Public eBook Table of Contents

1) Virtual Meeting Logistics            3
2) Invited FAA/DOT Attendees           4
3) Meeting Agenda                     5
4) DAC Membership Roster              6
5) FAA – Response to Task Group #9: Situational Awareness     8
6) FAA – Response to Task Group #10: Gender Neutral Language for the Drone Community    13
8) Master Slide Deck                   63
9) DAC Charter                        113
10) Fact Sheet: Advisory Committee Member Roles and Responsibilities 116
11) Biography: Jay Merkle, Executive Director, UAS Integration Office    117
12) Biography: Houston Mills, Vice President, Flight Operations and Safety, UPS 119
13) Meeting Minutes – June 23, 2021 Meeting      121
14) Public Comments Submitted After Last DAC Meeting  127
Virtual Meeting Logistics

• We ask that everyone remain muted during the presentations. After each briefing, there will be an opportunity for the DAC 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 DAC 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)

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<thead>
<tr>
<th>Name</th>
<th>Title</th>
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<tbody>
<tr>
<td>1. Jay Merkle</td>
<td>Executive Director, UAS Integration Office (DFO)</td>
<td>FAA</td>
</tr>
<tr>
<td>2. Bradley Mims</td>
<td>Deputy Administrator</td>
<td>FAA</td>
</tr>
<tr>
<td>3. Laurence Wildgoose</td>
<td>Assistant Administrator, Office of Policy, International Affairs and Environment</td>
<td>FAA</td>
</tr>
<tr>
<td>4. Chris Rocheleau</td>
<td>Acting Associate Administrator, Aviation Safety</td>
<td>FAA</td>
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<tr>
<td>5. Mark Bury</td>
<td>Acting Chief Counsel, Office of General Counsel</td>
<td>FAA</td>
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<tr>
<td>6. Shannetta Griffin</td>
<td>Associate Administrator, Airports</td>
<td>FAA</td>
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<tr>
<td>7. Claudio Manno</td>
<td>Associate Administrator for Security and Hazardous Materials Safety</td>
<td>FAA</td>
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<tr>
<td>8. Abigail Smith</td>
<td>Executive Director, Aviation Policy and Plans</td>
<td>FAA</td>
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<tr>
<td>9. Sabrina Saunders-Hodge</td>
<td>Acting Deputy Executive Director, UAS Integration Office</td>
<td>FAA</td>
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<tr>
<td>10. Emanuel Cruz</td>
<td>Manager, Implementation Branch, UAS Integration Office</td>
<td>FAA</td>
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<tr>
<td>11. 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>
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<tbody>
<tr>
<td>1. Erik Amend</td>
<td>Manager, Executive Office, UAS Integration Office</td>
<td>FAA</td>
</tr>
<tr>
<td>2. Tonya Coultas</td>
<td>Deputy Associate Administrator, Security and Hazardous Materials Safety</td>
<td>FAA</td>
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<tr>
<td>3. Adrienne Vanek</td>
<td>Director, International Division, UAS Integration Office</td>
<td>FAA</td>
</tr>
<tr>
<td>4. Joe Morra</td>
<td>Director, Safety and Integration Division, UAS Integration Office</td>
<td>FAA</td>
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<tr>
<td>5. Martha Christie</td>
<td>Deputy Director, Safety &amp; Integration Division, UAS Integration Office</td>
<td>FAA</td>
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<tr>
<td>6. Elizabeth Forro</td>
<td>Special Assistant, UAS Integration Office</td>
<td>FAA</td>
</tr>
<tr>
<td>8. Allison LePage</td>
<td>Digital Communications Manager, Office of Communications</td>
<td>FAA</td>
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<tr>
<td>9. Jessica Orquina</td>
<td>Lead Communications Specialist, UAS Integration Office</td>
<td>FAA</td>
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<tr>
<td>10. Jennifer Riding</td>
<td>Management Support Specialist, UAS Integration Office</td>
<td>FAA</td>
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<tr>
<td>11. Kevin Morris</td>
<td>Digital Communications Strategist, Office of Communications</td>
<td>FAA</td>
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<tr>
<td>12. Kristen Alsop</td>
<td>Digital Communications Strategist, Office of Communications</td>
<td>FAA</td>
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Drone Advisory Committee  
October 27, 2021 DAC Meeting • Virtual

Public Meeting Agenda  
**Time:** 12:00 pm. to 3:00 p.m. Eastern Time  
**Location:** Virtual Video Conference

<table>
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<tr>
<th>Start</th>
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<tr>
<td>1.</td>
<td>12:00 pm</td>
<td>12:02 pm FAA – Greetings &amp; Logistics</td>
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<td>2.</td>
<td>12:02 pm</td>
<td>12:05 pm DFO – Read Official Statement of the Designated Federal Officer</td>
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<tr>
<td>3.</td>
<td>12:05 pm</td>
<td>12:10 pm FAA – Opening Remarks from the FAA Deputy Administrator</td>
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<td>4.</td>
<td>12:10 pm</td>
<td>12:15 pm DFO – Review of Agenda and Approval of Previous Meeting Minutes</td>
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<td>5.</td>
<td>12:15 pm</td>
<td>12:20 pm DFO – Opening Remarks</td>
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<td>6.</td>
<td>12:20 pm</td>
<td>12:25 pm Chair – Opening Remarks</td>
</tr>
<tr>
<td>7.</td>
<td>12:25 pm</td>
<td>12:55 pm FAA – Response to Task Group #9: Situational Awareness</td>
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<tr>
<td>8.</td>
<td>12:55 pm</td>
<td>1:25 pm FAA – Response to Task Group #10: Gender Neutral Language for the Drone Community</td>
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<td>9.</td>
<td>1:25 pm</td>
<td>1:35 pm BREAK</td>
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<td>10.</td>
<td>1:35 pm</td>
<td>2:05 pm Task Group #11 Presentation -- Acceptable Level of Risk White Paper</td>
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<td>11.</td>
<td>2:05 pm</td>
<td>2:35 pm Task Group #12 Presentation -- Integrating UAS Operations into K-12 Curriculums</td>
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<td>12.</td>
<td>2:35 pm</td>
<td>2:50 pm Chair – New Business/Future Agenda Topics</td>
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<td>13.</td>
<td>2:50 pm</td>
<td>2:55 pm DFO – Closing Remarks/Final Thoughts</td>
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<td>14.</td>
<td>2:55 pm</td>
<td>3:00 pm Chair – Closing Remarks/Final Thoughts</td>
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<tr>
<td>15.</td>
<td>3:00 pm</td>
<td>3:00 pm Chair – Adjourn</td>
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**Questions/Comments:** Contact Gary Kolb, UAS Stakeholder & Committee Officer (gary.kolb@faa.gov or 202-267-4441).
## Drone Advisory Committee

### DAC Membership – As of 10/19/2021

<table>
<thead>
<tr>
<th>Stakeholder Group</th>
<th>Members</th>
</tr>
</thead>
<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>
</tbody>
</table>
| Airports and Airport Communities | Seleta Reynolds, General Manager, Los Angeles Department of Transportation  
Dr. Paul Hsu, Founder and Chair, HSU Educational Foundation  
Jeffrey Brown, Aviation Chief Operating Officer, Port of Seattle |
| Labor (controllers, pilots) | VACANT  
Joseph DePete, President, Air Line Pilots Association (ALPA) |
| Local, State, Tribal and/or Territorial Government or Appropriate International Entity | David Greene, Bureau of Aeronautics Director, Wisconsin Department of Transportation  
Bob Brock, Director of Aviation and UAS, Kansas Department of Transportation  
Mark Colborn, Senior Corporal, Dallas Police Department  
Michael Leo, Captain, New York City Fire Department |
| Navigation, Communication, Surveillance, and Air Traffic Management Capability Providers | Mariah Scott, President, Skyward (a Verizon company)  
Matt Parker, President, Precision Integrated Programs |
| Research, Development, and Academia | Robie Samanta Roy, Chief Operating Officer, Electra.aero |
| Traditional Manned Aviation Operators | Mark Baker, President and Chief Executive Officer, Aircraft Owners and Pilots Association  
Lorne Cass, President, Aero NowGen Solutions, LLC  
Molly Wilkinson, Vice President, Regulatory Affairs, American Airlines |
| UAS Hardware Component Manufacturers | Brad Hayden, Founder and Chief Executive Officer, Robotic Skies  
Christian Ramsey, President, uAvionix Corporation |
| UAS Manufacturers | James Burgess, Chief Executive Officer, Wing (an Alphabet company)  
Michael Sinnett, Vice President Product Development and Strategy, Boeing Commercial Airplanes  
David Carbon, Vice President, General Manager, Amazon Prime Air  
Adam Bry, Co-founder and Chief Executive Officer, Skydio |
| Corporate UAS Operators | Greg Agvent, Senior Director of National News Technology, CNN  
Todd Graetz, Director, Technology Services, UAS Program, BNSF Railway |
| Citizen UAS Operators | Kenji Sugahara, Chief Executive Officer and President, Drone Service Providers Alliance  
Vic Moss, Owner, Moss Photography |
## Drone Advisory Committee

<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 Executive Officer, 3DR                              |
| Agricultural Interests                                 | Brandon Torres Declet, Chief Executive Officer and Co-Founder, MEASURE and Chief Operating Officer & Board Director, AgEagle |
| Advanced Air Mobility                                  | Dr. Jaiwon Shin, Executive Vice President, Head of Urban Air Mobility (UAM) Division and Chief Executive Officer, Genesis Air Mobility, Hyundai Motor Group  
|                                                        | Dr. Catherine Cahill, Director, Alaska Center for Unmanned Aircraft Systems Integration (ACUASI) |
| Industry Associations or other specific areas of interest as determined by the DAC 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 #9: SITUATIONAL AWARENESS
Drone Advisory Committee

Background:

At the October 22, 2020 meeting of the Federal Aviation Administration’s (FAA) Drone Advisory Committee (DAC), the FAA tasked the DAC “to engage operators in low altitude airspace to obtain feedback on how remote identification might be used to increase situational awareness and use this feedback to develop recommendations on how the FAA can address responses to the RFI.”

The FAA had been seeking information on how the Remote ID rule may provide an opportunity to increase the situational awareness of UAS for piloted aircraft. Prior the tasking, the FAA issued a request for information (RFI) on the topic. While the responses to the RFI provide thoughtful feedback, the FAA only received 30 and wanted to leverage the DAC to broaden the number respondents and the level or representation in the responses.

Task Group 9

As noted in its report, Task Group 9 elected to examine the FAA’s tasking in two parts:

1) To answer the specific question posed by the FAA, and,
2) To explore the spirit of the question.

This led to the DAC to explore ways to increase situational awareness in low altitude airspace, to include the use of remote identification information. The task group comprised of three sub-groups:

- Sub-group 1 explored if and how remote identification could be used to increase situational awareness.
- Sub-group 2 studied existing and developing technologies that can convey situational awareness pertaining to UAS – including remote identification.
- Sub-group 3 analyzed ways to maximize the effectiveness of capabilities available to piloted aircraft and UAS to drive situational awareness while avoiding mandates on operators in low altitude airspace.

