Group recognizes National Center for Autonomous Technologies (NCAT)\(^5\) is already a repository for 2 FAA programs and has a curriculum library that is already being built for K-14 education. TG12 suggests to the FAA that this may be a viable repository to use for the purposes discussed below.

Consider an educator’s perspective: Imagine if your supervisor asked you to create a specialized training program for employees that was well outside your area of expertise. Now imagine that same supervisor asking you to make the program exciting, participatory, and fun. And to add an extra challenge, what if you were told the “employees” you will be training are aged somewhere between 4-to-19 years old and may have learning or behavioral challenges that limit their ability to receive and process information, or even stay focused on specific tasks.

While such an assignment may seem overwhelming to many of us, it is a request that is made frequently of K-12 educators.

Recent industry demands for a more technically sophisticated workforce are driving the desire for school systems across the country to implement specialized STEM programs that are increasingly outside the boundaries of more traditional classwork. Educators – from administrators to teachers – are tasked with developing programs on topics that are far outside their own areas of expertise and can struggle with how to even begin implementing such a plan, much less integrating it into an entire school year’s agenda.

Fortunately, government entities, industry organizations, and for-profit corporations are stepping in to provide K-12 STEM-related materials and events targeted at educators. These STEM initiatives are designed to include one or more of the following characteristics or objectives:

- Introducing students to the broader concept of STEM, or area of STEM-focus (ex. aviation, drones)
- Providing educators with a program that has specific learning curricula, or used in conjunction with STEM-focused school programs
- Detailing background information on how to extend the student’s post K-12 learning to collegiate, trade school, or On-The-Job (OJT) placement in preparation for working careers
- Engaging local Subject Matter Experts (SMEs) to assist educators in creating programs and/or providing hands-on demonstrations and instruction
- Outlining available national and state/regional funding sources to finance STEM curricula
- Often including competitive STEM events and other engaging venues

For this report, TG12 focused on analyzing successful STEM programs with both traditional aviation and drone aviation focus. While conducting research, the team assembled an impressive collection of these available STEM aviation/drone programs already being used by educators across the country.

\(^5\) [https://ncatech.org/course-curriculum/](https://ncatech.org/course-curriculum/)
These National and State/Regional programs are included in Appendices 4 - 6 of this report for reference.

Further, the team concluded that such a collection of existing STEM/aviation resources would be invaluable to educators as they begin to research their own curricula and programs. Therefore, TG12 recommends that the FAA continue to build this collection into a living, online Existing Resources library that is composed of summaries and contact information of providers of readily available materials and programs that can be leveraged by educators. The Existing Resources online library would feature:

- A robust collection of available STEM/Aviation programs with preferred contact information
- Ability to sort by those programs offering National and State/Regional emphasis
- Ability to sort by program-type (traditional aviation, drone, Advanced Air Mobility, etc.)
- Instructions for provider submission processes with clear requirements for acceptance
- A user-friendly interface

The Existing Resources library will quickly become the go-to destination for educators building aviation/drone/AAM curricula and associated, hands-on programs. Its success will be predicated upon a quality approach toward design and overall management. Submitting organizations will need to recognize the value of participating in the Existing Resource library, and of course educators will have to see the value in the platform to continue its use.

**Build Connections for Action and Cultural Transformation**

**Recommendation #4: Call for Public Private Partnership - The Pledge to America’s Future Advanced Aviation Workforce**, to encourage or incentivize industry partners to participate in K-12 education through funding, mentorship and driving relevant content requirements.

The Pledge to America’s Future Advanced Aviation Workforce would be a national campaign that provides an opportunity for companies to officially commit support towards a series of proactive workforce development initiatives. Partners would dedicate time, resources, mentorship and leverage training tools in their communities and challenge employees within their ranks.

The recommendation would begin in Phase 1 with a drive to connect and inspire collaborative action, with a primary objective for a national public awareness campaign and tour that promotes the principles of this tasking, especially with companies that will depend on the talent pipeline that is created by this effort. The recommendation expands to serve as a Gathered Resource in Phase 2 and would be communicated on the FAA Educational K-Career Dashboard. The resource would help communities know where they may find support for a successfully implemented program and the partnership of a regional advocate to help inform and support the school district and local schools. This effort, if accomplished effectively, would continue through all three phases. It would spread first by way of a
National USDOT / FAA Tour where leading members of the FAA and Secretary of USDOT would attend pledge signing events and bring significance to this important public-private partnered, nationwide endeavor. If participation is compelling, the President would issue an Executive Order, further expanding the impact.

This recommendation encourages both employers and the government to have a stake in educating the future advanced aviation workforce by calling for public and private cooperation in developing solutions collaboratively.

A pledge would reflect a series of committed actions from both the industry partners and the government. As part of the pledge, companies would offer funding for aviation and UAS focused educational programs, internship or apprenticeship opportunities with on-the-job training or work-based learning, or formal educational partnerships with local schools or extracurricular providers. Commitments would include financial, resource, and mentor support. The FAA could bring recognition and provide incentive via an annual Future Advanced Aviation Workforce Partner Award for businesses in each size category demonstrating excellence in their commitment to future advanced aviation workforce development. As part of this effort, ideally the FAA would partner with wide reach autonomous vehicle and aviation expo events where large segments of the industries are represented to launch this nationwide campaign as early as this year and on a recurring basis each year.

**Recommendation #5: Facilitate a Change in Attitudes Through Education to address Gender Bias in STEM Fields.**

As stakeholders work to integrate UAS education into K-12 schools and STEM programs, they must acknowledge and address the gender gap that exists in STEM-related fields in the United States. Gender bias in schools remains a significant barrier to girls’ progress in STEM.

Numerous studies have shown that women often face tremendous challenges if they choose to enter a Science, Technology, Engineering or Math field, such as aviation. Some never enter their chosen field even after graduating from college, or they may begin their career but do not stay for very long. A main reason for this, according to at least one study, is the stress that comes with being female in a male-dominated field. According to the National Science Foundation, in elementary, middle, and high school, girls and boys take math and science courses in roughly equal numbers, except in engineering and AP computer science. So why aren’t more women entering these career fields?

Teasing, bias, lack of encouragement, stereotypes, childcare issues, competition, and marginalization are just some of the reasons girls and women enter and remain in STEM fields at lower rates, so our nation must take steps to illuminate these gender gap issues. This initiative will benefit the U.S.’s citizens and increase workforce capacity.

***For a more detailed report describing the gender bias problem in America and some recommended solutions the FAA can adopt, please refer to Appendix # 2.***

Below are just two examples from several current STEM programs that address gender bias issues. The FAA can incorporate these strategies into future programs:
● She Maps in Australia has recognized that gender bias begins in Primary School, including girls’ perceptions around their future in a STEM career. “If we are going to equip our children (regardless of gender) for the future,” She Maps believes, “then engagement in STEM education across the curriculum is needed from primary school through high school and into tertiary education.”

● US Drone Soccer found that most robotics programs do not include girls from the beginning and they are trying to change this. US Drone Soccer has created inclusive and accessible youth programs and adopted a “Code of Conduct” that requires the fielding of diverse coed teams. It also includes an anti-harassment and respect policy to discourage bullying, racism, bigotry and sexual harassment. They have included an anonymous reporting system similar to professional aviation to address unsafe situations and inappropriate conduct. Integrity and fair play is encouraged, and interference with the equipment or operation of other teams (for instance; jamming, hacking, distraction, disruptive chatter, eavesdropping, or tampering with equipment in any way) is not tolerated. US Drone Soccer’s Core Values and Code of Conduct can be found in Appendix 4.

Recommendation #6: Leverage the resources of the FAA UAS Collegiate Training Initiative (CTI) to instruct and inform educators as they build programs.

The FAA UAS-CTI program was created to meet the requirements of Section 631 and 632 of the FAA Reauthorization Act of 2018 (U.S.C. 44809). It currently consists of 84 colleges and universities across 39 states. All participating institutions are required to have a certificate or degree program focused on UAS and one of the primary focuses of this group is the sharing of best practices and the development of the workforce within the UAS industry.

Many of these institutions are Community and Technical Colleges (CTC) with a regional focus. They have already done the industry research for their region and know what skills local employers are seeking from graduates. Many CTCs actively seek out relationships with local K-12 schools to provide “college in the high school” programs and establish transfer pathways. This UAS-CTI network is a ready-made solution for providing mentoring, subject matter expertise and local industry knowledge to K-12 educators, making integration of UAS topics into K-12 curricula more attainable.

Recommendation #7: Form an interagency working group with the Department of Education and ongoing industry advice with clear objectives.

In conformance with 15 U.S Code Section 7102 – Duties of the Interagency Committee, the Task Group 12 team suggests the FAA form an Interagency Committee which will monitor, coordinate and promote the plans, programs and operations of the departments involved. The scope of this interagency would be to work with the Department of Education on UAS-specific STEM initiatives to further the competitiveness of STEM employees in the United States.

Tasking Group 12 recognized the benefit of the FAA forming formal partnerships with National Career and Workforce Development Agencies, Social Agencies and National Chambers of Commerce,
including minority reaching groups, to make sure connecting resources are pushed out to connect resources to underrepresented groups on resource pipeline from classroom to career. Examples: FAA Summer Internship, Apprenticeship or Fellowship Programs, Hispanic American Career Days, American Indian Cultural Organizational Outreach, with Hosted Expos, Grants for Resources and Customized Training to expand access to underrepresented groups.

**Deliver Aviation - UAS Specific Curricula**

**Recommendation #8: Recognize and endorse standards developed by National Institute of Standards and Technology to quantitatively evaluate various system capabilities and remote pilot proficiency.**

The NIST standards are a great way to test a remote pilot’s proficiency, and the FAA could easily recognize and endorse these already developed and tested NIST standards as a Phase 1 implementation for evaluating future remote pilot proficiency. *For a more detailed description of this program refer to the NIST sUAS Standard Test Methods in the Appendix. These standards can be scaled down to reach students at the elementary, middle and high school levels. Formal progression and ultimate certification can provide a track towards a career through the career and technical education division of the school district. Additional information available in Appendix # 1.*

**Recommendation #9: Create a grade 8-12 Aviation-Specific STEM curricula modeled on CTE CyberNet. Continue through phases 2 & 3.**

This recommendation is to replicate the existing CTE CyberNet⁶ program the Department of Education and the NSA have created to strengthen the capacity of high schools to prepare students with a range of knowledge and skills to accelerate their entry into technical and professional aviation careers.

A combination of Government, private sector and academia would train the workforce – with hands on, work-based learning approaches including apprenticeships, research experiences and co-op programs. The program would:

- Create virtual training platforms to augment the number of available teachers.
- Create new CTE programs to support this initiative.
- Develop comprehensive career technical education program of study of cyber security through existing Perkins and CTE Act.
- Align with NICE Framework, deliver rigorous academic, technical, and employability skills and give credits that transfer directly to NSA/DHS CAE-designated institutions.

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⁶ Pursuing a Cybersecurity Program of Study, Department of Education, Albert Palacios, December 2021.
• Increase the capacity of the CTE teacher workforce to incorporate cybersecurity instruction through intensive professional development and incentives for current teachers.

The CTE CyberNet program aligns with grades 9 through 16, high school, two year and four year colleges.

**Centers of Academic Excellence (CAEs)**
CAEs have rigorous requirements for designation. CAEs Knowledgeable Units translate directly to the NICE Workforce Framework. The NICE Workforce Framework provides a common definition to cybersecurity work roles. There are more than 300 2-year and 4-year CAE institutions.

The NSA let RFP grants to CAEs with the desired outcomes of:

- Develop CTE programs aligned with CAEs
- Develop teacher professional development
- Build sharable CTE Programs of Study
- Provide online technical assistance content
- Map KSAs and KUs to Credentials

**Examples of how CTE and Cybersecurity may work:**

- Capitalize on a range of applied learning and technical education strategies
- Academic integration
- Student organizations (CTSO and Cyber)
- Competitive events
- Work-based learning (internships, apprenticeships)
- A variety of federal, state and local resources available to educators
CTE CyberNet milestones
- Initiated in 2019
- Created a network of CTE cybersecurity teachers
- Created six CAE locations with 10 teachers per site with two additional sites to be announced

Replicate CTE CyberNet model to the FAA & Department of Education
An FAA, Industry and academic analog to the CTE CyberNet program can leverage existing structures, institutions and passionate subject matter experts:
- AAAC Members across range of critical stakeholder organizations
- Industry
- Academia
- Associations
- Numerous aviation educators who could augment a FAA designated curriculum.

Proposed Next Steps to initiate a FAA – Department of Education – Industry partnership program:
1. Gain industry agreement on the number of technicians and pilots needed in the USA over the next 10 years (how big is the challenge).
2. Create a FAA – Department of Education – Industry team (committee) to shepherd the program from concept to production.
3. Create short term events to raise awareness and enthusiasm around the program.
4. Formalize a structure for subject matter experts to be available to local schools.
5. Committee to create an RFP for grants to Aviation Centers of Excellence (ACEs).

Example: How might a Program of Study Look?

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Advanced Courses in UAS Aviation following Academic Centers of Excellence

Other courses required to meet local prerequisites and graduation requirements

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Recommendation #10: Increase support for extracurricular programs to address K-12 aviation-specific STEM needs.

Non-traditional and extracurricular learning environments have long provided ways for children to gain STEM related skills outside of the classroom while exploring emerging technologies even when it was more challenging to integrate these applications into the traditional school day.

FAA has an opportunity to facilitate resources and support for the afterschool, home school, private club and extracurricular programs that apply drones to learning about STEM. These programs enjoy a unique flexibility to expand on experiential hands-on learning applications and encourage insight into a wide scope of career occupations while having fun.

Many non-traditional learning environments are on the rise these days. According to the Afterschool Alliance, more than 70% of students in STEM afterschool programs express more interest in and knowledge about careers in science. They also build essential skills, such as perseverance and critical thinking. Another compelling statistic is that 10.2 million students are enrolled in after-school programs nation-wide, while another 19.4 million are standing by for the opportunity.