The task group’s report included annexes that compiled the document the work of each of the Sub-groups to include recommendations from each group. Based on the inputs from each of the sub-group, Task Group 9 formulated four high-level observations and that formed the DAC’s recommendations.
DAC Recommendations:

The FAA received four high-level recommendations from the DAC. The FAA acknowledges that sub-groups in Task Group 9 provided additional recommendations as part of their research. The FAA has reviewed these, appreciates them, and may act on them. However, the focus of this response will be on the DAC’s high-level recommendations.

High-level Recommendations:

1. The FAA should avoid technology-specific recommendations related to the use of remote identification, but instead emphasize the accessibility of publicly available remote identification information.
2. Any updates to piloted aircraft practices and procedures should be voluntary and, when possible, should conform with existing electronic flight bag or onboard display technologies. Additionally, human-factors considerations should be investigated before promoting remote identification information to onboard piloted aircraft equipment.
3. The UAS industry (partnering with the FAA and piloted aircraft community) should develop integration strategies that foster maximum awareness in low altitude airspace, and create avenues for piloted aircraft to access information regarding UAS operations.
4. The FAA should review existing policies related to piloted aircraft technologies to assess their adaptability to UAS use cases. For instance, emphasis and encouragement should be placed where UAS and piloted aircraft integration efforts are already underway. Where possible, the FAA and industry should rely upon already-existing technology (such as ADS-B).

FAA Response Tasking 9:

Overview:

The FAA appreciates the work of the task group and the feedback by the DAC. The responses provide a thoughtful approach to consider providing piloted aircraft situational
The FAA unthreaded the recommendations a bit to lay out a set of activities captured by the DAC’s recommendation:

1) Investigate human factors considerations before promoting remote identification information to onboard piloted aircraft equipment.
2) Review existing policies related to piloted aircraft technologies to assess their adaptability to UAS use case.
3) The UAS industry, in collaboration with FAA and the piloted aircraft industry, develop integration strategies that foster maximum awareness in low altitude airspace, and create avenues for piloted aircraft to access information regarding UAS operations. As part of these strategies:

- Piloted aircraft practices and procedures should be voluntary and, when possible, should conform with existing electronic flight bag or onboard display technologies.
- Recommendations related to the use of remote identification should avoid specifying technology, but instead emphasize the accessibility of publicly available remote identification information.
- Emphasis and encouragement should be placed where UAS and piloted aircraft integration efforts are already underway.
- Where possible, the FAA and industry should rely upon already existing technology

The FAA concurs with this recommendation and will commit to taking the following steps:

1) Presenting these recommendations to the Drone Safety Team (DST) and recommending the DST establish the UAS industry workgroup that leads this effort.

2) Providing a white paper on human factors considerations to the industry workgroup.

3) Providing a white paper on existing policies related to piloted aircraft technologies to assess their adaptability to UAS use case to workgroup.
The DST is an industry-government partnership committed to ensuring the safe operations of unmanned aircraft systems (UAS) in the national airspace system. The DST includes participation from the General Aviation Joint Steering Committee. Leveraging the DST allows the FAA to meet key elements of the recommendation:

- UAS industry lead
- Collaboration with FAA
- Collaboration with the piloted community through GAJSC
- An avenue for developing “voluntary” non-regulatory safety enhancements

The FAA plans to present the recommendation to the DST Steering Committee at its next meeting. To support their efforts and address the other elements of the DAC recommendations the FAA will also commit to providing the workgroup white papers on: human factor considerations associated with providing pilots situational awareness of UAS operations, and existing policies related to piloted aircraft technologies to assess their adaptability to UAS use case.
FAA – RESPONSE TO TASK GROUP #10: GENDER NEUTRAL LANGUAGE FOR THE DRONE COMMUNITY
On February 24, 2021 the FAA presented the following task to the DAC:

**DAC Tasking: Gender Neutral Language for the Drone Community**

**Opportunity:**
- The DAC to lead promoting and instituting gender neutral language throughout the UAS/drone community.

**Tasking:**
- The DAC to develop recommendations for gender neutral language as an alternative to gender specific terms currently used in the drone industry and aviation community.
- The DAC to take the lead to facilitate the adoption of gender neutral language throughout the drone community and provide recommendations that organizations across the industry and community can implement.

On June 23, 2021 the DAC presented the following recommendations to the FAA:

**Recommendation 1:**
The Federal Aviation Administration should adopt gender-neutral language in the drone industry. To ensure inclusion of all regardless of sex, gender expression, gender identity, and to avoid burdensome language, we recommend using gender-neutral language (e.g., “person”; “they”) rather than gender-binary (e.g., “man or woman”; “he or she”). See style guide below.

**Recommendation 2:**

A. Due to the advantage of maintaining the use of a "U" in acronyms, which minimizes renaming disruption in both FAA and other groups, "unmanned" should be replaced with "uncrewed," at least in the short term. If the FAA determines that a two-phase approach is too cumbersome, we suggest replacing unmanned with drone immediately, as the ideal long-term solution — see recommendation 2 (B) below.

B. Drone is recommended as optimal for long-term use. It is a useful word that encompasses all of the various flight and control modes (from remotely piloted to highly automated) and aircraft types that currently fall under the category of “unmanned.”
C. Consider working with Congress on a revised definition of “UAS” that more accurately describes these aircraft systems.

**Recommendation 3:**

From a practical perspective, changes to adopt gender-neutral language should take on two priorities:

A. All new documents, speeches, social media, and marketing and promotional material should use gender-neutral language.

B. Rework of existing documents and materials should be prioritized by the number of individuals exposed to the material, as well as the effort required to update them.

**Recommendation 4:**

Expand beyond drones to aviation more broadly. Both the problem we are trying to solve and the benefits of making this change apply to the entire aviation industry – not just to the drone industry. Of course, language outside of the drone industry may be more entrenched given the comparative maturity of the rest of the industry, but that also means that there is a potential for even greater benefits. Furthermore, those within the drone industry naturally will need to interface with the broader aviation industry.
FAA Responses to the DAC’s Recommendations on Gender-Neutral Language for the Drone Community

Overview

The FAA greatly appreciates the time and thought the DAC applied to this task. We understand this is a complicated topic and acknowledge the research and attention to detail the DAC put into this recommendation.

The FAA’s mission is to provide the safest, most efficient aerospace system in the world. We strive to reach the next level of safety and efficiency and to demonstrate global leadership in how we safely integrate new users and technologies into our aviation system. To achieve this, we will need everyone to work together. Embracing diversity and inclusion will have a significant impact on bringing all voices into the conversation.

Language matters. As the DAC task group said in their recommendation, transitioning to gender-neutral language is a giant step to welcoming everyone to the drone – and aviation – community.

The FAA acknowledges that many of the terms that the DAC has proposed are not new words. Nor are they new to aviation. However, adapting them as primary terms and discontinuing the use of gendered terms will create a more inclusive and accepting environment within the drone and aviation communities.

FAA Response to DAC Recommendations 1-4:

The FAA is grateful for the DAC’s recommendations and agrees with the DAC that diversity, equity, and inclusion are critical building blocks for unleashing and maximizing innovation.

In fact, the DAC’s recommendations, in addition to several additional similar concurrent initiatives, have sparked a wider conversation across the Agency about formally embracing more inclusive language, including terminology that is gender neutral.

Our Office of Policy, International Affairs, and Environment in conjunction with our Office of Civil Rights, are jointly leading this discussion across the Agency and will jointly manage the development, coordination, and execution of any new resulting policies or orders. We acknowledge that the effort and time to fully implement these recommendations could be significant. However, the long-term benefits of doing so will help enhance safety in the national airspace system and benefit the future of aviation.
In the interim, the FAA has already begun taking steps to embrace gender neutral terms in documents. On July 20, 2021, the FAA published the draft Advisory Circular 150/5200-28G, Notices to Air Missions (NOTAMs) for Airport Operators, for public comment. This redefines the acronym NOTAM to no longer represent a gendered term. In addition, where possible and appropriate, the FAA will begin to use the term “drone” versus “Unmanned Aircraft System” or “UAS.”
Drone Advisory Committee

Task Group 11 Report on Acceptable Level of Risk White Paper
Table of Contents
1.0 Executive Summary 3
2.0 Introduction 5
   2.1 Background 7
3.0 Proposed Approach to UAS Safety 8
   3.1 Proposed Air Risk Target Level of Safety 9
      3.1.1 General Aviation (GA) 9
      3.1.2 Part 137 Operators 9
      3.1.3 Part 121/135 Operators 9
      3.1.4 UA-to-UA Collisions 9
   3.2 Proposed Ground Risk Target Level of Safety 9
3.3 A Proposed UAS Safety Framework 10
   3.3.1 Ground Risk Based Approach 10
   3.3.2 Translating Ground Risk to Operator and UAS Requirements 12
   3.3.3 Air Risk Based Approach 13
   3.2.1 FAA Determination of Airspace 14
4.0 Aircraft and Equipment Considerations 14
   4.1 Type Design 14
   4.2 Special Authority 15
   4.3 Approved Parts and Quality Systems 15
   4.4 Minimum Equipment Lists 15
   4.5 Aircraft and Equipment Summary 16
5.0 Operator Considerations 16
6.0 Comments to Draft FAA White Paper 17
   6.1 Additional Arguments against a Cumulative Risk Approach 24
7.0 Overall Recommendations 26
1.0 Executive Summary

The FAA’s Drone Advisory Committee (DAC), the agency’s industry advisory board, has been tasked to review a FAA white paper discussing proposed safety guidelines for the acceptable level of safety risk relating to the operation of aircraft without persons on board, regardless of size. Task Group 11 assembled and set forth the following expectations to accomplish this task; agreeing to:

- Challenge current assumptions,
- Prioritize making strategic positive impact ahead of “proving the math” on discreet individual issues,
- Recruit subject matter experts where helpful to increase clarity,
- Provide opportunity for each participating organization to express individual perspectives uniquely their own,
- Communicate openly and frequently to avoid unnecessary conflict at the closing bell of this project, and
- Achieve consensus where needed and beneficial to providing the FAA credible industry perspective on “acceptable levels of safety risk.”

Task group members agreed that the FAA white paper represented only one isolated process within a large and complex organization. While it certainly has merits that we hope to reinforce, the group also agreed we could not paint a complete or accurate industry picture without discussing additional areas of risk assessment that are inherent to employing new aviation technologies. Therefore, three sub-groups were organized to produce a more complete picture: Air/Ground Risk Assessment, Operator Risk Assessment, and Aircraft/Equipment Risk Assessment.

Prior to this task group, DAC Task Group 10 recommended gender-neutral terms as an alternative to gender-specific terms currently used in the drone industry and aviation community. This report utilizes those gender-neutral terms with the intent to make aviation more inclusive by reducing or eliminating language that reflects intentional or unintentional bias. The terms used in this document were selected from Task Group 10 recommendations to remain consistent with DAC recommendations to the FAA.

Task Group 11 recognizes that every flight represents a wide spectrum of risk variables. While it is natural to attempt to standardize operations to “make them all safer,” that is not necessarily a risk-appropriate response in every aviation context. For instance, it would be simpler and safer to require all general aviation aircraft to always fly IFR; however, this would ground most air ambulance helicopters operating today, as well as much of the general aviation community. Rather than limiting or imposing overly burdensome requirements on operations unnecessarily, we recommend empowering operators to employ the full spectrum of risk mitigation strategies for uncrewed aircraft that can be tailored to the specific context to meet the required safety target. This paper recommends strategies that should be formalized to appropriately assess acceptable levels of risk and mitigate air and ground risk, aircraft/equipment risk, and risk associated with a wide spectrum of operators and operations. While this requires a necessarily technical approach, this task group believes an optimum balance can be achieved by allowing operators to apply the full spectrum of risk mitigation strategies to meet the full spectrum of
variables represented by each unique flight operation. Risk mitigation policy is intertwined through every FAA line of business; therefore, it will be important to garner collaborative buy-in from each to fully achieve an acceptable level of safety.

Task Group 11 agrees that the first important step is for the FAA to establish target level of safety rates for both air and ground risk. These values should be based on generally acceptable historical targets or values. Society will not interact with uncrewed aircraft systems (UAS) in the same manner as traditional aviation; therefore, the FAA should not look solely to traditional aviation safety rates, but also to metrics of other transportation modes accepted in daily life, such as those of motor vehicles.

Equally important, the Task Group agrees it is not practical or reasonable to place a maximum cumulative risk allowed on UAS operations. Setting this artificial boundary is likely to force society to choose non-UAS options that are less-safe solely because those other methods have no maximum allowable risk to limit their use.

A framework that assigns one standard for maximum risk will also limit access to the technology and increase costs. We expect this approach to produce the unintended consequence of limiting access to under-served communities that would otherwise enjoy fewer barriers to entry as a participant in this industry.

Task Group 11 finds strong evidence of need for a risk-based approach to aircraft airworthiness approvals and authorizations for operations that fall in the continuum of operations between lightly monitored Part 107 and recreational operations and the more tightly regulated Part 135 commercial carrier operations. This can be accomplished by applying the characteristic risks of the operating environment and aircraft against a credible risk continuum to achieve target levels of safety. This approach to managing risk is like the strategies and techniques employed by JARUS SORA.

Pre-defined risk assessments and standard scenarios of common use cases can be used to create precise guidance and a qualitative risk appropriate regulatory framework. The FAA has recognized that fact in the past. In early 2020, the FAA publicly informed the DAC of its willingness to work with the DAC and industry to create standard scenarios. Such an approach would enable operations in less risky environments using known effective mitigations; allowing the FAA to focus their efforts and oversight on higher risk operations.

Many DAC member-organizations were part of the UAS Integration Pilot Program (IPP) and BEYOND. Task Group members report improved service from some FAA lines of business that participate in these programs and hope this trend extends agency-wide. Some areas of the FAA have moved beyond rule interpretation into a mutually accountable culture that shares the burden of accommodating emerging technology needs. We recommend the FAA partner with industry to introduce industry methods to identify organizational breakdowns in communication and counter-productive “stovepipes,” then utilize industry best practices to empower continuous improvement.
2.0 Introduction

On June 24, 2021, the FAA tasked the DAC to review an FAA white paper discussing proposed safety guidelines for the acceptable level of safety risk relating to the operation of aircraft without persons on board. To accomplish this, Task Group 11 was established. All members of the DAC were invited to participate as well as subject matter experts with unique expertise in a specific sector of the aviation industry that relates to acceptable levels of risk. In all, 24 participants agreed to serve as members of Task Group 11, to include the following:

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<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Organization</th>
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<tbody>
<tr>
<td>Bob Brock, Chair</td>
<td>Director, Division of Aviation</td>
<td>Kansas Department of Transportation</td>
</tr>
<tr>
<td>Jeffrey Brown</td>
<td>Aviation Chief Operating Officer</td>
<td>Port of Seattle</td>
</tr>
<tr>
<td>David Carbon</td>
<td>Vice President, General Manager</td>
<td>Amazon Prime Air</td>
</tr>
<tr>
<td>Lorne Cass</td>
<td>President</td>
<td>Aero NowGen Solutions</td>
</tr>
<tr>
<td>Mark Colburn</td>
<td>Senior Corporal</td>
<td>Dallas Police Department</td>
</tr>
<tr>
<td>Christopher Cooper*</td>
<td>Senior Director, Regulatory Affairs</td>
<td>Aircraft Owners and Pilots Association</td>
</tr>
<tr>
<td>Brandon Torres Declet</td>
<td>CEO/Co-Founder; CEO/Board Director</td>
<td>MEASURE; AgEagle Aerial Systems</td>
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<tr>
<td>Brad Hayden</td>
<td>Founder/CEO</td>
<td>RoboticSkies</td>
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<td>Ben Ivers</td>
<td>Director of Autonomous Systems</td>
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<td>Robert King*</td>
<td>UAS Safety Supervisor</td>
<td>United Parcel Service</td>
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<tr>
<td>Anthony Nannini*</td>
<td>Technical Program Manager</td>
<td>Wing</td>
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<td>Josh Olds</td>
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<td>Vas Patterson</td>
<td>First Officer</td>
<td>Airline Pilots Association</td>
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<td>Ric Peri</td>
<td>Vice President, Government and Industry Affairs</td>
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<td>Director of Regulatory Affairs</td>
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<td>Mark Reed</td>
<td>Engineering and Air Safety</td>
<td>Airline Pilots Association</td>
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Task Group 11 published an action plan prior to each large group meeting and discussed a set of participant expectations that were agreed upon:

- Challenge current assumptions,
- Prioritize making strategic positive impact ahead of “proving the math” on discreet individual issues,
- Recruit subject matter experts where helpful to increase clarity,
- Provide opportunity for each participating organization to express individual perspectives uniquely their own,
- Communicate openly and frequently to avoid unnecessary conflict at the closing bell of this project, and
- Achieve consensus where needed and beneficial to providing the FAA credible industry perspective on “acceptable levels of safety risk.”

Four large-group meetings were conducted for all participating members with action plans for each (appendix 3) to maintain continuity of effort. To remain inclusive of the most important issues for individual organizations, each participating member was invited to publish a separate one-page front-and-back position paper (appendix 4, format & foundation questions) to be published for the FAA to review as independent appendices to the final Task Group 11 product. Sub-group leaders convened numerous sub-group meetings to collaborate and capture credible data on the information provided in this document. All products were then combined and submitted for comment to the larger group. While there is no intent for this product to be comprehensive, we believe the themes and recommendations of this paper represent key areas for the FAA to focus resources. We also include positions that were not fully “consensed,” represented by individual position papers attached as appendices.

Given the large variety of operational concepts, use cases and aircraft types, the UAS industry needs a straightforward, easy-to-apply metric based upon a threshold safety target. Whether this metric is referred to as a Target Level of Safety, Equivalent Level of Safety, Acceptable Level of Safety, or Risk-Based Approach, the result is a set of defined numbers: three for air risk and one for ground risk. When coupled with a performance-based mitigation strategy and holistic operational approval process, such a metric is easily defined, highly defensible, quickly actionable, and enduring. This approach will help to support a safe,
competitive, and innovative industry of diverse UAS. All UAS operations, including Beyond Visual Line Of Sight (BVLOS), should be held to this same standard.

Using these standard safety targets, along with the risk characteristics of the aircraft system being flown and the operating environment, a risk continuum is formed and can be used to develop a risk appropriate regulatory framework, including the use of common scenarios and operational characteristics for precise guidance on common use cases. This approach enables operations in encourages operators to seek out low risk environments, while allowing the Federal Aviation Administration (FAA) to focus their efforts and oversight on operations in higher risk environments.

While it is a reasonable approach to allow operators to define a replacement risk or benefit to society, it is a much more effective approach to find a common set of replacement risks and take them into account when defining the acceptable Target Level of Safety (TLOS). Requiring applicants or operators to define a replacement risk set for each operation presents challenges and may take excessive amounts of time. Additionally, requiring the FAA to validate this value is not practical or conducive to an efficient regulatory framework. Nor should such an endeavor be expected of future entrants evaluating new use cases.

While we understand that this Task Group’s main objective was to respond to the FAA White paper, “UA Safety Objectives”, it was determined that it was important to also consider related topics such as operator and aircraft/equipment risk, as we feel they are essential to the air and ground risk assessment process.

2.1 Background

Traditional aviation safety objectives were developed over decades of aircraft operation and development. As accident rates improved across commercial and general aviation, objectives were refined and resulted in the metrics we see today. The commercial UAS industry is new and does not have the benefit of decades of operational and accident data to determine an acceptable objective. However, the UAS industry can look to currently accepted risk tolerances in traditional aviation, and other industries, as guidance on how operations, aircraft, and equipment used in the NAS meet an equivalent acceptable level of risk.

Currently, the FAA has 14 CFR 107, which established specific altitude, operating limitations, and aircraft weight limits that effectively provided separation of small UA within the NAS and reduced the risk of collision with other aircraft or people on the ground. Expanded operations outside of Part 107 can be achieved through new regulations that would enable many more types of high value operations. Under the existing regulatory framework, if an operation falls outside of 14 CFR 107, the operator confronts a set of limiting and burdensome options, such as becoming a Part 135 operator and using a UAS that is approved through 49 USC § 44807 (which is slated to sunset relatively soon) or the 21.17b Type Certification (TC) process (which has not produced a type certified UAS). These processes are very costly and time intensive, which is not always practical or risk appropriate— including for very small, lightweight drones that may present lower levels of risk. The current regulatory framework has either very little to no oversight (Part 107) or an equivalent level of oversight to an air carrier. There is clearly a large section of the risk continuum in the middle where a modest regulatory framework would provide immense value for both the industry and the FAA.
3.0 Proposed Approach to UAS Safety

DAC Task Group 11 asserts that a successful UAS Safety Framework should be:

1. **Clear**: Easy to understand, easy to implement, easy to measure.
2. **Consistent**: Key metrics remain stable and are applicable across the entire UAS industry.
3. **Useful**: Meeting metrics allows a broad range of use cases, operational environments and platforms.
4. **Effective**: Achieve a sufficient level of safety such that the public trust is honored and maintained.

The subgroup has identified two main, mostly independent risk categories: air risk and ground risk. For each type of risk, the subgroup recommends the following safety objective values:

1. **Air Risk**: The risk posed by UAS operations to other National Airspace System (NAS) users. The risk should be equivalent (or less than) the current levels of risk assumed by crewed aircraft in the same airspace classes. Mitigation approaches (strategic, tactical or a combination of both) should be left to the UAS proponent, if they can sufficiently demonstrate that performance targets are being met. **Air risk should be expressed in terms of midair collisions (MAC) per UAS flight hour.** This historical data is maintained and can be sourced from the National Transportation Safety Board (NTSB). Given the different types of crewed aircraft operations, and the potentially large difference in consequence of an event, it is most appropriate to have three primarily applicable operation types:
   
   a. General Aviation (GA) - Risk posed to GA aircraft.
   b. Part 137 - Risk posed to agricultural aircraft operations.
   c. Part 121/135 Operators - Risk posed to crewed 121/135 operators.