The opportunity to leverage these non-traditional settings of learning for integration into K-12 curriculum success is tremendous. Greater support, mentorship and resources for the programs that exist would help capture student interest in time for them to become self-motivated towards pursuit of a path in STEM and the programs offered in career and technical education tracks. Respondents to the TG12 Discovery Inquiry overwhelmingly reported that if a young person was not engaged in these fields and performing well in STEM by the fifth grade, the likelihood significantly declines in the years that follow. It happens that the focus of extracurriculars becomes more and more heavily divided in those same declining years.

As an added benefit, these programs often help overcome socioeconomic or gender bias concerns where they are a program specifically tailored to be relevant in addressing these concerns. These are the settings where students are more likely to discover real world applications for the STEM skills they see in the classroom and many times, the curriculum of an afterschool program can be lifted and used in the classroom.

Mentors are a critical component, and industry partners can be the solution as reflected in Recommendation #3, helping bridge industry and academia to give youth a better understanding of how these technologies play a role in their community. For example, an afterschool scouting troop can explore how UAS are used by law enforcement for search and rescue, clearing of accidents in traffic or as a solution in times of natural disaster.

In addition, these programs offer professional development for teachers by giving them the opportunity to work with other educators from outside of their geographical area or to serve as a mentor and gain confidence one on one before presenting the material to a large classroom.

The FAA should concentrate on more than just public-school education and expand its reach out to empower extracurricular groups such as after school programs, clubs, and on-line resource programs. Public schools, in many cases, are severely underfunded and may not have the resources or time to incorporate STEM based enriched experiential or project-based training. To fill this gap and identify talent which otherwise could go under-utilized, extracurricular can ignite a spark of interest and identify talent. This is especially true with underprivileged and under-performing students. See Appendix # 3.
Appendices

Appendix #1: Unabridged NIST sUAS Standard Test Methods

The National Institute of Standards and Technology, under the U.S. Department of Commerce, has developed standards to quantitatively evaluate various system capabilities and remote pilot proficiency. They are being standardized through the ASTM International Standards Committee on Homeland Security Applications; Response Robots (E54.09). They are also referenced as Job Performance Requirements in the National Fire Protection Association Standard for Small Unmanned Aircraft Systems Used for Public Safety Operations (NFPA 2400).

The NIST Basic Proficiency Evaluation for Remote Pilots (BPERP) is quickly becoming the remote pilot proficiency standard for public safety applications and agencies all over the United States. NIST only writes standards, they do not certify. So therefore, the Airborne Public Safety Association (APSA) has volunteered to become an organization that offers BPERP certifications to public safety remote pilots. APSA has held for the past year, and continues to hold, regional three-day courses to train public safety personnel how to proctor the NIST BPERP. There is at least two members of the AAAC who have attended this course and are currently qualified to administer or proctor the BPERP.

sUAS, especially over the past several years, have become increasingly easy to fly. Highly precise GPS receivers, and other stabilization methods built into the drone, can actually cause a remote pilot’s precision flying skills to diminish, for instance; flying in tight obstacle ridden areas or indoors in a GPS denied environment. The BPERP standardized course helps develop these precision flying skills. While flying the course, using two-gallon omni buckets with round ringed targets inside, the pilot must constantly rotate the drone through each axis of movement (pitch, roll and yaw), straight up and down, while also moving the camera up and down to snap a photo of the disk (capturing a complete green outer ring) inside the bucket. The course is timed, and although not required, the trend for each student is to get faster and smoother each time they run through the course.

A complete BPERP course consists of three, two-gallon omni buckets with printed stickers attached to wooden stands, set at a distance of 10’ apart. The entire course can be easily built with products from home supply stores or on-line retailers starting at under $150. With more buckets, NIST offers different levels of proficiency evaluation by increasing the difficulty of courses, for instance; obstructed lane, BVLOS (student turns back to course and flies the course strictly via a monitor), and night or low light operations.

The NIST standards are a great way to test a remote pilot’s proficiency, and the FAA could easily recognize and adopt these already developed and tested NIST standards for evaluating future remote pilot proficiency.

Appendix # 2 Unabridged Recommendation: Facilitate a Change in Attitudes Through Education to Reverse Gender Bias in STEM Fields

As we work to integrate UAS education into K-12 schools, we must acknowledge and address the gender gap that exists in STEM-related fields in the United States. Closing this gap benefits our citizens and increases the capacity of our national workforce.

Acknowledging the existence of gender bias in STEM fields

Numerous studies have shown that women often face tremendous challenges if they choose to enter a Science, Technology, Engineering or Math field, such as aviation. Some never enter their chosen field even after graduating from college, or they may begin their career but do not stay for very long. A main reason for this, according to at least one study, is the stress that comes with being female in a male-dominated field.7

The American Association of University Women (AAUW) claim on their website that gender bias in schools remains a significant barrier to girls’ progress in STEM. When it comes to ‘innate’ abilities, AAUW claims, there’s zero evidence to support the notion that boys are better at math and science. Yet these limiting stereotypes exist.8 And there are hundreds of studies on this subject to back up their claims. Though STEM fields account for some of the fastest-growing and highest-paying jobs of the future, according to the AAUW, girls and women are still not on par with boys and men in preparing for or entering into these fields.9

This paragraph from the AAUW’s website is also instructive:

It’s also a myth that girls aren’t interested in science: In elementary, middle, and high school, girls and boys take math and science courses in roughly equal numbers, except in engineering and AP computer science, according to the National Science Foundation. One study10 found that the apparent gender gap in mathematics is smaller in countries with greater gender equality, suggesting that gender differences in math are largely due to cultural and environmental factors, not ability.

If the number of girls taking science and math courses in school are the same as boys, then what is happening? Why aren’t more women entering these career fields? One example that gender bias is still alive and well, and a problem, was recently demonstrated during a speech posted to YouTube by Boise State University political science professor Scott Yenor. In his speech, Yenor stated,

“Young men must be respectable and responsible to inspire young women to be secure with feminine goals of homemaking and having children,” he told the crowd. “Every effort must be made not to

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8 The STEM Gap, from the web page of the American Association of University Women (AAUW) https://www.aauw.org/issues/education/stem/
9 Ibid.
10 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2689999/
recruit women into engineering, but rather to recruit and demand more of men who become engineers. Ditto for med school, and the law, and every trade,” he said.\textsuperscript{11}

If we are to encourage more women to enter and retain STEM careers, these types of attitudes and age-old prejudices must be confronted and challenged.

The number of women entering the aviation field has steadily increased over the past two decades, but still remains low. Female pilots only comprise about 6% of the total pilot population.\textsuperscript{12} One study discovered that bias pushes women out of science fields, not pipeline issues, or even personal choice issues.\textsuperscript{13} The bottom line is that when women are treated differently by male peers or instructors, it discourages them from entering these fields in the first place.

According to an article citing a study conducted by the New York Times Magazine, women earn 60% of all the bachelor’s degrees overall. But of those 60%, only 20% of those degrees earned by women are in computer science, 20% in physics and 18% in engineering.\textsuperscript{14} The article cites seven reasons why women are kept out of science careers:

1. **Teasing in school:** teachers and classmates sometimes stereotype girls who are interested in advanced physics and math, and teasing is a result. When there are few girls in an AP class, they tend to get discouraged and drop out.
2. There is a lack of encouragement for girls: Eileen Pollack, who wrote the New York Times Magazine piece stated that she graduated top of her class in physics, but none of her professors asked her if she was going to apply for graduate school, and she received little encouragement from her professors up to that point either.
3. **Stereotypes:** Hollywood has increased the number of female STEM-literate characters playing in popular movies, but when it comes to television shows, the article states, women are being held back by stereotypes.
4. **Childcare:** this issue cuts across all professions, and when maternity leave is not made available or discouraged, it can have a significant effect on a woman’s career.
5. **Competition:** The article claims that women are generally less competitive and aggressive than men.\textsuperscript{15} The author, in defending this conclusion, appears to be referencing the competition in


\textsuperscript{12} According to Women in Aviation. https://www.wai.org/resources/waistats


\textsuperscript{14} These are the 7 Things Keeping Girls out of Science Careers, by Jennifer Welsh. Oct 13, 2013. https://www.businessinsider.com/7-things-keeping-women-out-of-science-2013-10?op=1

\textsuperscript{15} In our Task Group’s research, AAAC Member Mark Colborn interviewed Dr. Kenneth Berry, Founder of ARISE, and Research Professor with the Caruth Institute for Engineering Education—Lyle School of Engineering, Southern Methodist University, University Park, Texas. Dr. Berry said kids by nature are competitive. And girls are competitive also but just not in the same way as boys. Boys are more technical and concentrate on the concrete issues such as hardware, etc., whereas, Dr. Berry has found, girls like being on teams and they end up being the better communicators and often become the leaders of the group.
technical fields to publish and that this expectation becomes a major determinant factor for a successful career.

6. **Marginalization**: Women in faculty positions often receive less pay than their male counterparts, are given smaller lab and office space, and get fewer awards and recognition for their achievements, according to a MIT committee, the article cites.

7. **Bias**: There are many ways in which bias can influence the number of women in the workforce. The article states that not only do women in STEM fields often face bias from male colleagues, but may face the same from other women. Gender bias can be built-in by the existing structure of certain organizations. For example, tenured professors (often male) make the decisions about who is hired or receives tenure.

**Addressing gender bias in STEM fields as a component of K-12 UAS education**

Stakeholders have the obligation to take action and must do more than simply introduce UAS education and other STEM-based training into K-12 schools. To close these STEM career gaps between men and women, the AAUW recommends the following steps to help create a lifelong pathway of opportunity for girls and women in STEM and instill a mindset of confidence.16

- Raise awareness that girls and women are as capable as boys — when given encouragement and educational opportunities.
- Promote public awareness to parents about how they can encourage daughters as much as sons in math and science — supporting learning opportunities and positive messages about their abilities.
- Teach girls, teachers and parents that math skills are learned and change over time — promoting a growth mindset that empowers girls to embrace challenges.
- Emphasize strong and visible role models of women and women of color in math and science fields.

For preschool through high school, the AAUW recommends:

- Provide professional education to teachers—addressing implicit and systemic biases — to raise awareness about girls’ math abilities, avoid passing on math anxiety and ensure boys and girls are held to the same standards.
- Encourage girls and women to take math and science classes — including advanced classes. Reduce tracking and high-stakes assessment in early grades that reinforce biases and stereotypes.
- Ensure every student is exposed to engineering and computer science, and Next Generation Science Standards in K–12.17
- Change how classes18 are taught by connecting STEM experiences to girls’ lives, promoting active, hands-on learning and emphasizing ways STEM is collaborative and community oriented.

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16 *Closing the STEM Gap, for website:* [https://www.aauw.org/issues/education/stem/](https://www.aauw.org/issues/education/stem/)
17 [https://www.nextgenscience.org/](https://www.nextgenscience.org/)
Teach girls of color math through open-ended and co-created problem posing and discovery.

Expand after-school and summer STEM opportunities for girls.

Increase awareness of higher education and career opportunities, pathway opportunities, role models and mentoring programs with women and women of color in STEM for girls.

The STEM Equity Pipeline is an example of a successful program boosting girls’ enrollment, performance and retention in STEM classes, and so far has reached tens of thousands of students in 19 states.

Create education programs, such as outreach and retention programs at the elementary, secondary, and postsecondary levels, to engage women and girls in STEM activities, courses and career development.

As an example of some programs that work, the AAUW referenced the following:

- **The STEM Equity Pipeline** is an example of a successful program boosting girls’ enrollment, performance and retention in STEM classes, and so far as reached tens of thousands of students in 19 states.

- **Harvey Mudd College** has achieved gender parity in its computer science and engineering courses. The college emphasizes the practical uses for computer science and engineering, incorporates female role models, offers course options for students with little or no programming background, trains faculty to support less experienced students and helps first-year female students develop support networks.

- **The University of Michigan** College of Engineering instituted equity measures — and now half of the school’s leadership are women.

She Maps in Australia, US Drone Soccer, and Women And Drones: an illustration of programs working diligently to close STEM career gaps between men and women.

She Maps In Australia

According to She Maps, gender bias begins in Primary School, including girls’ perceptions around their future in a STEM career. If we are going to equip our children (regardless of gender) for the future, She Maps believes that engagement in STEM education across the curriculum is needed from primary school through high school and into tertiary education.

19 https://peabody.vanderbilt.edu/bio/nicole-joseph
21 http://www.latinasinstem.com/
22 https://www.napequity.org/stem/stem-equity-project/
23 https://www.napequity.org/stem/stem-equity-pro
26 https://www.chronicle.com/article/An-Engineering-School-With/246214
A statement from She Map’s web site:

“When many people think of a scientist, they imagine someone (often male) in a lab coat working with a microscope or test tubes. Our vision of science is far broader. We believe that science is everything that we live and breathe in the environment. Unfortunately, we know that the environment is facing some really big challenges now and into the future.”

She Maps feels we need a diversity in science disciplines beyond the lab coat, and a diversity in ideas from people of every race, color, sex, and religion. She Map’s purpose is to bring STEM diversity into how we perceive science, and who does it.27

US Drone Soccer

US Drone Soccer found that most robotics programs do not include girls from the beginning and they are trying to change this. US Drone Soccer has created inclusive and accessible youth programs and adopted a “Code of Conduct” that not only requires the fielding of diverse coed teams but includes an anti-harassment and respect policy to discourage bullying, racism, bigotry and sexual harassment. They have included an anonymous reporting system similar to professional aviation to address unsafe situations and inappropriate conduct. Integrity and fair play is encouraged, and interference with the equipment or operation of other teams (for instance; jamming, hacking, distraction, disruptive chatter, eavesdropping, or tampering with equipment in any way) is not tolerated. *US Drone Soccer’s Core Values and Code of Conduct can be found in Appendix 4.