The risk that UAS pose to general aviation, on-demand commercial (Part 135) and scheduled air carrier (Part 121) operations, and agricultural (Part 137) operations has been separately categorized, as is common in other risk processes that the FAA applies to these stakeholders.

2. **Ground Risk**: Risk posed by UAS operations to 3rd party persons on the ground (the general public). Participating ground stakeholders such as operators, customers, etc. are presumably aware of and accepting of the potential additional risk. Additionally, participants can mitigate risks in ways not expected of the public, such as personal protective equipment (PPE) and training. **Ground risk should be expressed as fatalities per flight hour,** with acceptable rates similar to:
   
   a. The risk posed by GA aircraft to 3rd parties on the ground, as this an appropriate aviation-equivalent risk; and
   b. Ground vehicle fatality rates, as this is a common risk society is familiar with and currently accepted on a large scale. This approach also provides the benefit of equivalent risk to the mode of transportation that the UAS operation is replacing for many use cases.
3.1 Proposed Air Risk Target Level of Safety

3.1.1 General Aviation (GA)
Using the most recently available NTSB General Aviation Midair Collision Data (see Appendix 2), the risk of an airborne GA collision is 3.9E-7 per flight hour. To identify a fixed target, a reduced acceptability level of one MAC between a UA and a GA aircraft per 10,000,000 UAS flight hours (1E-7) is a justifiable and appropriate target level of safety for UAS operations.

3.1.2 Part 137 Operators
The historical safety data for Part 137 operators is like that of GA aircraft, so it is proposed to use an equivalent target level of safety of one MAC between a UA and a Part 137 aircraft per 10,000,000 UAS flight hours (1E-7) as justifiable and appropriate for UAS operations.

3.1.3 Part 121/135 Operators
The historical target for passenger carrying aircraft is 1 midair collision in 1,000,000,000 flight hours, or 1E-9 MAC/flight hour. This is a justifiable and appropriate target level of safety for UAS to passenger carrying aircraft midair collision rate as well.

3.1.4 UA-to-UA Collisions
Note that UA-to-UA collisions are not part of this approach, for two specific reasons:
1. The consequence of a UAS-to-UAS collision is a ground risk not an air risk due to the absence of humans onboard. Should a UAS-to-UAS airborne collision occur, the resultant debris is a localized hazard to people on the ground.
2. Much work is being done on UAS traffic management (UTM), and this space is rapidly evolving and adding capabilities. As UAS traffic volumes increase, it is expected that UTM-based solutions will mitigate a large portion of BVLOS UAS-to-UAS collision risk.

3.2 Proposed Ground Risk Target Level of Safety
As described above, the following two rates are the most appropriate and relevant measures of risk that should be accounted for:

1) The risk posed by GA aircraft to 3rd parties on the ground. This is the most directly comparable aviation risk, and most likely a conservative one, as UAS are expected to provide services and goods that directly benefit the communities they fly over in more convenient and tangible ways than GA aircraft have historically been able to provide. The historically accepted value is calculated to be around 1 ground fatality per 1,000,000 flight hours (1E-6), see Appendix 1 for details.

2) Ground vehicle fatality rates. As many UAS operations will replace ground vehicle trips or prevent or mitigate humans placing themselves at risk to perform certain tasks (such as

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It should be noted that historical data suggests that sUAS to piloted aircraft collisions are expected to have less severe outcomes than piloted aircraft to piloted aircraft collisions as there is yet to be a reported case of a UAS to piloted aircraft collision that has resulted in a catastrophic outcome for the piloted aircraft.
inspecting bridges or towers), it is appropriate to compare the societally-accepted levels of risk for ground vehicle operations. This value is calculated to be around one fatality per 1,000,000 “flight” hours (1E-6), see Appendix 1 for details.

Using these twin concepts of 3rd party risk and ground vehicle risk replacement, a value of one 3rd party ground fatality per 1,000,000 flight hours (1E-6) is a justifiable and appropriate target level of safety for all UAS operations.

As conservative assumptions will be used in the definition of standard scenarios and calculations of the target level of safety, and each UAS operation is expected to meet or exceed the TLOS, when aggregated across the industry, it is expected that the total safety rate for all UAS operations will exceed the TLOS’s. This phenomenon has played out in traditional aviation and is how the current UAS industry is performing (0 fatalities in 10’s of millions of flight hours). In addition, large volume Part 135 operators should track all UAS safety events in a Safety Management System (SMS) and compare the actual rate with the expected rate to verify they are at or better than the rate needed to meet the operation’s TLOS.

3.3 A Proposed UAS Safety Framework
Risk assessments using these safety metrics must account for all the relevant factors, not just traditional aircraft metrics.

For air risk this includes:

1. Encounter rate (assessment of the inherent risk of the airspace, including strategic mitigations)
2. Probability of a MAC given an encounter (assessment of tactical mitigations as needed)

For Ground Risk this includes:

1. Probability of an impact in an uncontrolled area (loss of control)
2. Probability of contacting a 3rd party in the event of an impact (driven by factors such as population density, shelter factors)
3. Probability of fatality in the event of a collision with a person

By accounting for all the factors that make up these risks, operators can use unique and novel approaches to mitigate them, if the final “rolled up” risk value is equal to or less than the acceptable level. This approach supports minimizing additional mitigations where they are not necessary to achieve the target level of safety, such as flights in very low risk airspace (e.g., shielded areas) without the need for active DAA.

3.3.1 Ground Risk Based Approach
With an acceptable target level of safety (TLOS) determined, an overall operational loss of control rate, R(LOC), can be calculated using the below formula and considering the specifics of the aircraft and the operational environment. This loss of control rate includes both operational and technical reasons for the failure. See Appendix 1 for more details on the calculation. Notice that the purpose of the flight operation is not relevant to the ground risk calculation:
Where:
- Pop_Density is the population density being overflown
- Pop_Exposed is the proportion of the population exposed to a UAS impact and is equal to (1 - sheltering factor)
- Critical_Area is the size of the area on the ground of the UAS impact
- P(Fatality) is the probability that a person would be fatality injured if impacted by the UAS

Furthermore, the R(LOC) can be divided into operational and airworthiness components that can be attached to qualitative risk-based requirements based on their respective values, consistent with standard practices in traditional piloted aviation (like the current FAA AC 23.1309 process and standards). This approach is currently used in the Joint Authorities for Rulemaking of Unmanned Systems’ (JARUS) Specific Operations Risk Assessment (SORA) with high levels of success. See Section 3.3.1 for additional details on this process. The Task Group thus recommends the FAA adopt a US-customized, SORA-like approach to UAS approvals outside of 107 operations or new regulations. In addition, the task group recommends adopting a set of standard scenarios or pre-defined risk assessments (PDRA’s) for common scenarios/operational characteristics. This approach also allows for quantitative analysis to be used as an acceptable means of compliance for novel operations to show an equivalent level of safety.

Because there will be different acceptable loss of control rates, R(LOC), based on the aircraft type and environment, it is recommended to create a unique set of risk based regulatory requirements for these different levels. This process can be modeled off the Specific Assurance and Integrity Level (SAIL) and corresponding Operational Safety Objectives (OSO) concepts in the SORA.

3.3.2 Translating Ground Risk to Operator and UAS Requirements

The goal of this section is to show how an applicant and the FAA can use details of the operating environment and the aircraft to derive a risk-based set of requirements for the operation in an effective and straightforward way².

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² This process has been simplified for illustrative purposes. The actual process would involve many more aspects of the flight operation and UAS, such as maintenance, design, external systems, etc. For a more detailed example of this process in use, reference the JARUS SORA.
In the loss of control equation above, the Target Level of Safety is a constant and the variables in the denominator can be broken apart to be functions of the operating environment and aircraft characteristics. The population density and what percentage of them that are exposed to the operation are related to what the UA is flying over. The size of the impact area, lethality of the aircraft and how well sheltering works are a function of the size, weight and speed of the aircraft. For classification purposes, the aircraft characteristics can be represented by a top-level representative value such as wingspan, maximum cruise velocity, mass, or kinetic energy and the operating environment by population density modified by exposure/shelter factors.

A straightforward SORA-like matrix can then be created where the combination of population density (for the example we will use generic descriptors of: Low, Medium and High) and the representative aircraft characteristic (for the example we will use generic descriptors of: Small, Medium and Large) can be used to determine the acceptable rate of loss of control. An example matrix is shown below:

<table>
<thead>
<tr>
<th>Sample SORA Like Matrix</th>
<th>Aircraft Characteristic</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Small</td>
</tr>
<tr>
<td>Population Density</td>
<td></td>
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<tr>
<td>Low</td>
<td>R(LOC) = 1E-1</td>
</tr>
<tr>
<td>Medium</td>
<td>R(LOC) = 1E-2</td>
</tr>
<tr>
<td>High</td>
<td>R(LOC) = 1E-3</td>
</tr>
</tbody>
</table>

Once the operator determines the final acceptable loss of control rate, qualitative requirements can be created that are commensurate with that rate, as shown in the example table below:

<table>
<thead>
<tr>
<th>&quot;Level of Requirements&quot;</th>
</tr>
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<tbody>
<tr>
<td>R(LOC) - Acceptable Loss of Control Rate</td>
</tr>
</tbody>
</table>

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A set of sample requirements could be:

- **Operator**
  - Low - Part 107 License
  - Medium - Part 107 License + Verified Procedures
  - High - Part 135 Operator

- **Aircraft**
  - Low - Self Declared Airworthiness + submission to FAA of key safety data
  - Medium - Special Airworthiness like process
  - High - Type Certified (TC) Aircraft

So as an example, if an operator wanted to fly over a “Medium” population density with an aircraft with a “Medium” aircraft characteristic, they would be expected to maintain a loss of control rate better than 1E-3 per flight hour, which would correspond to medium operator requirements (Part 107 License + Verified Procedures) and medium aircraft requirements (Special Airworthiness like process).

Having these quantitative loss of control rates allows standards organizations and the FAA to create guidance, standards, standard scenarios, and regulatory requirements that are risk appropriate for the operation. This is similar to what has been done successfully in traditional aviation. If an operator has a novel operation that falls outside of this structure, the numeric loss of control values provides the operator with a target for a quantitative assessment as a means of compliance.

### 3.3.3 Air Risk Based Approach

To calculate the air risk and compare it to the TLOS, we use the following equation:

\[
P_{\text{Intruder}} \times P_{\text{Collision}}
\]

Where:

- \(P_{\text{Intruder}}\) is the probability that an aircraft will be in the operation area during operating hours.
- \(P_{\text{Collision}}\) is the probability that the UAS flight collides with an aircraft that has entered the flight area.
Given this analytic approach, the Task Group recommends the creation of standardized processes for calculating $P_{\text{Intruder}}$ and defining risk appropriate mitigations that meet the TLOS. This approach allows operators to quantitatively demonstrate an equivalent level of safety.