Women And Drones

Women And Drones, along with industry partners P3 Tech Consulting (Dawn Zoldi) and the Diversity Development Network of Canada (DDNC), are taking steps to address the gender bias issue in STEM programs. These three partners conducted a diversity, equity, and inclusion (DEI) survey between August 6 and September 17, 2021, and approximately 1082 individuals responded.

The report summary is planned for release on Monday, January 24th on the Women And Drones website (after the completion of this report). It includes a list of top ten DEI takeaways for the UAS industry. Women And Drones has shared three major take-aways from the survey, early, for inclusion in this report:

- Almost 75% of respondents said they felt moderate to extreme concern about the lack of DEI in the UAS/AAM industry in general.
- More than 80% of respondents expressed concern, ranging from moderate to extreme, about the lack of DEI in their own UAS/AAM or UAS/AAM-related business or organization.
- The majority expressed moderate to extreme interest in increasing DEI in their companies.

Additional data and findings from the survey will be released in a 100 plus page DEI market report which will be available on the Women And Drones website.

Additional References:
27 https://shemaps.com/#programs
Appendix # 3 Unabridged Recommendation: Address K-12 Aviation-specific STEM needs with greater support for extracurricular programs

There is an increase in the demand for extracurricular programs which has led to a growth in their number and their unique offerings. These are some different approaches that have been used for cultivating successful programs.

1. Access to and sustained participation in programs
   Young people experience greater gains if they participate in afterschool programs with greater frequency and in a more sustained manner. They also benefit from programs tailored to their interests, needs, and schedules, as well as from those providing exposure to new ideas, challenges, and people.

2. Quality programming and staffing
   Developing programs intentionally, with a focus on promoting target outcomes through well-organized and engaging activities, is a critical component for achieving high quality afterschool settings. It entails having a clear vision and goals for the program from the start, as well as strong, directed leadership and sustained training and support to staff.

   Also, youth benefit by developing positive relationships with the program’s staff, who in turn model good behavior, actively promote student mastery of skills or concepts in activities, listen attentively, provide feedback and guidance, and establish clear expectations for mature, respectful interactions with peers. Children who attend these well-supervised afterschool programs display better work habits, task persistence, social skills, prosocial behaviors, academic performance, and less aggressive behavior at the end of the school year.

3. Strong partnerships
   High-quality programs effectively leverage partnerships with a variety of stakeholders, especially families, schools and communities.

   Well-implemented, quality afterschool programs can support healthy learning and development when the key factors described above are addressed. They also demonstrate how complex it is to provide excellent, effective support for youth and their families.

Implementation

Successful after-school programs that offer easy access for students and a quality, hands-on experience have proven to be effective, non-traditional learning environments for drone education. In order to promote these programs, incentives are important for maintaining engagement and follow through with the students, instructors, and their partner schools.
There are model programs where entry is usually provided, at least initially, without cost through incentive funding such as First Robotics Competition and Drone Team Challenge. The competition platforms provide the momentum driving student interest, but the truly tremendous impacts are on how the programs educate and empower the educators and parents who grow a stronger appreciation for the skills these students are capable of developing while having fun. Teachers receive credibility inside and outside the classroom, as well as opportunities to apply for grant support. For students, these programs offer a unique, hands-on learning environment, increasing interest to continue scaling up their rigor in the leveled programs. For FIRST, this means scaling engineering concepts from a small robot made with legos to a medium build and on to a full size ground robot conducting complex operations, some of which autonomously. Drone Team Challenge, a partnership endeavor of the Air Force Research Lab and the HSU Educational Foundation was designed with a focus on developing knowledge of aerospace engineering concepts, part 107 safe operations, simulated flight training, piloting and navigation on a course and coding the drones and autonomous creative applications. Applying the drone to a real world problem through a practical exercise called Mission Possible leads to discovery of how the drone can be used for surveillance, intelligence gathering, field studies, deciphering codes and performing geographical studies. This encourages students that learning math and science can be fun, but also there is more than one way to learn about any concept. It is only due to grants and sponsorships that these opportunities and all the curriculum are provided at no cost to the student or teacher.

Beyond funding or competition and recognition, mentorship is the crowning incentive for many successful programs. For youth to gain the invaluable guidance of a good mentor can be life changing. Companies can formally commit to provide this support as posed in Recommendation #5. There may exist certain challenging barriers to bringing mentors into the traditional classroom on a regular basis, but the non-traditional setting can provide a natural solution. Public and Private Partnership (PPP) solutions fostered in non-traditional settings help overcome barriers allowing all students to access quality learning.

The FAA has programs such as the STEM AVSED that help promote STEM and aviation programs. They provide kids, between the ages 5 and 13, a hands-on learning experience through AMA Flight School Youth Camps.

The adoption of extracurricular drone programs varies widely from state to state, just as they do for in-school programs. For instance, 4-H currently has no nationwide drone program or competition, however, Utah and Florida 4-H Extension Offices have incorporated drone programs into their 4-H clubs. The Boy Scouts of America recently introduced a drone program into their list of projects available for members. The Academy of Model Aeronautics (AMA) has an internationally available program called UAS4STEM. The program is designed for students to learn, practice, and demonstrate professional uncrewed aircraft system (UAS) knowledge, mission planning, flight skills, data collection, analysis, and safety practices in a competitive environment.

Competition is crucial to all in-school and extracurricular STEM programs, and it keeps kids interested. And kids by nature are naturally competitive. This competition is especially necessary in elementary and middle school years, but as kids move into high school, they should be encouraged to go beyond just competition and begin designing, manufacturing, creating and marketing a brand, and promoting their
ideas and work by using project management techniques. High school programs should apply the practical applications of the science, math and engineering principles and how they interact and are used in daily life. And by stressing the application aspect of the use of drones, it makes any engineering, math and science program relevant, plus it becomes obvious to the student what they need to know to be successful in the workforce.

In our research, we have found that after-school, homeschool, private club and extracurricular program leaders are all eager to work with the FAA to widen the scale and reach of their respective programs. This is especially true with the leaders of the U.S. Department of Agriculture, National Institute of Food and Agriculture (USDA-NIFA), the federal agency that administers the 4-H program nationwide. They are eager to encourage the FAA to enter into an MOU or draft an Interagency Agreement with the USDA-NIFA for drone and aviation STEM programs, which could facilitate the beginning of project sharing and funding for these projects nationwide. A similar interagency collaboration agreement currently exists with the USDA-NIFA and the military for family and youth support programs. See: https://nifa.usda.gov/sites/default/files/resource/A%20Guide%20to%20Cooperative%20Extension%20System%20and%20Military%20Collaborations%20in%20Family%20Support.pdf

4-H reaches over six million kids every year and has programs for kids aged 5 through 18.

Also, the USDA-NIFA offers an additional benefit to the FAA when it comes to recruiting new, or educating current teachers and mentors. The USDA has administered the 4-H program since 1912 and works with Land Grant Universities through County Extension Offices across America to administer Youth Development Programs in 4-H. The County Extension Offices, through their Land Grant Universities continually offer continuing education credits, and tuition assistance if available, for existing teachers and mentors that are interested in teaching STEM programs. The FAA should be encouraged to tap into this already existing, and incredible resource.

Appendix #4, National Existing Resource Library

Ed Cormier
Program Analyst
ANE STEM AVSED POC
NASA is leading the nation to quickly open this new era in air travel called Advanced Air Mobility, or AAM. The vision of AAM is that of a safe, accessible, automated, and affordable air transportation system for passengers and cargo capable of serving previously hard-to-reach urban and rural locations.

This STEM Module brings together a curated list of NASA activities and resources that can be used to explore the STEM principles behind Unmanned Aerial Vehicles (UAVs) and the AAM system. Our intention is to provide a broad range of activities, centered on AAM, which can be embedded in
different lessons. Students can engage with the principles of AAM in a variety of ways - including hands-on STEM activities, coding activities, math lessons, and more.

These activities have been designed for students of middle school age. Depending on the students, however, the activities can be used with younger or older students as they are or with minor modifications.

https://www.nasa.gov/aeroresearch/stem/AAM

**National Center for Autonomous Technologies**

The National Center for Autonomous Technologies (NCAT) was formulated through the National Science Foundation’s Advanced Technological Education (NSF ATE) program. The NSF ATE program has been funding innovation at two-year colleges for over 25 years focusing on the education of technicians for the high-technology fields that drive our nation’s economy. The ATE program supports curriculum development; professional development of college faculty and secondary school teachers; career pathways to two-year colleges from secondary schools and from two-year colleges to four-year institutions; and other activities.

Fields of technology supported by the ATE program include, but are not limited to, advanced manufacturing technologies, agricultural bio-technologies, energy and environmental technologies, engineering technologies, information technologies, micro- and nano-technologies, security technologies, and learning, evaluation, and research.

As the first national ATE center in autonomous technologies, NCAT is crafting, adapting, and implementing educational resources to support K-12 educators, and two-year college faculty in
numerous disciplines to meet workforce demands while increasing the quality and diversity of the highly skilled technical workforce.

NCAT is currently building a curriculum repository for k-16 education [https://ncatech.org/course-curriculum/](https://ncatech.org/course-curriculum/)

**Civil Air Patrol**

The CAP STEM Kit program is designed for CAP's Internal and External AE programs.

* Internally, the unit AEO (or commander) is authorized to apply for a STEM Kit to enhance the AE portion of the cadet program.

* Externally, educator members are authorized to apply for a STEM Kit to help perpetuate interest in STEM subjects and careers.

**NOTE: This is an application process.**

The FAA's 2018 Reauthorization Act required the FAA to establish a collegiate training initiative program relating to uncrewed aircraft systems (UAS). The Unmanned Aircraft Systems Collegiate Training Initiative (UAS-CTI) Program was launched in April 2020 and addresses the Section 631 requirement of the FAA 2018 Reauthorization Act.

Any public two-year institutions of higher education that participate in the UAS-CTI program will also be designated as members of the Consortium for Small Unmanned Aircraft System Technology Training. The FAA will invite members of this consortium to participate in annual meetings and other events with the agency, and we will facilitate the development and sharing of best practices through this consortium.

The results of this collaborative working relationship will include a continuous dialogue with stakeholders to connect colleges and universities with general industry, local governments, law enforcement, and regional economic development entities to address labor force needs.

UAS-CTI currently includes 84, 2 and 4-year college institutions, across 39 states.

https://ncatech.org/uas-cti/
The General Aviation Manufacturing Association (GAMA) yearly Aviation Design Challenge provides registered schools with free “Fly to Learn” curriculum, which is aligned with national STEM standards, to facilitate the learning of flight and airplane design principles. Teachers can guide their students through the curricula in approximately four to six weeks through in-person and/or virtual settings. The teams will then virtually modify an airplane design and complete a mission in a fly-off using X-Plane software. The winning team will receive an all-expenses-paid general aviation experience. The second-place team will receive a STEM Lab Camp.

https://gama.aero/opportunities-in-ga/aviation-challenge

The FAA’s Airport Design Challenge is a seven-week interactive, learning and collaboration opportunity which provides students the opportunity to design virtual airports in Minecraft based on guidance from FAA aerospace and engineering experts. The challenge offers first-hand experience in an aviation-related application of STEM concepts and helps students apply their academic knowledge and skills to professional simulations.
The National Center for Autonomous Technologies (NCAT) was formulated through the National Science Foundation’s Advanced Technological Education (NSF ATE) program. The NSF ATE program has been funding innovation at two-year colleges for over 25 years focusing on the education of technicians for the high-technology fields that drive our nation’s economy. The ATE program supports curriculum development; professional development of college faculty and secondary school teachers; career pathways to two-year colleges from secondary schools and from two-year colleges to four-year institutions; and other activities.

https://beta.nsf.gov/funding/opportunities/advanced-technological-education-ate

The National Institute of Standards and Technology, under the U.S. Department of Commerce, has developed standards to quantitatively evaluate various system capabilities and remote pilot proficiency. They are being standardized through the ASTM International Standards Committee on Homeland Security Applications; Response Robots (E54.09). They are also referenced as Job Performance

The NIST Basic Proficiency Evaluation for Remote Pilots (BPERP) is quickly becoming the remote pilot proficiency standard for public safety applications and agencies all over the United States. NIST only writes standards, they do not certify. So therefore, the Airborne Public Safety Association (APSA) has volunteered to become an organization that offers BPERP certifications to public safety remote pilots. APSA has held for the past two years, and continues to hold, regional three-day courses to train public safety personnel how to proctor the NIST BPERP.


Pitsco Education

Starting in middle school, we have our Drone Flight Guide Curriculum and Field Elements Kit, which enables students to get hands on with drones. This curriculum was designed to introduce students to some of the various ways drones can be used in the real world.

Our middle school curriculum has many great advantages to help get you and your students excited about drones in an easy-to-use, non-intimidating way.

- Includes both manual flight and coding activities
- Includes up to 120 hours’ worth of curriculum tied to ITEEA standards
- Has many progressive activities and open-ended challenges and competitions
- Includes real-world connections to many drone-related careers
- Allows flexibility for any drones to be used (although we do offer the Tello EDU Drones)

https://blog.pitsco.com/blog/flying-into-2021

AOPA’s High School Aviation Initiative
Introducing Students to Careers in Aviation

- With hundreds of thousands of members spanning 75 countries, AOPA represents the world’s largest community of aviators. It is our goal to put the sky within reach of everyone who dreams of flying.
- Through AOPA’s High School Aviation Initiative, students get the chance to explore exciting aviation career opportunities using science, technology, engineering, and math (STEM). AOPA works in partnership with high schools nationwide to deliver free curriculum that engages students and provides real-world preparation for careers as pilots or drone operators.
- AOPA also awards hundreds of thousands of dollars in flight training scholarships each year to both high school students and teachers who have demonstrated a passion for aviation.
- [https://youcanfly.aopa.org/high-school](https://youcanfly.aopa.org/high-school)

Organization of Black Aerospace Professionals

About OBAP:

The Organization of Black Aerospace Professionals has been in operation for 46 years as a nonprofit organization dedicated to the encouragement and advancement of minorities in all aviation and aerospace careers.

OBAP Activities:

- Aviation volunteers work with minority students using OBAP program materials and contacts in the aerospace and aviation industry.
Aviation and Aerospace industry advocacy
Congressional advocacy
Working with the FAA to create Aerospace Career Education (ACE) Academies to introduce and guide diverse students to aerospace careers.

Available Resources

OBAP delivers these programs to minority students throughout the school year.

- Project Aerospace
- Aerospace Professional in Schools
- Aerospace Career Education Academy
- Solo Flight Academy
- Luke Weathers Flight Academy
- Scholarships

http://obap.org

Drone Team Challenge
Unmanned Aerial Vehicles (UAVs) provide an exciting way for students to explore STEM and discover the path to amazing careers. This program is developed to inspire and prepare our future workforce with the skills needed to solve tomorrow’s challenges.

This program was developed by a local high school engineering educator with the HSU Educational Foundation and the continued partnered support of the Air Force Research Lab.

Beginning as early as 3rd grade, students can dive into an immersive autonomous quadrotor competition based program that will take them through progressive levelized training to prepare them for a variety of drone related career opportunities. The program encompasses five mission areas: 1. Knowledge of engineering, basic flight concepts, industry applications and equipment and safety regulations. 2. Flight Simulation 3. Proficiency in Flight and Navigation 4. Creation - innovative drone applications such as autonomous flight, coding the drone and building new parts and addition of payloads. 5. Mentorship - the cornerstone of this program, both in receiving it from skilled subject matter experts and operators while also providing mentorship to peers.

Whether attending in- person flight operations in our HSU Innovation Institutes or joining in on competitions, students are learning and growing their love of STEM. Some only participate from their classrooms or virtually online, our mission remains the same: Drone Team Challenge focuses on increasing student knowledge and making learning fun, there is the opportunity to go beyond DTC and gain certifications in preparation of a career. As part of this comprehensive program, not only have all the teams of over 3000 participants received kits, curriculum and weekly mentored instruction and open flight operations but teachers can also receive professional education. The curriculum can be used with or without plans to participate in the competition. All participants are now administered the TRUST and are also provided the opportunity at no cost to sit for their Part 107 once they meet the necessary age and training requirements. Upon completion of all levels of DTC, students are able to apply for special projects hosted by the HSU Educational Foundation such as Sky Dreamer, a design build fly project of a
470 lb payload VTOL aircraft. DTC brings the exploration of STEM to life in the classroom and encourages ongoing progression and linkage with STEM courses that expand capabilities, provide certifications and inspire future UAS innovation.

DRONE BLOCKS

DroneBlocks teaches STEM and the real-world application of drone technology through our apps, drone coding curriculum, simulator, and professional development.

Drag and drop coding APP allows students to program/code Tello drones with drag and drop block programming. Drag and drop coding allows users to create their own custom flight logic and algorithms. DroneBlocks is available on iOS, Android, and Google Chrome

Drone coding simulator. Simulation is a crucial part of the coding experience that is sometimes overlooked. In the real world, a user would never create code and send it to a piece of hardware or production system before testing.

https://www.droneblocks.io/
EduEverything, Inc. is a 501c3 nonprofit organization dedicated to expanding the use of technology and robotics education in our nation. EduEverything comprises three separate wings: Drones in Schools, National Robotics Challenge – Multi-GP STEM Alliance Program, RemotEDx

A Safe, Scalable Option

Drones in School was designed by classroom educators and administrators who see value in developing engagement opportunities that involve hands-on learning for students. Drones in School utilizes small-scale drone technology, allowing students to develop technical skills through a safe and scalable process for the classroom environment. https://www.edueverything.org/

SKILLS USA - Commercial UAS Drone Competition

http://www.skillusa.org

The Skills USA Commercial UAS Drone Competition in coordination with CrossFlight Sky Solutions, MINDS-i Robotics, Pitsco Education, and the University of Florida's Herbert Wertheim College of Engineering worked closely together to develop the new competition that can be conducted in person or virtually in 2021, enabling student participants to experience real-world, scenario-based situations involving small uncrewed aircraft systems.
The competition evaluates team members' skills and preparation for employment in multiple career fields related to the safe and efficient use of drone technology in the National Airspace System. In addition to honing academic skills such as engineering design, technical literacy, problem-solving, and systems thinking, the drone competition evaluates students in four specific tasks: flight skills, maintenance troubleshooting and repair, FAA regulations, and autonomous flight. Safety is emphasized throughout the event and competition.

Pitsco Education also offers a train the trainer program to augment this initiative. 
https://www.pitsco.com/Our-Programs/Professional-Services/&loc=mm

Black Girls Drone Inc. - An On-Line or Virtual Drone Education Program

https://www.blackgirlsdrone.org/

https://www.bigthought.org/audience/clients/black-girls-drone-takes-flight/

Black Girls Drone Inc. focuses on STEAM equality, education and visibility for underrepresented women and girls from underserved communities with aeronautical education training for the designation of FAA-certified UAV drone pilots.

In 2021, Black Girls Drone’s summer programming ran from June 15 to August 11, with a jam-packed schedule. Learners experienced the drone simulators and were introduced to coding through Java and Python. They virtually visited a wealth of places, including the White House, the National Air and Space Museum and the Intrepid Museum. Rachel Jacobson, who was announced as the president of the Drone Racing League in April, spoke to the class. Learners also designed two camp T-shirts and built both a chatbot and their own drone camp websites.

The goal for Black Girls Drone has always remained the same: to close the gap in the industry. “Black Girls Drone definitely wants to change that narrative,” founder Ernanda White said. “And that’s what we’re here to do: to empower, to educate, to motivate women of color to join the drone industry.”
Women and Drones

Women And Drones is the leading membership organization dedicated to driving excellence in the uncrewed aircraft systems (UAS)/Urban Air Mobility (UAM)/Advanced Air Mobility (AAM)/Vertical Take Off and Landing (VTOL) industries by achieving equity and participation of women in all disciplines and across all employment sectors.

Women and Drones’ Goal: To inspire and support more women to pursue careers in STEM and aviation. Why? We focus on women and girls…If we want to see more girls in STEM and aviation, it’s OUR responsibility to inspire them.

How does Women in Drones do it? They partner with organizations to provide age appropriate education or exposure target audiences, children with a focus on girls (we are not exclusive of males and often our K-middle school programs are co-ed), K–12 schools, universities/colleges, career organizations, libraries, and educators. And sessions are led by female pilots, business executives, etc.

https://womenanddrones.com/
The USDA administers the 4-H program and works with Land Grant Universities through County Extension Offices across America to administer Youth Development Programs, reaching over 6-million kids a year.

Although 4-H does not currently have a national drone program in its curriculum, the leaders at USDA-NIFA are very interested in encouraging the FAA to enter into an MOU or draft an Interagency Agreement with the USDA for drone STEM programs. This agreement could facilitate the beginning of collaboration and the project funding process for 4-H projects. *The USDA has a similar agreement with the military, and the same process can be used by the FAA: please see: A Guide to Land-Grant University / Cooperative Extension System and Military Interagency Collaborations in Youth & Family Support.

4-H also has a plethora of funding sources that can leverage existing programs like the 4-H Council, the 4-H Tech Change Makers, and the 4-H Alumni. The USDA-NIFA controls the purse strings at the national level by administering grants, and issues RFA’s for new projects.

Also, like all organizations, 4-H depends on adults for leaders and mentors who can work voluntarily with a group of 4-H members. The County Extension Offices, through their Land Grant Universities continually offer continuing education credits, and tuition assistance if available, for existing teachers and mentors that are interested in teaching STEM programs. The FAA should be encouraged to tap into this already existing and incredible nationwide resource.  https://4-h.org/
PCS Edventures

For more than thirty years, PCS Edventures has instilled a passion for Science, Technology, Engineering and Mathematics (STEM) in students all over the globe. Through exciting, experiential learning, our learners quickly develop the foundations of scientific inquiry, engineering design principles and spatial mathematical awareness while also exercising problem-solving, communication, reflection and collaboration skills. With content designed to integrate instructional goals into application-based ed-ventures, we’ve coupled hands-on objectives and cutting-edge curriculum with manipulatives from fischertechnik, Mod Robotics, Thrust-UAV and more.

PCS Edventures offers Professional Development for educators seeking hands-on STEM courses in the areas of Drones for Education. Some classes are open to the public, and others are exclusively designed for existing customers.

Discover Drones training participants have come away with the confidence needed to implement a drone program in their learning environment. From after-school instructors to robotics educators, the PCS Edventures Training Institutes are a surefire way to bolster your expertise in any subject area.

https://edventures.com/pages/about-pcs-edventures

Boy Scouts of America - Merits in Drone Flying Training
The Boy Scouts of America (BSA) is one of the largest scouting and youth development organizations in the United States. Keeping pace with 21st century Unmanned Aircraft Systems and the ease of accessibility of drones by novices, BSA is adding drone flying to its programs and activities.

BSA offers its 1.2 million members opportunities to earn merit badges, including an aviation merit badge. A Scout can become a drone pilot once she/he passes the Federal Aviation Administration’s TRUST exam. BSA is an FAA-approved test administrator of the TRUST exam (Test Administrator of the Recreational UAS Safety Test). TRUST is a collaboration between the FAA and industry to provide TRUST and educational safety material to recreational flyers.


PEACH STATE STARBASE

STARBASE is a national Department of Defense youth program, designed to increase the interest in, and abilities at selected STEM (Science, Technology, Engineering, and Maths) topics in an at-risk population. Authorized by an Act of Congress in 2000, there are currently more than 75 locations in 40 states and territories, with a combined attendance of over 100,000 students each year.

The flagship STARBASE program is an on-base, 5-day program consisting of 25 contiguous hours of classroom instruction, group activities, and hands-on application of STEM topics that center around aerospace engineering. This program is primarily oriented towards at-risk 5th or 6th grade students in public Title I schools.

The STARBASE 2.0 program is a 6th-8th grade aerospace engineering program, centered around the theory and operation of aerial robotics. It is conducted at participating public middle schools, as either a 9-week semester course or as a before or after school club. As with the 5th/6th grade on-base program, it
is intended primarily for at-risk students, and adult mentors participating as volunteer instructors are an important component.


AERIAL ROBOTICS IN STEM (ARISE)

ARISE Drone Design Competition: is for aspiring aviation and aerospace high school upperclassmen. Drone tournaments will be hosted in a few different regions during the spring of 2022. The Championship will be in early summer 2022.

Drones in the Classroom Conference: is geared towards educators, administrators, drone developers, curriculum developers, drone trainers and students looking to deepen their drone knowledge. Just completed our third annual conference on Drones in the Classroom. It was a virtual in late November and early December 2021 using the LexGo conference interface.

ARISE Community: Join our dynamic community of educators! We are developing a community of teachers, administrators, program directors, students and others interested in promoting drones in the classroom

Coaches Clinic: ARISE hosts coaches’ clinics throughout the year.

https://arisedrone.org/
Academy of Model Aeronautics (AMA)

Founded in 1936, The Academy of Model Aeronautics is the national community-based organization for model aviation enthusiasts and has been integrating UAS in the classroom for decades. They offer a range of programming and resources to support UAS education.

**UAS4STEM**: UAS4STEM is designed for students to learn, practice, and demonstrate professional uncrewed aircraft system (UAS) knowledge, mission planning, flight skills, data collection, analysis, and safety practices in a competitive environment. This annual competition challenges teams to build and program their own UAS and engineer a mechanism to complete a mission-specific task. All participants complete a virtual ground school that prepares them to operate safely and successfully in the National Airspace System.

**Educational resources**: AMA’s education department provides lessons and activities that leverage model aircraft as an engaging tool for teaching and learning about flight.

[www.modelaircraft.org](http://www.modelaircraft.org)

US Drone Soccer

**Core Values**
The mission of U.S. Drone Soccer is to make aerospace education accessible for all students.

**Accessibility** - We are committed to providing opportunities in aerospace to teachers and families by easing the learning curve and eliminating other barriers to entry. Our priority is creating a safe space for learning and professional growth regardless of background or prior experience.
Community - We are committed to the growth of local outreach programs and creating robust support networks for drone education. Together we will foster a culture of safety, equal opportunity, and mutual respect to ensure that all participants are welcomed and valued.

Teamwork - We will ensure that all students can contribute to their team’s success through communication, leadership, and collaboration. Students will mirror professional aerospace team principles of responsibility, integrity, and accountability.

U.S. Drone Soccer Code of Conduct

Fielding Diverse Coed Teams - All teams must intentionally create and maintain a welcome and supportive environment for new pilots, and ensure equal representation and participation of all genders, abilities, and communities that have been historically excluded from aviation.

Respect and Anti-Harassment - All players have the right to equal participation and respect without fear, bullying, intimidation, or belittlement. U.S. Drone Soccer maintains a zero tolerance policy for bullying, racism, bigotry, and sexual harassment. All officials and coaches have a duty to immediately report known or suspected situations involving a minor that are unsafe or inappropriate. It is a violation of this policy to retaliate against any person who asserts their rights regarding harassment.

Safe Aircraft Operation - Each pilot and crew member must take responsibility for the condition and operation of their drones and equipment. All flights should be conducted in a netted arena or designated practice area. Reckless flight or intentional damage to other teams or players will not be tolerated. Each participant, students and teacher, must practice good situational awareness to ensure the safety of themselves and others.

Anonymous Reporting - Mirroring practices in professional aviation, all concerns about unsafe situations or inappropriate conduct can be anonymously provided to league administrators. Drone Sports, Inc. Page 41 DroneSoccer.US

Please include your contact information and a description of your concerns to reporting@dronesports.us. Personally identifying information will be kept confidential unless prior consent is obtained, or the situation involves a suspected crime or threat to public safety that must be reported to law enforcement.

Integrity & Fair Play - Teams cannot interfere with the equipment or operations of other teams. Examples of prohibited activities include radio frequency interference or jamming, hacking, distraction, disruptive chatter, eavesdropping, or tampering with equipment in any way.