The Task Group further recommends that the FAA determine a performance-based approach to calculate $P_{\text{Collision}}$, which can be tailored to individual aircraft performances.

$P_{\text{Intruder}}$ is a fundamental characteristic of the airspace and the rules governing it. The Task Group recommends that the FAA create categories for $P_{\text{Intruder}}$ based on the level of GA, Part 137 and Part 121/135 aircraft activity in the area, similar to the SORA’s Airspace Risk Classes (ARC) where each class has an associated expected encounter rate. This will aid operators in the application of this process and help the FAA minimize duplicate work.

3.2.1 FAA Determination of Airspace

As the FAA is the Air Navigation Service Provider (ANSP) for the United States (US) and has the relevant expertise, the Task Group recommends that the FAA create and publish a map of the air risk class (ARC) levels for piloted aviation for the entire US that all UAS operators can use as a baseline for application of appropriate mitigations. The ARC levels should be data driven based on traditional piloted aircraft traffic, structure, and class of airspace.

4.0 Aircraft and Equipment Considerations

4.1 Type Design

Part 107 gives specific limits for the weight of UA and restrictions on their operation outside of the exemption of recreational use (49 USC § 44809). Standard type and production certification are not practical, nor risk appropriate for all UA. Existing operational restrictions and methods of certification have delayed the advancement of the UA industry in the United States. Opportunities are available for utilizing existing regulatory structures (14 CFR 21) while also enabling certain lower risk operations using a risk-based approach (cf. JARUS SORA).

This group feels there is a need for a risk-based approach to aircraft airworthiness that falls between the absence of direct approval in Part 107 and the high level of oversight in the type design process. Thus far, the FAA has indicated that regular BVLOS operations will require traditional type design approval. This level of oversight may be appropriate for aircraft operations that carry elevated risk. However, this same level of certification will deter economic and technological growth in the industry if applied universally. Mitigation requirements and regulator oversight should be appropriate for the risks of the operation. For aircraft that do not meet the standards of a strict quality system, operations may be limited. Conversely, public acceptance and economic growth will be limited by accidents and incidents that occur due to inadequate safety standards. An appropriate balance must be found between the regulatory burden of OEMs and the assurance of safely designed aircraft.

4.2 Special Authority

The path to approval for 49 USC § 44807 is not consistent or well defined and is therefore timing consuming and costly. TG11 believes the related policies and procedures must be revised and clarified to maintain value as the commercial UAS industry expands. This process includes requirements for Concept of Operations, Operations and Maintenance Manuals, Emergency
Procedures, Checklists, a Training Program, and documented Flight History. We recommend maintaining the requirements for these elements past the expiration of 49 USC § 44807 while simplifying the process. This will allow for an appropriate, risk-based approach to aircraft airworthiness, operator risk acceptance, and public risk acceptance for UA operations in the NAS.

4.3 Approved Parts and Quality Systems

Historically, all parts are approved in conjunction with type certification of a product. (14 CFR 21.8). Many UA operating today utilize consumer-grade, Commercial Off the Shelf (COTS) parts in their design. These parts may be manufactured outside of a certified aviation quality system. Due to their affordability, they are utilized throughout the UA’s design, which decreases the cost of the final product, allowing for wider adoption and use. However, manufacturers must understand the implications of design changes on overall reliability and safety when used in UA applications.

The issue at hand is the level of oversight of replacement parts.

Part 21, Subpart D, “Changes in Type Design” adequately addresses the foundation of changes to a TC. However, a fundamental question that arises is: “what changes in type design would introduce an appreciable effect on the weight, balance, structural strength, reliability, operational characteristics, or other characteristics affecting the airworthiness of the UA.”

If the change does not introduce an appreciable effect, then minor change procedures in the type certification context that follow a validation of “form, fit, and function” would be satisfactory. On the other hand, if the replacement part does introduce an appreciable effect, then major change procedures may be necessary. For aircraft that have been certificated via a D & R protocol, that portion of the aircraft affected by the change may require redemonstration of D & R or appropriate analysis such as bench testing to show functional equivalency.

4.4 Minimum Equipment Lists

A Minimum Equipment List (MEL) is an important consideration for safe operation. MELs provide clear limitations to operators for what equipment and components must be operational to conduct a flight. OEMs are motivated to create a Master MEL (MMEL) as part of the TC process and routinely do so. UA undergoing special authority approval are encouraged to develop an MEL. In fact, the FAA recognizes this need and has set the precedent through § 44807 approvals already granted as detailed below:

“The certificate holder may not operate the small UA with known inoperable instruments or equipment installed except in accordance with a minimum equipment list (MEL) that has been prepared in accordance with § 135.179 and approved by the FAA. If the operator desires to utilize an MEL, the operator must develop its own proposed MEL and submit it to the FAA for approval.”

4.5 Aircraft and Equipment Summary

For small UA in the portion of the NAS established by Part 107 regulations (flying below 400’ AGL), increased risk may be acceptable when compared to operations at higher altitudes.
Aircraft intended to operate in these types of environments may not require type design. However, parts and equipment for UA operating in the NAS should require a risk-appropriate quality system. A natural benefit of UA being on the leading edge of technology is the ease of integration of monitoring systems for the technology. A requirement for operational flight data monitoring of Part 135 UA operations should be considered, similar to a Flight Data Recorder in a traditional aircraft.

BVLOS operations require different mitigations because of the reliance on the aircraft itself. Therefore, UAS approved to complete high-risk BVLOS operations may need to undergo rigorous airworthiness and quality standards (such as Type Certification), as discussed earlier in this paper. UAS performing low and medium risk BVLOS should be subject to risk-appropriate authorization processes, as discussed above.

5.0 Operator Considerations

When establishing safety performance objectives, the FAA considers both the average and specific risk. The Task Group believes that, when determining whether, and at what magnitude, an average or specific target level of safety is appropriate, it is important to consider the associated operational and economic impacts. For example, a target level of safety based upon an average risk (i.e., the aggregation of all sources of risk and mitigations) exposes limitations and adds costs to operators who have greater operational risk mitigations and quality safety records when a small number of operators lower the average industry safety through a lack safety culture and controls.

When considering the appropriate target level of safety for operator risk, it is important the FAA consider the appropriate variables for the specific operator. Examples include who is operating the UAS (pilot certification and their qualifications), what is being operated (equipment and aircraft used/needed), where will the UAS be operated (airspace, geographic location(s), altitudes), how the UAS will be operated (and the appropriate mitigations), and whether the operation is occurring under an air carrier certificate. Consideration of these factors are essential for assessing the risk of an operation and directly impact the air and ground risk exposures, as discussed elsewhere in this document. Taking into consideration the appropriate target level of safety for operator risk can also ensure the most appropriate and cost-effective risk mitigation strategies can be implemented.

Of the limited safety performance standards currently available (e.g., part 107, 89, and operations over people), the BVLOS UAS industry is substantially affected by a lack of consistent and predictable standards. For example, an operator who intends to undertake BVLOS operations should understand and be expected to meet defined standards for their safety mechanisms and programs prior to applying for the requested operations, instead of going through full de novo reviews of each application submitted to the FAA. Providing consistent and predictable safety performance standards will help the UAS industry expand in a safe and deliberate manner, while providing transparency and confidence to the public.
6.0 Comments to Draft FAA White Paper


| Safety Performance Objectives: 
| Acceptable Level of Risk for Unmanned Aircraft Operations |

This white paper proposes safety guidelines for the acceptable level of safety risk relating to the operation of aircraft without persons on board, regardless of its size. These guidelines describe the high-level safety objectives, in keeping with FAA and ICAO SMS and consistent with the FAA annual performance goals for safety.

The FAA is applauded for attempting to define high-level safety objectives that are performance based. We agree that operations with people on board, including Urban Air Mobility (UAM) are outside the scope of this document. For ease of applicant use, it is suggested that the FAA develop a customized SORA like process that can be used as an acceptable means of compliance in addition to the ICAO SMS framework for operations that fall outside of the regulation.

**Issue**

Unmanned aircraft (UA) are being introduced into the national airspace system as the FAA evaluates proposals for waivers, exemptions, and develops new standards and regulations. However, unlike conventional aviation application, there are no established safety objectives for UA. Decisions relating to approving waivers or determining new regulations lack the underlying guidelines that are routinely applied to commercial and general aviation. This uncertainty contributes to a wide disparity in perspectives of acceptable risk.

It is appreciated that the FAA recognizes and wants to address this challenge that industry is currently facing, making the current approval process extremely inefficient, both in terms of resources and time.

**Background**

The FAA has established aviation safety goals for:
- U.S.-Owned Commercial Carrier Fatalities per 100 Million Persons on Board: 5.4 (FY21)
- U.S. General Aviation Fatal Accidents per 100,000 Flight Hours: 0.96 (FY21)

These safety goals have been informed by decades of experience in aviation and Congressional and public feedback. The goals reflect a broad initiative to reduce the accident rate in comparison to historical levels with feasible solutions.

These two specific safety goals represent two points along a safety continuum. The public accepts a higher level of risk for experimental aircraft operations than for personal use general aviation, which in turn is a higher acceptable risk than air taxi and air carriers. This paper addresses how UA fall within that continuum.

**General Principles**
While the FAA administers the safety performance objectives, the FAA considers feedback from Congress, the public and the industry in establishing appropriate objectives. This paper proposes initial objectives to be further informed through consultation with stakeholders. The safety objectives inform FAA actions and policies and guide the risk mitigation and acceptance processes under the Safety Management System framework, which the FAA considers in reaching decisions.

Many factors affect the risk that the public finds acceptable. These include:

- The degree to which the individual is informed, can manage the risk themselves, and in control of the decision to accept the risk. A pilot of an experimental aircraft for research understands that they accept a higher risk and can mitigate many risks with their skill, while passengers on commercial transportation cannot control any of the risks that they take (other than to avoid aviation altogether).

We agree with this principle and feel that the ground risk for UAS should be applied to nonparticipating individuals. It is assumed that participating individuals are more aware of and accepting of higher risk levels than the general public as well as could have additional mitigations such as training, PPE (e.g., ASTM-complaint headgear), etc.

- The perceived value of the operation. The public will not accept risk without some corresponding benefit, and may accept higher risks based on the value that is placed on the operation.

We also agree with this principle that the more value or benefit an operation provides, the higher the acceptance of the risk.

- The perceived feasibility of risk mitigations. When risk mitigations are feasible and available, their use is expected. Risk is not acceptable if it can be avoided at a cost proportional to the value of the operation.

While acknowledging some truth in the first 2 sentences, we feel it is important for the FAA and the applicant to look at the complete risk picture and not necessarily be driven by perceptions. If an applicant is meeting the safety case, they shouldn’t be required to add additional mitigations for perception reasons as that starts to become overly prescriptive. Practically speaking, different members of the public have different perceptions, and it does not seem appropriate to ask the FAA to determine whose perceptions matter most and then try to measure them, as well as the fact that perceptions change over time.