Embry-Riddle Aeronautical University periodically provides free Massive Open Online Courses (MOOC) in the remotely piloted aircraft systems discipline. These complementary and non-credit courses deliver specialized instruction from subject-matter experts on a variety of topics. Courses include readings, practitioner interviews, discussions, quizzes, and surveys. Examples of drone related
MOOCs conducted are at the introductory level for all ages, and even addressed to UAS STEM topics for teachers. Point of contact: Dr. Scott Burgess, Associate Professor of Aeronautical Science, Department of Flight, College of Aeronautics, Worldwide Campus.

https://worldwide.erau.edu/massive-open-online-courses

Appendix #5, State Existing Resource Library

She Maps – Australia - Addressing Gender Bias in STEM

**STEM industries have a problem. She Maps has the answer.** Two thirds of children aged nine to eleven draw a man when asked to draw a scientist. 16% of university and VET STEM graduates are female.

Gender bias begins in Primary School, including girls perceptions around their future in a STEM career. If we, as a country, are going to equip our children (regardless of gender) for the future, then engagement in STEM education across the curriculum is needed from primary school through high school and into tertiary education.

When many people think of a scientist, they imagine someone (often male) in a lab coat working with a microscope or test tubes. Our vision of science is far broader. We believe that science is everything that we live and breathe in the environment. Unfortunately we know that the environment is facing some really big challenges now and into the future.

The environment needs science to help out. And we need a diversity in science disciplines beyond the lab coat, and a diversity in ideas from people of every race, colour, sex, and religion.

Our purpose at She Maps is to bring STEM diversity into how we perceive science, and who does it.

https://shemaps.com/#programs
The Aggie Drone Academy is a non-profit affiliated with the water research arm of the Utah State University. They put on youth and adult drone camps and conduct outreach (coordinating through their representative County Extension offices) to schools all over the state introducing drones to kids, 10 to 18.

The camps are inexpensive to the kid’s parents, and for about $100 a day or less, they get a small Holy Stone drone, camp shirt, lunch and a day’s worth of instruction. They customize their curriculum to fit the level and needs of the kids that are attending.

At the end of the day, the Academy has a “Drone Jousting” competition where the kids attach Q-tips to the drone and try to knock each other out of the sky! They learn about aerodynamics, weight and balance, and other aviation related stuff. Their program has only been in existence for two years, so they are just getting started.

https://uwrl.usu.edu/aggieair/

LOCO ROBO DRONES

- Empower your students for the future with experiential and hands-on learning. https://locorobo.co/
- LOCO LOBO empowers students for a bright future in modern technology.
- LocoRobo Innovations is a Philadelphia-based robotics company and creator of the LocoXtreme robot and LocoRobo Academy - a world of knowledge and interactive tools for
developing skills in critical thinking, robotics, coding, sensors, 3D design, physics, statistics, green energy and more!

- We created LocoSummer to bring modern technology out of the labs and into the hands of curious kids to show them the endless possibilities that modern technology can create. LocoSummer instructors are top-notch engineers and industry professionals. We teach kids critical thinking and real-world coding, while having fun!
- **LOCOXTREME**: Project Based Learning (PBL) curriculum for real-world coding and robotics beyond the bricks. Elastic education for K-2, 3-7 and 8-12.
- **LOCODRONE**: Grades 6-8, 9-12: Explore real-world coding and robotics through the modern, aerial technology that is shaping the future of problem-solving in medical, commercial and space applications.
- **LOCOWEAR**: Grades 6-8, 9-12: Apply real-world coding and sensor technology to develop the health monitoring and performance analysis applications that are driving the Quantified Self movement and modernizing the healthcare industry.
- **MYLOOPY**: Grades K-2: An interactive exploration into the science behind sensors, light, and sound of robotics technology. 100+ STEAM lessons covering core science, math, social studies and language arts.

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**STEAM Thru Drones - Georgia & Southeast US - On-line Drone Learning Program**

STEAM Thru Drones’ main objective is Science, Technology, Engineering, Arts, and Mathematics (STE(A)M) curriculum for teachers of rural areas; while our current initiative is STE(A)M thru Drones teaching students and teachers to introduce drone flying and programming to students of rural areas with lack of exposure to uncrewed aerial systems. We currently provide activities for summer camps, after school programs, churches, nonprofit organizations and K-12 schools private and public.

The objective of our activities is not only to introduce Drone technology, but to also encourage and build and interest in STE(A)M while keeping students in the rural areas active. Our sessions include learning the basics of droning, standard flying, and programming challenges. The interactive session is a part of Focusing On Me, Inc. 501(c) (3) STE(A)M initiative specifically designing 21st century STE(A)M skills in and out of the classroom programs! All of our programs have been designed to encourage teamwork, curiosity, critical thinking, courage, and creativity. Our spectacular demonstrations, hands-on activities, and real-world discussions make learning about STE(A)M fun for kids! No prior experience is necessary. All skill levels are welcome. For grades 4 and above.

[https://steamthrudrones.com/](https://steamthrudrones.com/)  
Dr. LaQuata Sumter, Founder
DRONE CADETS -by Tony Reid, NYC Corrections Officer

Tony Reid started an on-line drone program that is now accredited by STEM.ORG. Three separate programs: Kids from 8 to 12, teens from 13 to 16, and Cadets 17 to 21. Created cartoon characters to illustrate and promote his program. He asks the question, “what can drones do?”

Tony put together a “Drone Cadets Boot Camp” workbook. “Panda the Drone Safety Bear” is the program mascot. The “Drone Cadets App” is a free download on the App Store, Google Play, and available through STEAM. His program encourages kids to study for and take the FAA Trust Test to obtain Recreational Operator status. Program requires kids to take the “Drone Oath,” which states; “I will always keep safety first.” And the program requires the use of a checklist.

Drone Cadets is a unique Drone Education Program designed to produce safe and responsible drone pilots of any age. Our Certified Drone Instructors have taught more than a thousand students. We work with schools and organizations throughout the Hudson Valley and beyond, to bring life-changing technology education to families and under-served populations here and throughout the world.

Drone Cadets train individuals, families, and groups. Drone Cadets can come deliver a program, or train your trainers to duplicate what we know works best. We can even provide analytics to support your grant proposal. http://drone-cadets.com/

Fullerton Drone Lab - California

https://drones.fullcoll.edu/
Established in 2018, the Fullerton Drone Lab seeks to train students in drone technology and operations while helping train them to be smarter and safer pilots while preparing them for careers in a variety of fields utilizing drones.

The Fullerton Drone Lab not only teaches students to become better and safer pilots, but also teaches them the application of drones in various industries. Students from all industry sectors can learn how drones can help enhance their workplace, while learning to be safer in the skies. The program is recognized by the FAA as part of its Collegiate Training Initiative. It is a certified Service Provider by the Association for Unmanned Vehicle Systems international. It also received certification by ASTM International as a Certified Training Provider.

Appendix #6, National Success Stories

Flite Test STEM (FT STEM) Success Stories

- **Problem Statement**
  - Flite Test recognized an aging out of RC aircraft modeling in the early 2000’s, Flite Test and others have turned that around. The average age of an RC modeler is now significantly lower than it has been in decades
  - Flite Test recognized that RC aircraft can be a low-cost “vehicle” to get school-age children excited about aviation…Educate, Elevate, Empower

- **Program description**
  - Over 3,000 students and Teachers are using the FT STEM program across the USA, European Union, Canada and Australia
  - K-12 through college curriculum
  - Leverage the spectrum of teachers’ experience and available time to adopt FT STEM

- **How we achieved these milestones:**
  - We hired professional educators, experienced in creating & supporting curricula
  - Education program leverages easy-to-build, low-cost model aircraft teaching building, flying, coding, aerodynamics…
  - **FT STEM** integrates in existing curricula or may be used with extra-curricula programs
We leveraged our Flite Test store with 1.9 million customers to provide local mentorship and subject matter expertise to schools. *FT STEM* benefits students as well as teachers’ skills.

Academy of Model Aeronautics (AMA) success stories

Problem statement: Historically, full-scale flight has fascinated people but seemed inaccessible to many, due to lack of resources or education.

Program description:

- The Academy of Model Aeronautics was founded in 1936 with the goal of allowing all people to experience the thrill of flight via the hobby of model aviation, which is why “Academy” is in the name of the association.

How we achieved these milestones:

- AMA has presented educational programs featuring UAS for decades as part of their mission reaching nearly all 50 states as well as globally.
- AMA leverages its 2,400 fixed flying sites and trained SMEs to assist at full scale events and in the classroom.
- AMA partnered with full scale organizations such as EAA to build UAS with youth under 16 for free at airports and EAA Young Eagle programs.

Problem statement: Today’s students are the next generation of pilots, engineers, innovators, educators, and scientists.

Program description

- AMA actively creates programs and resources that are geared toward inspiring children to have a love of flight.
AMA alumni include notable aviators, engineers, and scientists. Contemporary Matt Keennon who helped design, build and test the Mars helicopter Ingenuity was inspired by AMA SMEs in the classroom.

How we achieved these milestones:

- Free educator resources at amaflightschool.org
- Hosting educational competitions with waived or discounted fees for youth to include recognition through the National Aeronautic Association and the Fédération Aéronautique International.
- Awarding over a million dollars in scholarship funds.
- AMA offers at-cost or grant funded airframes for students to learn fundamentals of flight in the classroom such as the ALPHA, BETA, DELTA, and FPG9.

Drone Team Challenge

- Problem Statement
- Drone Team challenge Recognizes the need to educate youth on complex UAS operations and teach them all aspects of uncrewed systems
- Program description
- Focusing on 5 Missions: Mission 1 Knowledge, Mission 2 Simulation, Mission 3 Flight, Mission 4 Creation (includes coding, building and designing), Mission 5 Mentorship
- K-12 curriculum crossing education from the classroom into the extracurricular arena. [https://droneteamchallenge.com/](https://droneteamchallenge.com/)
- Leverage competitions as well as team building and mentorship while keeping learning fun and engaging.
- How we achieved these milestones:
- Utilizing public private partnerships with industry to provide current training and challenges to students.
- Incorporating real life missions as well as subject matter experts to interact with students to show potential jobs in the UAS industry.
- Training teachers and coaches on how best to foster student creative, project based learning while furthering their knowledge of critical core standards in STEM.
Drone team challenge benefits students, as well as, teachers and industry while applying a wide scope of skills in science, technology, engineering and math to the applications that exist in the real world.

DTC programs exist in collaboration with other worthy platforms for learning new ways to explore STEM, such as First Robotics Competition teams, 4H and Future Farmers clubs, Future Engineers and ROTC.

Aggie Drone Academy – A Utah State University 4-H Extension Program Success Story

Problem statement:

- The Aggie Drone Academy identified a lack of drone education in K-12 schools in Utah and in the 4-H program in both the state of Utah and at the national level. For two years the Aggie Drone Academy has been developing programs to introduce more drone related STEM programs starting in Utah schools and 4-H programs.

Program Description:

- The Aggie Drone Academy is a non-profit affiliated with the water research arm of the Utah State University. They put on youth and adult drone camps and conduct outreach (coordinating through their representative County Extension offices) to schools all over the state introducing drones to kids, ranging in age from 10 to 18.

How we achieved these milestones:

- The Aggie Drone Academy is composed of seasoned professionals who have been involved in UAS for many years and have taught classes and seminars to many seeking training as new UAS operators. The instructors at the academy help students gain the knowledge necessary to safely and legally operate Unmanned Aerial Systems, and the many applications of UAS, all in a “one-stop-shop” environment, meaning a student will learn all they need to prepare to enter any industry utilizing UAS. Aggie Drone Academy programs offers educational opportunities for youth, adults, amateur operators, educators, and professionals of all industries who utilize UAS in their jobs.
The one to five day long camps for kids are inexpensive for their parents, and for about $100 a day or less, they get a small Holy Stone drone, camp shirt, lunch and a day’s worth of instruction. The Academy customizes their curriculum to fit the level and needs of the kids that are attending. And at the end of the day, they have a “Drone Jousting” competition where the kids attach Q-tips to the drone and try to knock each other out of the sky! The kids learn about aerodynamics, weight and balance, and other aviation related stuff.

What sets the Aggie Drone Academy apart is they also created a “Cashmakers” program to train 4-H leaders so they can mentor kids on drone STEM programs. This is possible through their affiliation with Land Grant Universities and County Extension Offices. In many cases teachers can receive tuition assistance to achieve continuing education credits.
Housekeeping

- Meeting is being livestreamed on the FAA’s YouTube, Twitter and Facebook pages.
- Meeting is also being recorded and will be made available for future viewing.
- Please remain muted during the presentations.
- After each briefing, there will be an opportunity for the members to engage in discussion and ask questions.
- Please raise your hand using the Zoom command on your dashboard and an FAA moderator will call on you to speak.
- FAA team is monitoring the livestream, if you have any problems during the meeting, please reach out in the comments.
Official Statement of the DFO

PUBLIC MEETING ANNOUNCEMENT

Read by: Designated Federal Officer Jay Merkle

Advanced Aviation Advisory Committee

February 23, 2022

In accordance with the Federal Advisory Committee Act, this Advisory Committee meeting is OPEN TO THE PUBLIC. Notice of the meeting was published in the Federal Register on:

February 09, 2022

Members of the public may address the committee with PRIOR APPROVAL of the Chair. This should be arranged in advance.

Only appointed members of the Advisory Committee may vote on any matter brought to a vote by the Chair.

The public may present written material to the Advanced Aviation Advisory Committee at any time.
## Agenda

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<td>12:00 pm</td>
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<td>FAA – Greetings &amp; Logistic</td>
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<td>DFO – Read Official Statement of the Designated Federal Officer</td>
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<td>DFO – Review of Agenda and Approval of Previous Meeting Minutes</td>
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<td>FAA – Opening Remarks</td>
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<td>FAA – Overview of AAAC Roles and Responsibilities</td>
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<td>FAA – Response to Task Group #11: Acceptable Level of Risk White Paper</td>
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<td>Task Group #12 – Integrating UAS Operations into K-12 Curriculums Recommendations</td>
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<td>FAA – BVLOS ARC Update</td>
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<td>LA DOT – UAM Policy Framework Considerations</td>
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<td>FAA – New Taskings</td>
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<td>Chair – New Business/Future Agenda Topics</td>
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Opening Remarks from the DFO

Jay Merkle
Designated Federal Officer
FAA Advanced Aviation Advisory Committee
Opening Remarks from AAAC Chair

Houston Mills
Acting Chair
FAA Advanced Aviation Advisory Committee
FAA Overview of AAAC Roles and Responsibilities

Jay Merkle
Executive Director
UAS Integration Office
FAA Response to Task Group #11: Acceptable Level of Risk White Paper

Jay Kinser
Manager, Strategic Programs
UAS Integration Office
Background

- AAAC TG 11 provided recommendations on the Acceptable Level of Risk at October 2021 previous meeting.
- Thank you!
Approach to Interim Responses

• Decision to provide interim responses while waiting on final BVLOS ARC report
• We expect to provide final responses to the AAAC at the June meeting
• We agree or concur with nearly all of the recommendations
  • Several of the recommendations are already in place
  • We disagree only with the recommendation related to cumulative risk
Recommendation & Response #1

Clearly establish rate-based safety targets that are relevant for all UAS operations for air and ground risk.

The FAA agrees that the acceptable level of risk (ALR) posed by UAS should be appropriate to the type of operation being performed. We agree with the BVLOS ARC recommendation that the ALR should be based on the risk to human life due to collision with traditional manned aircraft or collision with a person on the ground. We further agree that applicants should be able to use a combination of qualitative and/or quantitative methods to demonstrate their adherence to the acceptable level of risk. The FAA is continuing to research and determine the most appropriate ALR values for UAS operations based on proximity to traditional manned aircraft operations (general aviation and air carrier) as well as overflown populations.
Recommendation & Response #2

Develop an emergency use provision where the risk-based requirements can be waived or lowered for emergency and/or life-saving operations.

The FAA agrees and has provided means for enacting TFRs and other emergency use provisions for rapid UAS response. The FAA has a process in place to enable approval of tactical BVLOS waivers and emergency authorizations when first responders contact the FAA’s SysOps Support Center. The FAA also has the Special Government Interest (SGI) process. This process enables response to an emergency with UAS in an expeditious manner by allowing public safety agencies to apply for expedited airspace authorizations. The SGI process, depending on the nature of the operation, can be completed in a matter of minutes.
Recommendation #3

Require risk-appropriate qualification and approval of aircraft and systems that account for the significant role of the UA during BVLOS operations, without defaulting to Type Certification as the only regulatory pathway.
Interim Response #3

Pathways for UA approval for operations in the national airspace system (NAS), aside from type certification, include:

- exemptions under the authority of 49 U.S.C. 44807, which allows the Secretary to determine whether an airworthiness certificate is required for a UA to operate safely in the NAS; and
- experimental airworthiness certificates, which allow operators and manufacturers to operate for limited purposes with a UA that has not yet been type certificated.

Additionally, with respect to the approval of UAS, the FAA has determined that for certain UAS, it is more appropriate for the agency to approve the system outside of type certification, as explained by the FAA's memorandum on associated elements issued earlier this year. The FAA is also evaluating what further rulemaking is needed to address this concern.
Recommendation & Response #4

The highest level of rigor of aircraft, systems, and equipment scrutiny is appropriate for high-risk operations using higher risk UA (examples may include: higher weight, kinetic energy, size, etc.) and/or higher risk operating areas.

The FAA agrees that the highest standard of review is appropriate for operations involving higher-risk UA and more complex and high-risk operating areas.
Recommendation & Response #5

Accept and adopt a SORA-like risk-based approach to UAS approvals outside of 107 operations or new regulations, including a set of standard scenarios or pre-defined risk assessments (PDRA’s) for common scenarios/operational characteristics.

The FAA agrees that tools such as PDRAs are useful for streamlining and standardizing certain kinds of operational approvals. The FAA is exploring the feasibility of recognizing common scenarios for operators who are seeking approvals in low-risk settings, but that cannot be accommodated without a waiver from existing regulations.
Recommendation & Response #6

Do not adopt a cumulative risk approach.

Cumulative risk is just one of many tools the FAA uses to assess risk in the NAS. When an operation does not comply with FAA policy, a formal safety analysis enables the examination of all available resources and techniques. This process has often allowed the FAA to permit some operations that would otherwise not meet the agency’s existing policies. It would not be prudent to remove such a tool from the FAA toolbox.
Recommendation & Response #7

Recognize and accept performance standards from accredited standards development organizations (SDOs), such as ASTM or RTCA, in developing comprehensive, industry vetted safety performance standards that can be used as a means of compliance with FAA safety regulations.

The FAA works collaboratively with Standards Development Organizations in developing and incorporating industry vetted recommendations within its regulations. In general, a standards-based means of compliance must reference an existing regulation, not a waiver or exemption to that regulation. Therefore, formally accepting many emerging standards requires that enabling regulations be promulgated through the formal, public rulemaking process.
Recommendation & Response #8

Adjust the current operational approval process to minimize duplication of effort wherever possible.

The FAA continually reviews its processes and procedures to make them more efficient for the agency and applicants, and we agree that this work must continue in the future to enable the current approval processes to scale to meet increasing industry demand.
Recommendation #9

A risk-based quality system for production of aircraft and replacement parts should be included in qualification and approval processes for aircraft and systems. The requirements of a quality system should be proportional to and appropriate for the risk level of the aircraft and operating environment.
Interim Response #9

For Type Certification (TC), Part Certification (PC), and certification management, risk-based approaches are currently being applied. Deviation memo AIR600-21-600-DMO1 is available for certain low-risk UA. It is foundationally risk-based and provides relief from the certification and oversight rigors traditionally applied to manned aircraft. Additionally, 14 CFR 21.137 allows each Production Approval Holder (PAH) to develop a quality system that meets both the needs of the PAH (size, scope, criticality, and complexity) and the rule. As such, PAH quality systems are scalable to the size and complexity of the product/article being produced. Finally, rulemaking is underway (RIN 2120-AL60) that would expand SMS requirements under Parts 21, 91, 135, and 145. The NPRM is anticipated to be released in late calendar year 2022.
Recommendation & Response #10

Encourage commercial Part 135 operators to track UAS safety events (i.e., loss of control) in a Safety Management System (SMS) and compare the actual rate with the expected rate. The UAST SMS recommendations should be used as a guide to align scope of the SMS with the risk of the operation.

The FAA agrees with this recommendation. Rulemaking is underway (RIN 2120-AL60) that would expand SMS requirements under Parts 21, 91, 135 and 145. The NPRM is anticipated to be released in late calendar year 2022. Additionally, any commercial operator may voluntarily comply with the existing provisions of 14 CFR Part 5.
Recommendation & Response #11

Using a data driven approach based on traditional piloted aircraft traffic, structure and class of airspace, create and publish a map of airspace risk class levels for piloted aviation for the entire US that all UAS operators can use as a baseline for the application of suitable mitigations.

The FAA is in the process of researching, validating and implementing a variety of data-driven approaches to airspace characterization and risk assessment. The FAA agrees that making this data available in the appropriate form to external stakeholders is beneficial and will consider the appropriate means of releasing such information as these tools, techniques, and policies mature.
Recommendation #12

Do more outreach to educate operators on the UAS safety reporting capabilities within the Aviation Safety Reporting System (ASRS) and create a portal that allows all UAS operators to voluntarily report hours flown. Data from this reporting system should be made available to industry/regulatory groups like the UAST to help offer guidance to improve safety for the industry.
Interim Response #12

The FAA has a continuing commitment to the education of drone operators. The Drone Safety Team (DST) promotes NASA’s ASRS program on its homepage and has access to the information that is provided by the ASRS program. The ASRS submission portal provides the reporting party the opportunity to submit information including:

- total operating time to date in all UAS makes/models,
- total operating time in the past 90 days in all UAS makes/models, and
- total operating time to date in the UAS make/model involved in the event.

The FAA conducts regular public outreach and promotion of education through a variety of events, including its yearly UAS Symposium. Anyone can query the ASRS portal to review de-identified reports or to generate a variety of aggregate statistics on the reports collected and the data they contain.
Next Steps

• Review BVLOS ARC findings, incorporate into responses, and coordinate with relevant LOBs
• Provide final responses at June AAAC meeting
Questions?
10 Minute Break
Task Group #12 – Integrating Uncrewed Aircraft Operations into K-12 Curriculums

Paul Hsu & Brian Wynne
Task Group #12 Co-Chairs
Task Group 12: Integrating Uncrewed Aircraft Operations Into K-12 Curriculums

Opportunity:
Leverage expanding interest in UAS operations into K-12 curriculums. Develop the next generation of innovative thinkers, leaders and operators. Encourages investments and continued education in STEM related fields.

Tasking: DAC (AAAC) to develop recommendations on how to integrate Uncrewed Aircraft Operations into K-12 curriculums.

Co Chairs:
Paul Hsu, Chairman, HSU Educational Foundation
Brian Wynne, CEO, AUVSI
# TG12 diverse and experienced team

<table>
<thead>
<tr>
<th>Organization</th>
<th>Representatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academy of Model Aeronautics</td>
<td>Chad Budreau, Emily Rice</td>
</tr>
<tr>
<td>Aero NowGen Solutions LLC</td>
<td>Lorne Cass</td>
</tr>
<tr>
<td>Air Line Pilots Association, International</td>
<td>Vas Patterson</td>
</tr>
<tr>
<td>Aircraft Owners &amp; Pilots Association</td>
<td>Chris Cooper</td>
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<tr>
<td>Alaska Center for Unmanned Aircraft Systems Integration</td>
<td>Catherine Cahill</td>
</tr>
<tr>
<td>Association for Unmanned Vehicle Systems International</td>
<td>Brian Wynne</td>
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<tr>
<td>Dallas Police Department</td>
<td>Mark Colborn</td>
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<tr>
<td>Flite Test</td>
<td>Josh Bixler</td>
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<tr>
<td>FPV Freedom Coalition</td>
<td>Dave Messina</td>
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<tr>
<td>Global Drone Air Academy</td>
<td>Alex Suarez</td>
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<tr>
<td>HSU Educational Foundation</td>
<td>Paul Hsu, Amanda Negron, Mario Werth</td>
</tr>
<tr>
<td>Kansas DOT</td>
<td>Bob Brock</td>
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<tr>
<td>Moss Photography</td>
<td>Vic Moss</td>
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<tr>
<td>National Center for Autonomous Technologies</td>
<td>Zackary Nicklin</td>
</tr>
<tr>
<td>Robotic Skies</td>
<td>Brad Hayden</td>
</tr>
<tr>
<td>United Parcel Service – Flight Forward</td>
<td>Houston Mills</td>
</tr>
</tbody>
</table>
Representative list of organizations providing UAS/Aviation educational programs today
Methodology for Forming Recommendations

- Significant Tasking

- Mutually Inspired Collaboration

- Identifying Approach, Discovery and Forming Recommendations
**TG12 Recommendations**

**AAAC TG12 Aviation-STEM integration in K-12 curricula**

<table>
<thead>
<tr>
<th>Phase 1</th>
<th>Phase 2</th>
<th>Phase 3</th>
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<tbody>
<tr>
<td><strong>Make Content &amp; Resources Readily Accessible</strong></td>
<td>• 1) Make today’s resources visible</td>
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<td></td>
<td>• 2) Formal mentors</td>
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<td></td>
<td>• 3) Existing national registry</td>
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<tr>
<td><strong>Build Connections for Action and Cultural Transformation</strong></td>
<td>• 4) Pledge to America’s Future Advanced Aviation Workforce</td>
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<td></td>
<td>• 5) Cultural transformation – Eliminate gender bias in Aviation STEM</td>
<td>•</td>
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<td></td>
<td>• 6) Team with Collegiate Training Initiative to Identify curricula SMEs</td>
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<td></td>
<td>• 7) Formation of interagency working group</td>
<td>•</td>
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<tr>
<td><strong>Deliver Aviation-specific Curricula</strong></td>
<td>• 8) NIET UAS training evaluation standards</td>
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<td></td>
<td>• 9) FAA-Dept of Education program modeled after CTE CyberNET</td>
<td>•</td>
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<tr>
<td></td>
<td>• 10) K-12 STEM programs for extracurricular programs</td>
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★ It is suggested that the FAA set Phase 2 and 3 milestones to track progress over the 10 year period.
Make Content and Resources Readily Available

**Recommendation #1:** Expand access to resources for teachers and students by leveraging existing tools that are offered by FAA, are nationally-reaching, and are publicly-available – including website tools, sample lessons, FAA educational safety week initiatives and utilization of TRUST for outreach to all classrooms.

**Recommendation #2:** Guide the development of a formal network of UAS educational volunteer mentors and flying sites.

**Recommendation #3:** Provide collected national & State/regional existing resource libraries to FAA in appendix of the recommendation. Propose that the FAA continue to collect these resources and build them into an online repository that can be accessed by educators to research and leverage for building curricula.
Build Connections for Action & Cultural Transformation

Recommendation #4: Call for public private partnership - The Pledge to America’s Future Advanced Aviation Workforce, to encourage industry partners to participate in K-12 education through funding, mentorship and driving relevant content demand.

Recommendation #5: Facilitate a change in attitudes to address gender bias in STEM fields through education.

Recommendation #6: Leverage the resources of the FAA UAS Collegiate Training Initiative (CTI) to instruct and inform educators as they build programs.

Recommendation #7: Form an interagency working group with the Department of Education and ongoing industry advice with clear objectives.
Deliver Aviation – UAS Specific Curricula

Recommendation #8: Recognize and endorse standards developed by National Institute of Standards and Technology to quantitatively evaluate various system capabilities and remote pilot proficiency.

Recommendation #9: Create a grade 8-12 aviation-specific STEM curricula modeled on CTE CyberNet.