Given the unique tradeoffs inherent in UAS, there may be perceptions that increase or transfer risk into other areas in non-beneficial, very nuanced ways that are not obvious to the public. An example could be a small UAS strategically flying 10-feet away from a tower in “shielded airspace” that does not have a DAA system. People may perceive that a DAA solution “is feasible and available,” but it may not be an appropriate solution for this use case. In this example, a DAA solution could dramatically increase weight, thereby increasing exponentially the risk to humans on the ground. In that way, although intended to minimally mitigate an already acceptable air risk, it could increase the ground risk in a non-proportional way.
Safety performance objectives consider these perspectives and are not quantifiable with any defined level of precision or operational experience. Commercial and general aviation safety performance goals are derived from objective measures (safety performance indicators) of the achieved performance, which are not currently available for UA operations. Experience and feedback will refine the safety objective as UA operations mature.

In establishing safety performance objectives and evaluating our decisions, the FAA should consider both the average risk and the specific risk. The average risk is the aggregate over all sources of risk and mitigations, and is the overall result that is achieved by every decision and action that is taken throughout the aviation community. The average risk provides a guide to inform specific decisions: by definition, some operations have a risk that is higher than the average, and some have an achieved risk that is lower. The specific risk considers the variables for a specific operation, such as what variables contribute to the risk and what mitigations are feasible. The specific risk is important to ensure the FAA does not allow too much risk to be placed on a single flight, and to provide a guideline to avoid overly conservative decisions for the specific risk based on the average risk.⁴

The approach outlined in Section 3.0 is consistent with this approach where the target levels of safety should be the goal for the specific risk of each operation.

Finally, when evaluating a specific proposal against the safety objectives, the FAA should consider the initial estimate of risk and the ability to monitor and manage that risk in operation. More uncertainty concerning specific factors in the safety case is acceptable if the underlying factors of the safety case can be monitored to validate, or invalidate, the safety case in operation, and if the FAA has the ability to take appropriate actions before the risk can accumulate. This experience is valuable to inform future decisions to normalize UA operations, when greater certainty in the underlying factors will be necessary.

We agree that for larger or ongoing commercial operations (i.e., Part 135 or 137 certificated operations), Safety Management System (SMS) with Safety Performance Indicators (SPI’s) should be used to track the actual performance of the operation vs. the expected performance during the application process. Additionally, the FAA should gather and combine this data from the larger operators to inform the appropriateness of the approval process itself and adjust if needed.

Establishing a UA Safety Performance Objective

For manned aviation, the FAA has defined safety performance objectives for scheduled passenger operations and general aviation. These safety performance targets are defined with respect to the aircraft and its occupants. A UA has no occupants. What should the objective be for the UA itself – in other words, what should the objectives be to protect the UA from damage?

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³ Consider a hypothetical example where the specific risk can be known for each operation. A safety target of 0.1 accidents could be achieved with nine operations that were known to be safe, and one that is known to result in an accident. Alternatively, if every flight with a specific risk greater than 0.1 were prevented, the resulting average risk would be considerably lower than 0.1.
The protection of most UA from damage is not a significant matter of public interest. The owner of the UA has an interest in its safety and is in control of many of the risks associated with its operation, so that FAA involvement is not warranted for those operations. As package delivery operations are introduced, there will be a public interest in the safety of the package. However, the economic value of the package of a single UA is small, and no specific safety target is proposed to protect the UA or small cargo.

We strongly agree. UA damage, when not risking non-participant safety, primarily presents financial loss to the operator—something that can be mitigated in the form of private insurance. We feel there could even be negative public safety consequences by having operators prioritize protecting the UAS from damage, as this would disincentive things like frangible designs, meant to increase public safety in the event of a crash, as well as potentially impact remote pilot decision making in emergency situations where to prevent damage to the UAS they may try to land on a risky street vs. ditch the aircraft in a nearby lake.

As large UA are introduced for cargo operations, we can expect a public interest in the reliable delivery of the cargo that warrants a safety target for such operations. However, the absence of any person on board will still differentiate these operations and allow for a higher acceptable level of risk than the general aviation target. The FAA may need to eventually establish a safety target appropriate to those operations.

It is recommended that the FAA apply the same safety standards to cargo operations as they do to all other UAS operations as outlined in Section 3. Reliable delivery targets are a business objective, not a safety objective, and trying to account for business objectives may unintentionally compromise safety. Businesses with poor business performance should be appropriately handled by market forces.

For these reasons, the acceptable risk to unmanned aircraft is higher than aircraft with people on board. At this time, the FAA does not need to establish specific safety objectives for the unmanned aircraft itself.

It is suggested that the FAA establish specific safety objectives for UAS operations outlined in Section 3.

Unmanned Aircraft as a Risk

While the FAA need not take action to protect UA, the risk that each UA poses to others must be addressed. UA are a risk to:
1) Manned aircraft
2) People and property on the ground (with and without carriage of hazardous materials)

We agree these are the two main areas that UAS pose a safety hazard to, and to a lesser severity other airborne UA.

Hazard to Manned Aircraft

The FAA proposes to consider the following when determining what risks are acceptable:
The average risk of an injury or fatality in aircraft with people on board as a result of a collision with a UA should be less than one order of magnitude below the safety performance targets for those aircraft. The resulting targets would be:

- 0.5 fatalities in commercial aviation, for 100 million persons on board
- 1 GA fatal accident per 1,000,000 flight hours

For GA aircraft it is more appropriate to choose the more conservative value articulated in Section 3.1.

The specific risk of a collision with an aircraft with people on board should be addressed after considering the type of operation and potential risk mitigations. It is not appropriate to rely solely on an average encounter likelihood, without any specific mitigations. Similarly, it is not appropriate to assume that a mid-air encounter will occur.

We do agree that it is not appropriate to assume that a MAC will occur in the event of an encounter and, in fact, it most likely will not occur. We do not agree with the blanket statement that “it is not appropriate to rely solely on an average encounter likelihood, without any specific mitigations.” There are situations in the NAS for which the safety case can easily be made using only strategic airspace mitigations. Additionally, there may be airspace where mitigating only one type of aircraft equipage is appropriate, such as ADS-B out-equipped aircraft in the Mode C Veil.

Rationale:

- The FAA has established safety targets for commercial carriers and general aviation that reflect the public expectations and an increase in the number of UA operations must be considered in achieving those targets.
- The introduction of UA operations should be an order of magnitude lower so as not to alter the underlying order-of-magnitude of risk.

Example Application: A general aviation aircraft is unlikely to encounter a UA operating at low altitude (<500') over power lines or railroad tracks, outside of the arrival and departure areas for airports and heliports. If there is one hour of GA operation in this vicinity for every 10,000 GA flight hours, and the likelihood of a UA being in the same vicinity is 1 in 1000, then the average target would be met without any further mitigation. However, the specific risk should consider feasible mitigations if an encounter were to occur, such as increasing the conspicuity of the UA, notifying pilots of the area of operation. In addition, identifying such encounters would be critical to monitoring the underlying assumptions.

We suggest risk-appropriate mitigations be used and not require that “feasible” mitigations need to be considered and applied if the safety case is met. Feasible is not a well-defined term and will be open to interpretation and further delays in approvals, especially considering many of the “feasible” technologies cost and weigh just as much as small UAS themselves.

Hazard to People on the Ground (without hazardous materials)

The FAA proposes consider the following when determining what risks are acceptable:
UA-induced ground fatalities should be fewer than 10 per year (average risk). A greater risk of fatality may be acceptable for operations where risk can be transferred from non-aviation activity, improving the overall safety of the public.

We agree with the concept of: "A greater risk of fatality may be acceptable for operations where risk can be transferred from non-aviation activity, improving the overall safety of the public." However, for practical reasons, we do not think a cumulative risk approach is suitable because implementation of a case by case "risk replacement" strategy for individual operations will be extremely difficult. **Instead, it will be more effective to bake this concept into the single safety rate for all operations by selecting a value that encompasses common and socially accepted tasks, thus removing the need for a cumulative limit.** Given the challenges the FAA and industry have had in agreeing on one number, there are bound to be immense challenges in coming to agreement between the operator and FAA on a unique number for each individual operation. This approach will lead to challenging questions such as:

- What is the definition of the “non-aviation” activity? Is surveying a strawberry field the same as surveying a corn field? Is doing real estate photography the same as doing sports photography?
- How do we calculate the transferred non-aviation risk value?
- What data is valid for that purpose?
- What happens for non-aviation risks where the sample size is very small and either 0 fatalities happen over a certain period or 1 fatality creates a large acceptable risk?
- When using a UAS, the risk may transfer from participants to non-participants, how is that handled?
- How is this approach relevant to totally new fields?
- How are secondary safety/health/economic benefits accounted for (reduction in pollution, reductions in vehicle traffic or people climbing towers, etc.)?

Answering these questions for each applicant (where an application to the FAA is required) to everyone’s satisfaction is bound to result in excessive delays and complexities in the approval process. A single safety rate for all operations, considering standard risk replacements (such as ground based vehicles), will be significantly more feasible for the FAA and industry to plan and implement.

- The specific risk should be addressed considering the type of operation and potential risk mitigations.

**Rationale:**
- Managing the risk of injury or property damage is unlikely to be a constraint, as compared to managing the risk of a ground fatality, and therefore is not explicitly addressed. Other than the small UA that are addressed in Part 107 Category 1, 2 and 3 operations over people, UA have sufficient kinetic energy to likely cause a fatality in the event of a collision with a person and the acceptable likelihood of a ground fatality is lower than the acceptable likelihood of property damage or injury. Injury and property damage should be considered in the specific risk.
We agree that the top-level safety target should be fatalities. Injuries and property damage are more difficult to predict, more open to interpretation and expected to be more acceptable than fatalities. Additionally, the consequences of these risks can be partially mitigated with insurance.

- Aviation fatalities to people on the ground over the last four decades have ranged from 5 to 20 fatalities per year in the United States.

It is previously stated by the FAA in this white paper that: “The public will not accept risk without some corresponding benefit, and may accept higher risks based on the value that is placed on the operation.” When compared to GA operations, whose risk is publicly accepted, it can be assumed that a large majority of UAS operations will provide increased direct benefits of convenience and accessibility to members of the public. Thus, to hold a high-value generating UAS operation to the same cumulative risk as a GA operation is not a valid comparison, given the earlier points the FAA has made.

Additionally, the value of 10 based on general aviation is a realized current value and is not tied to what society would ultimately accept as a limit. For example, significant growth in UAS, with significant corresponding benefits to the public, could have a minimal negative impact on public acceptance. In fact, in previous years when GA ground fatalities were closer to 20, there was no public backlash. Thus, there is no demonstrable correlation for the proposed cumulative limit, particularly when the value argument is applied to the general public.

Modes of transportation such as cars are a more relevant example that provide significant economic benefits to society, just like UAS have the potential to do.

- UA operations offer significant economic and safety potential to society.
- The public expectation for risk to people on the ground should not be represented in aviation-related exposure terms (such as per flight hour or per operation) because those exposure terms are not relevant to people on the ground.