Recommendation #10: Increase support for extracurricular programs to address K-12 aviation-specific STEM needs.
Recommendation for a program of study, as based on an NSA Cyber-net model adopted by the Department of Education.

<table>
<thead>
<tr>
<th>Course/Grade</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
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</thead>
<tbody>
<tr>
<td>English/Language Arts</td>
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<td>English/Language Arts II</td>
<td>English/Language Arts III</td>
<td>English/Technical Reading</td>
<td>English/Comp/Tech Writing</td>
<td>Speech/Oral Comm</td>
<td>Advanced Courses in UAS Aviation following Academic Centers of Excellence</td>
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<tr>
<td>Social Studies/Sciences</td>
<td>World History</td>
<td>Social Studies of aviation</td>
<td>Intro to aviation law and reg</td>
<td>Aviation Sociology</td>
<td>Information Ethics</td>
<td>Criminology Government</td>
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<tr>
<td>Math</td>
<td>Algebra I or Geometry</td>
<td>Geometry or Algebra II</td>
<td>Computational Thinking in Math</td>
<td>Pre-Calc/Trig</td>
<td>AP Calculus or Advanced Math</td>
<td>Calculus</td>
<td>Computer Applications</td>
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</tr>
<tr>
<td>Technical Courses</td>
<td>Exploring UAS</td>
<td>Intro to aerodynamics</td>
<td>Introduction to application programming</td>
<td>Introduction to aviation design</td>
<td>Programming Flight Controllers</td>
<td>AT Programming of Autonomous Aircraft</td>
<td>Aviation Systems design, mechanical, electrical and software</td>
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<tr>
<td>Project and Work-based Learning</td>
<td>Classroom projects</td>
<td>Intro to UAS competitions</td>
<td>UAS competitions</td>
<td>UAS Internships</td>
<td>Internships/Entry-level Jobs</td>
<td>Work study/Internships</td>
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<td>Credentials</td>
<td>Vendor Sponsored Badges</td>
<td>Vendor Sponsored Badges</td>
<td>Part 107 Certification</td>
<td>Advanced Certifications</td>
<td>Advanced Certifications</td>
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</table>

Other courses required to meet local prerequisites and graduation requirements.
Summary Conclusions

This report represents a roadmap for FAA, with opportunities to integrate existing resources, expand on tools, transform the culture and provide a K- career training pathway with standards, certifications and curricula that can be implemented in the traditional and non-traditional learning environments.
Thank you.

Questions?
FAA BVLOS ARC Update

Jay Merkle
Executive Director
UAS Integration Office
LA DOT – UAM Policy Framework Considerations

Seleta Reynolds
General Manager
Los Angeles Department of Transportation
What happens when the entire city is an airport?
A city’s role in managing the Public Realm

Three public realm stewardship functions

**Investor**
- Land use, where to invest, what to invest

**Regulator**
- Ensuring all those operating in the public right of way do so aligned with policy-based outcomes

**Operator**
- Orchestrate the public right-of-way to ensure safety and balance among users
In 2018, LADOT started to plan for AAM in Los Angeles.
We worked with the public and industry
With a principled approach

**Establishing Principles of the Urban Sky** to guide policy making as technology, concepts of operation, and consumer demands evolve

- Safety
- Sustainability
- Equity of access
- Low-noise
- Multimodal connectivity
- Local workforce development
- Purpose-driven data sharing
We invested in research

1: Downtown LA
High or mid-rise structure

2: San Fernando Valley
Commercial dev. in low-rise area

3: Westside
New development

4: South LA
UAS/Cargo surrounded by residential

5: UAS Flyover
Delivery vehicles overhead

6: Medical Flyover
Approved route from Caltech to JPL

7: Hollywood Medical
Large campus w/helipad in dense mixed use area

Source
(takeoff/landing)
Flight path
Receiver location
Confirmed the relationship between noise and equity

[Image: Maps showing the relationship between noise and equity, with labels for airports, noise levels, quiet zones, zoning, and equity areas.]
Published a city policy framework

Informed by LADOT’s Strategic Plan Update 2021-2023, the Urban Mobility in a Digital Age Strategic Plan, and the Principles of the Urban Sky. The Policy Framework identifies the following UAM priorities:

- Equity
- Health & Safety
- Data Responsibility
- Sustainability
- Multimodal Connectivity
- Economic Growth
- Transportation Network Adaptation
To enable this....
…and avoid this
We need to secure public acceptance with new tools
And new approaches

**Vehicle Weight Class (mass / 100)**
- **05** - 500-599 lbs
- **25** - 2500-2599 lbs

**A - Quietest, most acceptable aircraft (Better than a modern automobile)**

**F - Most Offensive, least quiet vehicle (2-blade helicopter w/ open tail-rotor)**

**Frequency**
- **10** - Landing / Takeoff Events per hour
- **XX** - Prohibited
- **NULL** - Unlimited

**Energy Class**
- **E** - Electric
- **P** - Petroleum
Next Step: AAAC Tasking Recommendation

LADOT is asking the FAA to consider a tasking that:

1. Acknowledges the FAA’s role as an airspace designer, manager, and operator.
2. Acknowledges State, Tribal, and Local governments as agents for catalyzing vertiport development, operation, and maintenance.
3. Acknowledges desired outcomes shared among all stakeholders.
4. Task 1: Provide clarity on existing roles and responsibilities of different levels of government and recommendations where exchanging planning and operational data between stakeholders can enable desired outcomes.
Questions?
FAA New Tasking to the AAAC

Jay Merkle
Executive Director
UAS Integration Office
Strategic Framework for Advanced Air Mobility (AAM) Near-Term Operations

• The transportation system is poised to evolve with the advent of AAM.
• While FAA collaborates with industry to characterize future AAM concepts, the FAA is also receiving real proposals and plans for the near-term.
• To ensure we are prepared to facilitate near-term operations of AAM aircraft, the FAA has drafted the Strategic Framework for AAM Near-Term Operations.
• The document aims to characterize near-term operations and identify associated gaps and decision points.
Tasking: Strategic Framework for Advanced Air Mobility (AAM) Near-Term Operations

Opportunity
• The AAAC to lead industry in informing the FAA as we prepare to respond to industry’s near-term AAM plans.

Tasking
• The AAAC to provide comments on the FAA’s draft Strategic Framework for Advanced Air Mobility (AAM) Near-Term Operations.
New Business/Future Agenda Items

Houston Mills
Acting Chair
FAA Advanced Aviation Advisory Committee
New Business

1. What should AAAC be thinking about?
2. Impacts of FAA certification process on Advance Aviation
3. Develop communication approaches to answer “How do I get started?”
   a. Focus on underrepresented groups
   b. Would relate to recreational or commercial UAS operations
Closing Remarks

Jay Merkle
Designated Federal Officer
FAA Advanced Aviation Advisory Committee
Closing Remarks

Houston Mills
Acting Chair
FAA Advanced Aviation Advisory Committee
Adjourn

Houston Mills
Acting Chair
FAA Advanced Aviation Advisory Committee
Charter of the Advanced Aviation Advisory Committee
U.S. Department of Transportation

1. **Committee's Official Designation.** The Committee's official designation is the Advanced Aviation Advisory Committee (AAAC).

2. **Authority.** The Committee is established under the authority of the U.S. Department of Transportation (DOT), in accordance with the provisions of the Federal Advisory Committee Act (FACA), as amended, Pub. L. 92-463, 5 U.S.C. App 2. The Secretary of Transportation has determined that the establishment of the Committee is in the public interest.

3. **Objectives and Scope of Activities.** The objective of the AAAC is to provide independent advice and recommendations to the Department of Transportation (DOT) and the Federal Aviation Administration (FAA) and to respond to specific taskings received directly from the FAA. The advice, recommendations, and taskings relate to improving the efficiency and safety of integrating advanced aviation technologies--including unmanned aircraft systems (UAS) and advanced air mobility (AAM), into the National Airspace System (NAS)--while equipping and enabling communities to inform how UAS, AAM and other technologies may operate in ways that are least impactful to those communities. In response to FAA requests, the AAAC may provide the FAA and DOT with information that may be used for tactical and strategic planning purposes.

4. **Description of Duties.** The AAAC will act solely in an advisory capacity and will not exercise program management responsibilities. Decisions directly affecting implementation of transportation policy will remain with the FAA Administrator and the Secretary of Transportation. The AAAC will:

   a. Undertake only tasks assigned by the FAA

   b. Deliberate on and approve recommendations for assigned tasks in meetings that are open to the public.

   c. Respond to ad-hoc informational requests from DOT and the FAA and or provide input to DOT and the FAA on the overall AAAC structure (including the structure of subcommittees and or task groups).

5. **Agency or Official to Whom the Committee Reports.** The AAAC reports to the Secretary of the U.S. Department of Transportation (DOT) through the FAA Administrator.
6. **Support.** The FAA will provide support, including funding for the Committee. The UAS Integration Office is the primary entity within the FAA responsible for supporting the AAAC.

7. **Estimated Annual Operating Costs and Staff Years.** The FAA’s annual operating costs to support the AAAC for the period and scope specified by the charter is approximately $460,000, which includes 2.0 full-time equivalent salary and benefits at $413,000, plus $47,000 for meeting, travel, and miscellaneous expenses.

8. **Designated Federal Officer.** The FAA Administrator, on behalf of the Secretary of Transportation, will appoint a full-time or permanent part-time Federal employee to serve as the AAAC Designated Federal Officer (DFO). The AAAC DFO will ensure that administrative support is provided for all activities. The DFO will:
   
   a. Ensure compliance with FACA and any other applicable laws and regulations.
   
   b. Call and attend all the committee and subcommittee meetings.
   
   c. Formulate and approve, in consultation with the Chair, all committee and subcommittee agendas.
   
   d. Notify all Committee members of the time, place, and agenda for any meeting.
   
   e. Maintain membership records.
   
   f. Ensure efficient operations, including maintaining itemized contractor invoices.
   
   g. Maintain all AAAC records and files.
   
   h. Adjourn any meeting when doing so would be in the public interest.
   
   i. Chair meetings when directed to do so by the FAA Administrator.

9. **Estimated Number and Frequency of Meetings.** AAAC estimates meeting three times a year to carry out its responsibilities. AAAC meetings will be open to the public, except as provided under Section 10(d) of FACA, as implemented by 41 CFR part 102-3, and DOT Order 1120.3C.

10. **Duration.** Continuing, subject to renewal every 2 years.
11. Termination. The charter will terminate 2 years after its effective date, unless renewed in accordance with FACA and other applicable regulations. If the AAAC is terminated, the FAA will give as much advance notice as possible of such action to all participants.

12. Membership and Designation. AAAC shall comprise members appointed by the U.S. Secretary of Transportation upon recommendation by the FAA Administrator. All AAAC members serve at the pleasure of the Secretary of Transportation. To the extent practicable, the membership of the AAAC shall include persons of diverse backgrounds in race, ethnicity, religion, sexual orientation, and gender.

   a. The AAAC will have no more than 41 members. Members represent airports and airport communities; pilot and controller labor groups; local, state, and tribal governments; navigation, communication, surveillance, and air traffic management capability providers; research, development, and academia; agricultural interests, traditional piloted aviation operators; UAS hardware component manufacturers; UAS manufacturers; corporate UAS operators; citizen UAS Operators; UAS software application manufacturers; advanced air mobility; community advocates; and industry associations or other specific areas of interest as determined by the FAA Administrator or Secretary of Transportation.

   b. Members will serve without charge, and without government compensation. Members who represent a particular interest of employment, education, experience, or affiliation with a specific aviation related organization will serve as representatives. Members appointed solely for their expertise serve as Special Government Employees.

   c. Member representatives and SGEs are appointed for a 2-year term, but can continue to serve until their replacement is chosen or they are reappointed

   d. Members shall not preference or otherwise utilize their membership on the Committee in connection public statements in their personal capacities without a disclaimer that views expressed are their own and do not represent the views of the Committee, the Federal Aviation Administration, or the Department of Transportation

13. Subcommittees. The FAA Administrator has the authority to create and dissolve subcommittees as needed. Subcommittees must not work independently of the AAAC. They must provide recommendations and advice to the AAAC, not the FAA, for deliberation, discussion, and approval. Subcommittees are comprised of subject matter experts from multiple stakeholder groups to include traditional, pilotless, and advanced aviation communities and they will include expertise on a range of policy matters, including security, safety, and privacy.
14. **Recordkeeping.** The records of the AAAC are handled in accordance with the National Archives and Records Administration (NARA) General Records Schedule 6.2, or other approved agency records disposition schedules. Subject to the Freedom of Information Act, 5 U.S.C. § 552, the records, reports, transcripts, minutes, and other documents that are made available to, or prepared for or by AAAC will be available for public inspection at https://www.faa.gov/uas/programs_partnerships/drone_advisory_committee/.

15. **Filing Date.** This charter will expire on June 12, 2022. The amended charter is effective October 25, 2021.
Advisory Committee Member Roles and Responsibilities

Advisory committees have played an important role in shaping programs and policies of the federal government from the earliest days of the United States of America. Since President George Washington sought the advice of such a committee during the Whiskey Rebellion of 1794, the contributions made by these groups have been impressive and diverse.

Through enactment of the Federal Advisory Committee Act (FACA) of 1972 (Public Law 92-463), the U.S. Congress formally recognized the merits of seeking the advice and assistance of our nation's citizens to the executive branch of government. At the same time, the Congress also sought to assure that advisory committees:

- Provide advice that is relevant, objective, and open to the public;
- Act promptly to complete their work;
- Comply with reasonable cost controls and recordkeeping requirements; and
- Had government oversight through creation of the Committee Management Secretariat.