We do not agree with this statement. Traditional aircraft are regulated based on per flight hour failure rates. Using this logic, those figures “are not relevant to” the passengers of those aircraft or the people those aircraft are overflying, but that is not the point. Those figures intend to provide practical requirements to the operators and manufacturers of aircraft. The purpose of the regulations should be to create consistent requirements that can be understood and met by operators and manufacturers, as well as verified by regulators--whether or not they are “relevant” to the people being overflown. See Section 6.1 for additional arguments against a cumulative approach.

- Some UA operations have the potential to reduce the risk of serious injury or fatality from other causes, such as climbing towers for inspection or driving vehicles for delivery. It is in the public interest to enable such operations if the risks from the UA are lower than the risks of the activity they replace, regardless of how they would contribute to the aviation-induced ground risk.

We agree that in especially risky situations where the public benefit is even greater than the defined target level of safety, operations should be approved if they can be shown to meet the
replacement risk, such as public safety and lifesaving medical operations. For general cases see the response to the first paragraph in the “Hazard to People on the Ground (without hazardous materials)” above.

- The damage to property on the ground from a UA accident is limited by the energy transference of the UA, and by the type and quantity of fuel on board. Given that the majority of UA are smaller than an automobile, no separate target for property is proposed. This may change as large UA are introduced, and options such as requiring insurance can be considered.

Agree, insurance should be sufficient to mitigate any of this additional risk.

- The FAA may consider setting a combined safety target for people on the ground that considers aviation and commercial space launches.

We believe that the target level of safety proposed, which considers the third-party risks of general aviation and the socially acceptable motorized vehicle risk, are appropriate comparisons for UAS. From a public perception standpoint, commercial space launches present entirely different levels of risk are not an appropriate point of comparison.

Example Application: In order to apply the safety performance target to a UA operation, the operation in question must be allocated a portion of the overall acceptable risk. Note that since the average risk is expressed as an annual, national rate, any specific operation must be converted to identify its relevant share of that total risk. For example, if there were 50,000 hours of relevant UA operations throughout the US in 2020, then an equal allocation of the acceptable risk would yield a risk-per-hour of 1 in 5000. The specific risk should also be considered, such as choosing a flight path that exposes the fewest number of people on the ground for the given mission (e.g., staying over private property for the preponderance of agricultural operations, staying over critical infrastructure for inspection, or flying over buildings and avoiding common outdoor activity areas for package delivery).

We do not endorse this approach. In this example, the resultant risk of 1 fatality in 5,000 flight hours is not appropriately safe and should not be accepted by the public or the FAA. In addition, given the status of UAS approvals, it is expected that UAS operations will be confined to certain geographical areas soon and this approach would allow significantly higher risk to the people in those areas than a rate-based approach.

6.1 Additional Arguments Against A Cumulative Risk Approach

- A cumulative risk approach tends to penalize safe and responsible UAS operators for the irresponsible actions of others. The number of UAS-related accidents or incidents that occur NAS-wide in a given year is outside of the control of any single operator, and arbitrarily assigns accountability. Basing operational approval upon cumulative risk could result in operators with flawless safety records having to shut down their businesses (perhaps permanently) because of the actions of reckless operators – or even a single large operator – once the cumulative “clock” is reached.
• Practically, it would be extremely difficult to appropriately allocate the 10 expected fatalities per year in a way that won’t result in substantial year-over-year variations and unnecessary shutdowns, especially in an industry that has the potential to experience massive growth. Potential UAS businesses would have difficulty in creating a business case for financing under such arbitrary and uncertain criteria, and customers could not count upon critical services continuing to be offered when and where needed.

• Most significantly, using a cumulative approach means that the safety target will continue to change over time, making it difficult for companies to plan and run businesses and for the FAA to regulate. Given a volume of 1,000,000 flight hours per year, a company might receive approval for meeting a threshold of $1E^{-5}$, but as the volume grows over 10,000,000 flight hours per year, then the threshold would increase to $1E^{-6}$. Companies would be required to substantially increase their target safety level year over year, particularly when the threshold value could grow by as much as an order of magnitude or more based on operations outside the control or visibility of the company.

• If the solution to the above bullet point is to grandfather in existing operations, new entries may be held to a vastly different target level of safety, creating additional requirements for those new entrants. This can easily create a situation where operations that are approved, in compliance and without safety incidents in one year may no longer meet next year’s safety target. Also, companies could be required to invest substantial time and effort going through Type Certification and Part 135 approvals only to be told (at the end of the process) that their safety targets are no longer acceptable and they would need to redesign and/or re quality all or parts of the system. Additionally, the FAA’s change process operates on a multi-year calendar, which could make it difficult or impossible to respond to substantial year-over-year changes in an evolving market.

• Lastly, by taking a cumulative approach, we risk putting artificial supply constraints on the technology, which the FAA says “offer significant economic and safety potential to society.” Increasing scarcity will tend to drive up prices and limit access to technology, which will inadvertently deprive these technology benefits to under-served or less affluent areas. These are the kind of communities likely to benefit the most from these technologies, further increasing the opportunity gaps that exist today.

By using a rate which is a consistent approach used for transportation safety, it removes the FAA and industry from creating very difficult to predict cumulative limits based on potentially flawed assumptions about how society will react to this new technology and it puts the choice back onto society. We must admit we do not fully understand how society will react to and accept this new technology. If society does not feel the realized benefits are greater than the realized costs, society will stop using that service, or other economic factors such as insurance and legal costs will make it not economically viable. If society accepts the technology and appreciates the benefits, it will accept the growth in cumulative risk that comes with it, such as has been done with motor vehicles.

7.0 Overall Recommendations

Based on the principles outlined above, this subgroup recommends the FAA should:

1. Clearly establish rate-based safety targets that are relevant for all UAS operations for air and ground risk.
2. Develop an emergency use provision where the risk-based requirements can be waived or lowered for emergency and/or life-saving operations.

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.

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.

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.

6. Do not adopt a cumulative risk approach.

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

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

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.

10. 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.

11. 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.

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.

Appendix 1.0 - Ground Risk Safety Details

A1.1 Calculation of Approximate GA Risk to 3rd Parties on the Ground

To determine an acceptable Target Level of Safety (TLOS) for Ground Risk based on aviation risk, the approach used in the JARUS Scoping Paper to AMC RPAS.1309 Issue 2 was used looking at General Aviation risk to 3rd parties:

\[ \text{TLOS} = P(\text{GA}_\text{accident}) \times (\text{Ground}_\text{Fatality}/\text{GA}_\text{accident}) \]

In this equation, \( P(\text{GA}_\text{accident}) \) is the historically acceptable value established by the FAA in
AC 23-1309-1E, paragraph 15(c) of 1E-4 accidents per flight hour for general aviation\(^4\). And (Ground_Fatality/GA_accident) is the expected number of ground fatalities per general aviation aircraft accident. A value of < 1E-2 fatalities per piloted GA accident rate is used, as seen in historical yearly NTSB data.

This produces a value of 1E-6 fatalities per flight hour.

### A1.2 Calculation of Approximate Ground Transportation Risk


Looking at the last 3 years:
- There were 1.14 fatalities per 100 million vehicle miles traveled in 2018.
- There were 1.10 fatalities per 100 million vehicle miles traveled in 2019. There were 1.37 fatalities per 100 million vehicle miles traveled in 2020.

Since this data is in vehicle miles traveled instead of per hour, we need to make some assumptions to translate it into a UAS per flight hour replacement risk. If we assume that these miles were replaced by UAS, and that the UAS traveled 80 miles per hour (under the Part 107 limit of 100 mph), then that would translate into 1.25 million flight hours.

- \(1.14 \text{ fatalities/1.25 million flight hours} = .91E-6 \text{ fatalities/flight hour}\)
- \(1.10 \text{ fatalities/1.25 million flight hours} = .88E-6 \text{ fatalities/flight hour}\)
- \(1.37 \text{ fatalities/1.25 million flight hours} = 1.10E-6 \text{ fatalities/flight hour}\)

Which averages to .96E-6 fatalities/flight hour which is approximately 1E-6 fatalities per “flight hour” as a replacement risk.

### Appendix 2.0 - Air Risk Safety Details

#### A2.1 Historical GA Events

To determine the target level of safety for general aviation aircraft, we examined the risk of midair collision for GA aircraft using historical data for these events and present the data below. The National Transportation Safety Board (NTSB) compiled the GA MAC data from 2009 until 2018 and the results are shown below in the table.

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\(^4\) From AC 23-1309-1E, Paragraph 15(c): “In assessing the acceptability of a design, the FAA recognized the need to establish rational probability values. Historically, failures in GA airplanes that might result in catastrophic failure conditions are predominately associated with the primary flight instruments in IMC. **Historical evidence indicates that the probability of a fatal accident in restricted visibility due to operational and airframe-related causes is approximately one per ten thousand flight hours or 1 x 10^-4 per flight hour for single-engine airplanes under 6,000 pounds.”
Averaging the data, we get an average number of flight hours per year from 2009 until 2018 around 20.9 million. With 81 MACs over 10 years, that averages to 8.1 MACs per year for an average risk of approximately 3.9 MACs per 10,000,000 flight hours or 3.9E-7 MACs/flight hour.

Using similar data sources, the AOPA's Air Safety Institute shows 86 midair collisions from the 10 year period from 2010 until 2019. Using data from the NTSB's AviationAccidentStatistics_1999-2018_20191101 spreadsheet, from 2010 to 2018 (2011 data is also missing), GA aircraft averaged approximately 20.9 million flight hours per year (flight hours estimated by the FAA). This works out to a recent yearly average of 8.6 MAC events / 20.9 million flight hours, which is approximately 4.1E-7 MACs/flight hour.

We use the most conservative value of 3.9E-7 MACs/flight hour.

General Aviation Midair Collision Data from the NTSB

<table>
<thead>
<tr>
<th>Calendar Year</th>
<th>General Aviation Flight Hours (100,000s)</th>
<th>Midair Collisions Involving General Aviation Aircraft</th>
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<tr>
<td></td>
<td>Accidents</td>
<td>Fatal Accidents</td>
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<tr>
<td>2009</td>
<td>208.61866</td>
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</tr>
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<td>2010</td>
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</tr>
<tr>
<td>2018</td>
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<td><strong>Total</strong></td>
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<tr>
<td><strong>Average</strong></td>
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</tr>
</tbody>
</table>

* Total GA Flight Hours does not include missing 2011 data
Appendix 3.0 – Task Group 11 Administrative Action Plans

Task Group 11: Acceptable Level of Risk White Paper
Action Plan

Meeting #1 -- July 23, 2021

Problem Statement from FAA: UAS are being introduced into the national airspace system as the FAA evaluates proposals for waivers, exemptions, and develops new standards and regulations. However, unlike conventional aviation application, there are no established safety objectives for unmanned aircraft. Decisions relating to approving waivers or determining new regulations lack the underlying guidelines that are routinely applied to commercial and general aviation. This uncertainty contributes to a wide disparity in perspectives of acceptable risk. This white paper proposes safety guidelines for the acceptable level of safety risk relating to the operation of aircraft without persons on board, regardless of its size. These guidelines describe the high-level safety objectives, in keeping with FAA and ICAO SMS and consistent with the FAA annual performance goals for safety.