Participation in a FACA such as the Advanced Aviation Advisory Committee (AAAC) provides the Federal Government with essential advice from subject matter experts and a variety of stakeholders. The FACA requires that committee memberships be "fairly balanced in terms of the points of view represented and the functions to be performed." Selection of committee members is made based on the particular committee's requirements and the potential member's background and qualifications. AAAC members assume the following responsibilities:

- Attend ¾ of all AAAC public meetings during membership term.
- Provide oversight, deliberation, comments and approval of the AAAC activities.
- Contribute respective knowledge and expertise.
- Participate as a member on a working group, if desired.
- Coordinate with the constituents in his or her Unmanned Aircraft System and aviation sector.
- Review work plans, if requested.
- Review the AAAC and any subcommittee or working group recommendation reports.
- Inform the AAAC Chair and the DFO when he or she can no longer represent his or her organization/association on the AAAC.
  - Members may continue to serve until a replacement has been appointed or removed.
Jay Merkle, Executive Director, Unmanned Aircraft Systems Integration Office

Prior to being named the new Executive Director of the Unmanned Aircraft Systems Integration Office, Peter “Jay” Merkle was the Deputy Vice President (DVP) of the Program Management Organization (PMO) within the Air Traffic Organization (ATO). The PMO is responsible for all NextGen program activity; all National Airspace System (NAS) communications; navigation, weather, surveillance and automation modernization programs; and all service life extensions to legacy NAS sensors, communications and navigation aids. Given the tight coupling between successful automation program delivery and current system operation, the PMO also leads and manages all second-level automation engineering efforts. Lastly, the PMO works with FAA operations and aviation users to ensure globally interoperable solutions for NextGen.

Prior to that position, Merkle was the Director of Program Control and Integration, AJM-1, in the PMO for the ATO. In that capacity, he led the PMO in developing effective, timely, and innovative solutions to evolving business needs. The focus areas were program control, crosscutting analysis and integration, and special initiatives.

Since joining the FAA, Merkle has served as the Manager of Systems Integration for Portfolio Management and Technology Development within the NextGen organization. He also has held positions as the Lead Engineer for tower, terminal, and en route automation systems, as the Chief System Engineer for En Route and Terminal Domains, and as the Chief Architect for NextGen at the Joint Planning and Development Office.

Merkle has over 30 years of extensive experience in engineering and program management. He started his career as an engineer working in cockpit and crew station design on several aircraft,
including the C-17 large transport aircraft. Merkle holds a Bachelor’s degree in Psychology from the University of Central Florida and a Master’s degree in Industrial Engineering and Operations Research from the Virginia Polytechnic Institute and State University.
As Vice President of Flight Operations & Safety, Captain Mills has global oversight of and responsibility for UPS Airline Flight Operations, Training, Regulatory Compliance and Airline Safety.

Prior to his current position Houston served as Global Aviation Strategy & Public Policy Director, where he advocated for federal and international aviation policy and collaborated with domestic and international industry groups to harmonize aviation safety standards and sustainability rules. He was also responsible for aggregating aviation strategy issues under one umbrella within UPS to help maximize safety and reliability for the company, as well as service to UPS’s growing global customer base.

Houston also served as UPS’s Director of Airline Safety and Compliance where he was responsible for ensuring safe and regulatory compliant Flight, Maintenance, and Ground support operations, Emergency Response preparedness, and interaction with government regulatory and safety organizations worldwide. Under his leadership UPS became one of the first U.S. airlines to have a certified Safety Management System (SMS). He also served as the UPS International Chief Pilot, where he was responsible for crew-related international flight operation activity and as the Director of Flight Training where he was responsible for the UPS Advance Qualification Program (AQP) for all crewmembers.

Houston currently serves as Chairman of the FAA Drone Advisory Committee, where as one of 35 executive stockholders he brings a traditional aviation perspective to a group of other transportation and technology leaders as they explore policy considerations for unmanned aerial systems (UAS) integration into the National Air Space system. He also serves as the Chairman of the Cargo Airline Association Board of Directors, Board of Governors for the Fight Safety Foundation, Board of Advisors of RTCA and is a member of the IATA Safety Flight Ground Operations Advisory Council, and the Airlines for America (A4A) Safety and Operations Councils.

A native of Indianapolis, Houston received a bachelor’s in English literature from Wabash College and an MBA from Webster University. He also holds a Professional Human Resources (PHR) designation.

Houston began his aviation career in 1985 as a Marine Corps officer and F/A-18 fighter pilot where he was certified as an air combat tactics instructor (ACTI). He served the United States in Operations Desert Shield, Desert Storm, Restore Hope and Southern Watch. He has more than 100 aircraft carrier landings to his credit. He has previously served as an FAA designated check airman and is currently an international qualified Captain on the Boeing 757/767.

In step with UPS’s commitment to the community, Houston has served on numerous Boards to include: Washington Aero Club, Marine Toys for Tots Foundation, Association for Unmanned Systems International, Center for Women & Families, Hospice, and many others. He currently serves on the Board of Directors of the National Center for Families Literacy, RTCA Board of Advisors, Flight Safety Foundation Board of Governors, The Organization of Black Aerospace Professional Board of Advisors, and is president of the Marine Corps Coordinating Council of Kentucky.

Married and the father of three, Houston particularly enjoys motivational speaking, golf, and has coached various youth sports for many years.
Detailed Minutes

Introduction
A Drone Advisory Committee (DAC) meeting was held on October 27, 2021, from 12:00 PM to 2:30 PM EST. This meeting was held virtually and livestreamed because of the COVID-19 travel and in-person meeting restrictions.

Designated Federal Officer Opening Remarks

Mr. Jay Merkle started the meeting by welcoming the audience and reading the Designated Federal Officer (DFO) opening statement. After reading the opening statement, Mr. Merkle proceeded to highlight significant achievements that have occurred since the June 2021 DAC meeting, including the conclusion of Episode Four of the 2021 Federal Aviation Administration (FAA) UAS Symposium and the progress of the Unmanned Aircraft Systems (UAS) Beyond Visual Line of Sight (BVLOS) Aviation Rulemaking Committee (ARC). Upon finishing his remarks, Mr. Merkle turned the meeting over to the Deputy Administrator, Mr. Bradley Mims, for his opening remarks.

View the DFO’s remarks (link is timestamped for DFO Opening Remarks):
https://youtu.be/FBiaRHRHQ1o?t=336

Deputy Administrator Opening Remarks

Mr. Mims opened his remarks by expressing gratitude to be at the DAC meeting. He recalled receiving DAC Task Group #10’s recommendations to the FAA on gender neutral language at the previous DAC meeting and proceeded to discuss the importance of having diversity and equity within the workplace. Mr. Mims explained that the FAA had been inspired by the recommendations of DAC Task Group #10, as well as several other internal initiatives, and would be hosting a virtual event, the Inclusive Language Summit, on November 10, 2021, for all to attend. Mr. Mims thanked the DAC members for their hard work before sharing his final announcement. He revealed that on Friday, October 22, the FAA received approval from the Secretary to make several major changes to the DAC, including expanding membership from 35 members to 41 members, expanding the scope of the committee to include Advanced Air Mobility (AAM) issues, interests, and policies, changing the name of the committee to the Advanced Aviation Advisory Committee (AAAC), and adding a 15th stakeholder group: the community advocate representative. Mr. Mims shared that a new solicitation for AAAC members would be posted soon in the Federal Register and urged the audience to help spread the word. He then returned the meeting to Mr. Merkle, who turned it over to Acting DAC Chair Captain Houston Mills.
View the Deputy Administrator’s remarks (link is timestamped for ADA Mims’ Opening Remarks): https://youtu.be/FBiaRHRHQ1o?t=525

**Acting DAC Chair Opening Remarks**

Capt. Mills began his remarks by thanking everyone for their support and giving a personal welcome to DAC members and those viewing the livestream. Capt. Mills iterated that the work of the DAC is a key component in the safe integration of drones into the National Airspace System (NAS), and attested to the value the DAC provides the FAA through its thoughtful leadership and input of information in shaping future policy. Capt. Mills then introduced the first presentation of the afternoon.

View the Acting DAC Chair’s remarks (link is timestamped for the Acting DAC Chair’s Opening Remarks): https://youtu.be/FBiaRHRHQ1o?t=980

**FAA Response to Task Group #9: Situational Awareness**

**Presenter: Emanuel Cruz, Manager, Implementation Branch, UAS Integration Office, FAA**

Mr. Cruz began the presentation by providing a broad overview of the tasking given to DAC Task Group #9 at the February 2021 DAC meeting. He then proceeded to provide an overview of the actions of the DAC task group, as well as the high level recommendations presented to the FAA at the previous DAC meeting. He stated that the FAA concurred with these recommendations, finding them to be very robust, and then thanked the DAC task group for all of their efforts.

The DAC eBook provides the official FAA Response to Task Group #9: Situational Awareness report and presentation slides.

Following the presentation, there was a discussion and question and answer period.

Upon completion of the discussion, Mr. Cruz turned the meeting over to the Acting DAC Chair, Capt. Houston Mills, to introduce the next presentation.

View the presentation and discussion (link is timestamped for FAA Response to Task Group #9: Situational Awareness): https://youtu.be/FBiaRHRHQ1o?t=1088
FAA Response to Task Group #10: Gender Neutral Language for the Drone Community
Presenter: Abby Smith, Executive Director, Aviation Policy and Plans, Office of Policy, International Affairs and Environment, FAA

Ms. Smith began the presentation with an overview of the tasking given to DAC Task Group #10 at the February 2021 DAC meeting, including the recommendations developed by the Task Group and provided to the FAA at the previous DAC meeting. On behalf of the FAA, she thanked Task Group #10 for their hard work, as well as the high level of detail and thought that was put into this tasking. She let the DAC know that the FAA concurs with the recommendation to adopt gender neutral language for the drone and aviation communities. Ms. Smith concluded the presentation by sharing both short and long-term actions the agency plans to take to advance the work of the DAC.

The DAC eBook provides the official FAA Response to Task Group #10: Gender Neutral Language for the Drone Community report and presentation slides.

Following the presentation, there was a discussion and question and answer period.

Upon completion of the discussion, Ms. Smith turned the meeting over to the Acting DAC Chair, Captain Houston Mills.

View the presentation and discussion (link is timestamped for the FAA response to Task Group #10: Gender Neutral Language for the Drone Community):
https://youtu.be/FBiaRHRHQ1o?t=1915

Task Group #11 Presentation: Recommendations to FAA Acceptable Levels of Risk White Paper
Presenter: Bob Brock, Director, Division of Aviation, Kansas Department of Transportation

Mr. Brock began the presentation by thanking the DAC Task Group members for their participation, giving a special shout out to the three sub-group leaders for their assistance. Mr. Brock described the approach the task group used to tackle this tasking, starting with a simple document review and providing detailed feedback on every section of the paper. He then proceeded to provide an overview of each of the three sub-groups and the recommendations that were developed.
The DAC eBook provides the official FAA Task Group #11: Acceptable Levels of Risk White Paper report and presentation.

Following the presentation, there was a discussion and question and answer period.

Upon completion of the discussion, Mr. Brock turned the meeting over to the Acting DAC Chair, Captain Houston Mills, who entertained a motion to forward DAC Task Group #11’s recommendations on Acceptable Levels of Risk to the FAA. The motion was approved with no objections.

View the presentation and discussion (link is timestamped for FAA Response to Task Group #11: Acceptable Levels of Risk White Paper): https://youtu.be/FBiaRHRHQ1o?t=3690

Task Group #12 Presentation: Integrating UAS Operations into K-12 Curriculums
Presenters: Paul Hsu, Chairman, Hsu Educational Foundation
Brian Wynne, Chief Executive Officer, AUVSI
David Messina, FPV Coalition

Mr. Hsu opened the interim brief by providing an overview of the tasking provided to the DAC Task Group, before turning the presentation over to Mr. Messina to continue the presentation in Mr. Wynne’s absence. Mr. Messina proceeded to give an overview of the task group’s three-phase approach. The task group is currently in the second phase: Discovery. The presentation was returned to and completed by Mr. Hsu, following a discussion on potential recommendation areas. The task group will provide final recommendations at the next committee meeting.

The DAC eBook provides the official FAA Task Group #12: Integrating UAS Operations into K-12 Curriculums presentation.

Following the presentation, there was a discussion and question and answer period.

Upon completion of the discussion, Mr. Hsu turned the meeting over to the Acting DAC Chair to introduce the final agenda item.

View the presentation and discussion (link is timestamped for Task Group #12: Integrating UAS Operations into K-12 Curriculum): https://youtu.be/FBiaRHRHQ1o?t=6372
Advanced Aviation Advisory Committee
October 27, 2021 DAC Meeting • Virtual Meeting

New Business/Agenda Topics

The Acting DAC Chair, Capt. Houston Mills, opened the floor to DAC members to bring up any new business items or agenda topics. Mr. Vic Moss proposed developing a task group for drone operator safety. Ms. Seleta Reynolds shared that the Los Angeles Department of Transportation recently published a concept of operations to prepare for the arrival of AAM. Mr. Jay Merkle proposed that Ms. Reynolds do a presentation on this topic at a future meeting.

View the discussion (link is timestamped for New Business/Agenda Topics):
https://youtu.be/FBiaRHRHQ1o?t=8552

Closing Remarks and Adjourn

Mr. Merkle began his closing remarks by thanking all of the presenters and those who help make the DAC possible. He acknowledged that the FAA would be taking a look at DAC Task Group #11’s report and provide their response at the next meeting. He also acknowledged that he is looking forward to reading DAC Task Group #12’s full report in the future. He encouraged everyone viewing to watch the Federal Register for an updated solicitation for new membership to the AAAC. He also made everyone aware that the next committee meeting would be in February 2022, and more information would become available about the format in the upcoming weeks. Mr. Merkle then proceeded to thank Capt. Houston Mills for his assistance with the DAC before turning the meeting over to him for is closing remarks.

Capt. Mills gave his thanks and acknowledged the success of the meeting. He expressed how great it is to be a part of the DAC as we begin to transition into include AAM. He then encouraged all interested parties to seek out opportunities to participate in the committee. He then encouraged a motion to adjourn the meeting. The motion was approved with no objections.

View the closing remarks (link is timestamped for Closing Remarks and Adjourn):
https://youtu.be/FBiaRHRHQ1o?t=8960
Written Public Comments Submitted Since Last Committee Meeting