Challenge: Provide recent and relevant industry perspective to the FAA on “acceptable levels of risk.”

Tasking: DAC provide comments and validate White Paper.

Agenda:
1. Discuss Overarching Objectives for TG# 11
   a. DAC members and SMEs continue review of White Paper to assemble written feedback
   b. Challenge assumptions with credible supporting data
   c. Accomplish DAC charter: helping identify challenges and recommend improvements
   d. Present alternate courses of action that are supported by credible data
   e. Examine economic and societal impact of both the current risk assessment framework and alternative risk assessment strategies proposed by Task Group 11 to the DAC

2. Task Group members voice organization-specific goals for this feedback to FAA
   a. What standards of behavior would you offer for us to embrace to maximize the impact of this effort?
   b. What is one message your organization hopes this product gets through to FAA?

3. Discuss outreach to external organizations for SME support

4. Assign homework: Draft outlines/framework to deliver the most impactful product by September 1, 2021

5. Schedule next meeting: 3:30-4:30 CST Thursday, July 29

Outcome of this effort: Presentation to Drone Advisory Committee in 60 days to include one consolidated DAC recommendation as well as supporting data and documentation
Problem Statement from FAA: UAS are being introduced into the national airspace system as the FAA evaluates proposals for waivers, exemptions, and develops new standards and regulations. However, unlike conventional aviation application, there are no established safety objectives for unmanned aircraft. Decisions relating to approving waivers or determining new regulations lack the underlying guidelines that are routinely applied to commercial and general aviation. This uncertainty contributes to a wide disparity in perspectives of acceptable risk. This white paper proposes safety guidelines for the acceptable level of safety risk relating to the operation of aircraft without persons on board, regardless of its size. These guidelines describe the high-level safety objectives, in keeping with FAA and ICAO SMS and consistent with the FAA annual performance goals for safety.

Opportunity: Provide recent and relevant industry perspective to the FAA on “acceptable levels of risk.”

FAA Tasking: DAC provide comments and validate White Paper.

Agenda:
1. Discuss consolidated framework (DAC TG11 Objectives & Schedule)
   a. Objectives.
   b. Schedule.
2. Major topics to address (DAC TG11 Position Paper Template)
   Also: Identify if and/or where your task has a tie or commonality with other sub-groups so we can orchestrate a smooth linkage for the reader/audience
3. Please connect to the Google Doc’s site to ensure you have access. If not, please let us know at UAS@KS.GOV so we can get you plugged in. You should have the opportunity to request access to this shared drive. If you don’t see the option we can directly add users, just let us know. You'll receive a notification in your inbox once access is granted. Please complete this form using your primary work email to link your account to the drive. Do not use a personal email account.
4. Schedule next meeting. **11:30 – 3:30 CST, Thursday, August 5, 2021.**

OUTCOME OF THIS EFFORT: Presentation to Drone Advisory Committee in 50 days to include one consolidated DAC recommendation as well as supporting data and documentation
Task Group 11: Acceptable Level of Risk White Paper
Action Plan

Meeting #3 – August 24, 2021

Problem Statement from FAA: UAS are being introduced into the national airspace system as the FAA evaluates proposals for waivers, exemptions, and develops new standards and regulations. However, unlike conventional aviation application, there are no established safety objectives for unmanned aircraft. Decisions relating to approving waivers or determining new regulations lack the underlying guidelines that are routinely applied to commercial and general aviation. This uncertainty contributes to a wide disparity in perspectives of acceptable risk. This white paper proposes safety guidelines for the acceptable level of safety risk relating to the operation of aircraft without persons on board, regardless of its size. These guidelines describe the high-level safety objectives, in keeping with FAA and ICAO SMS and consistent with the FAA annual performance goals for safety.

Opportunity: Provide recent and relevant industry perspective to the FAA on “acceptable levels of risk.”

FAA Tasking: DAC provide comments and validate White Paper.

Agenda:
1. Discuss time extension and updated schedule:

   - August 13  Individual Organization Appendices Due Complete.
   - September 10  Sub-groups brief each other to assess continuity of message across groups
   - September 24  Sub-group Products Due to UAS@KS.GOV
   - October 8  Final Product Due to FAA
   - October 27  DAC Meeting

2. Ensure connectivity between participants and sub-group leaders
   Note: Sub-group leaders will meet offline periodically to ensure strategic vector is on course

3. Schedule next all-hands meeting. 3:00 – 4:00 CST Wednesday, September 1, 2021.

OUTCOME OF THIS EFFORT: Presentation to Drone Advisory Committee to include one consolidated DAC recommendation as well as supporting data and documentation
Task Group 11: Acceptable Level of Risk White Paper

Action Plan

Meeting #4 – September 27, 2021

Problem Statement from FAA: UAS are being introduced into the national airspace system as the FAA evaluates proposals for waivers, exemptions, and develops new standards and regulations. However, unlike conventional aviation application, there are no established safety objectives for unmanned aircraft. Decisions relating to approving waivers or determining new regulations lack the underlying guidelines that are routinely applied to commercial and general aviation. This uncertainty contributes to a wide disparity in perspectives of acceptable risk. This white paper proposes safety guidelines for the acceptable level of safety risk relating to the operation of aircraft without persons on board, regardless of its size. These guidelines describe the high-level safety objectives, in keeping with FAA and ICAO SMS and consistent with the FAA annual performance goals for safety.

Opportunity: Provide recent and relevant industry perspective to the FAA on “acceptable levels of risk.”

FAA Tasking: DAC provide comments and validate White Paper.

Agenda:

1. Review time extension and updated schedule:

- August 13  Individual/Organization Appendices Due Complete.
- August 16  Sub-groups assemble credible industry perspective on assigned topic by engaging FAA white paper
- September 10  Sub-group leads brief each other to assess continuity of message across groups
- September 24  Sub-group Products Due to UAS@FAA.GOV
- September 27  Task Group 11 review all three sub-group products for fatal flaws
- October 1  Provide feedback to sub-group leads to correct significant factual errors
- October 8  Final Product Due to FAA
- October 27  DAC Meeting

2. Ensure connectivity between participants and sub-group leaders
   Note: Sub-group leaders will meet offline periodically to ensure strategic vector is on course

OUTCOME OF THIS EFFORT: Presentation to Drone Advisory Committee to include one consolidated DAC recommendation as well as supporting data and documentation
Appendix 4.0 – Task Group 11 Position Paper Template & Foundation Questions

Task Group 11 Position Paper Template

This template is intended to be a guide to aid in meeting the objective for each TG11 Sub-group

TG-11 Sub-group: Air / Ground / Operator / Aircraft Risk Assessment (circle one)

What is the issue? Economic and societal impact of current risk assessment processes related to air / ground / operator / aircraft (circle one) risk assessment as it pertains to sections _____, and _____ of the FAA white paper on acceptable risk.

What specific data / references support this perspective?

What alternative course of action should be considered by FAA to address this issue?

What would economic / societal impact would be realized from implementing this course of action?

What specific data / reference supports this forecasted economic / societal impact?

Which specific portion of the FAA White Paper introduces this specific issue/conversation?
Foundation Questions

These questions are intended to help us challenge our thought processes and ensure the product from TG11 is both meaningful and credible (in no particular order...).

- Is the issue we’re bringing up significant to the entire industry?
- Do we have credible data to demonstrate the impact of this issue?
- Is there a better way?
- Are we defining the issue clearly enough that the message matters to every reader?
- Is this issue within the scope of the TG11 Charter?
- Are we objectively thinking outside the box with this issue, or are we too focused on making a single point?
- Have we offered appropriate Scope Considerations with our issue?
- Is the better path one based on current regulation, or starting completely fresh?
- What will be required to execute our proposed solution (Legislation? FAA Procedures?)
- Is it time to address this issue or should this issue be in the FAA Parking Lot for now?
Appendix 5.0 Individual Industry Position Paper: Boeing Company

The Boeing Company appreciates the opportunity to review and provide feedback on the FAA’s draft whitepaper on Acceptable Level of Risk for Unmanned Aircraft Operations. This is a significant and important building block in establishing the foundation for the future operation and integration of unmanned systems into the U.S. National Airspace System (NAS). We support the objectives of establishing safety targets for UAS and feel these targets are key to enabling safe, saleable operations. Working alongside the Drone Advisory Committee Task Group 11, we have identified a number of recommendations. We would like to commend the entire Task Group for their hard work and appreciate the diversity of thought and working together attitude.

There is one area of the recommendations where we would like to offer an additional perspective for the FAA to consider. The recommendation from the DAC Task Group 11 is to establish a rate-based safety target of 1E-6 third-party ground fatalities per UAS flight hour (recommendation 1.a.). As the scope of this recommendation is to include all UAS without persons on board, regardless of size, Boeing believes this safety target rate is not commensurate with the public’s expectation for safety and is inadequate for an emerging industry that is poised to grow at a significant rate over the coming years. Additionally, the value does not provide a target for both participants and non-participants (third parties). Boeing recommends that any target should include all affected parties.

In appendix 2, the Tasking Group Report incorrectly identifies the generally accepted piloted GA accident rate as being approximately 1E-4 per flight hour, citing paragraph 15(c) of AC 23-13091E which states the probability of a fatal accident in restricted visibility due to operational and airframe-related causes is approximately 1E-4 per flight hour for a single-engine airplane under 6,000 pounds. The rate cited does not account for fatal accidents that occur in visual meteorological conditions or those that stem from failure conditions caused by airplane’s systems or any other potential catastrophic failure conditions. Therefore, it is inappropriate to use this value as an overall GA accident rate. Furthermore, this rate does not differentiate between participants or non-participants.

While there is not a widely accepted forecast for flight hour growth in UAS operations, it is conceivable that in the next several years the industry could see 10 million flight hours per year, or more. Applying the proposed 1E-6 third party ground fatalities per UAS flight hour to this forecast, the target level of safety would be 10 third-party ground fatalities per year. For comparison, a rate of 1E-7 fatalities per UAS flight hour applied to the same forecast yields a target level of safety of 1 fatality per year. And in addition, we feel the rate should include all affected parties.

Boeing agrees that a rate-based target level of safety is appropriate for UAS operations. However, as described above, we believe the rate proposed by the Task Group in this report is inadequate and does not account for all stakeholders. We thank you for the opportunity to
provide input on this important topic and trust that the FAA will consider our perspective in addition to the broader DAC Task Group 11 feedback.

Appendix 6.0  Individual Industry Position Paper: FPV Freedom Coalition

Prepared by Dave Messina, President & CEO, FPV Freedom Coalition August 2021

I.  Background
The FPV Freedom Coalition is privileged to participate in Task Group # 11 (TG11), “Acceptable Level of Risk White Paper.” This Tasking Group is the 11th DAC Tasking Group the FPV Freedom Coalition has participated in since June 2019. The FAA has written a white paper describing the difference in a Safety Framework for UAS to crewed aircraft. Safety is of course, the FAA’s primary directive and it uses safety objectives (metrics) to guide decisions on rules, regulations and how it considers every action under its authority. In the FAA’s White Paper, the FAA has proposed using crewed aircraft metrics and raising them by an order of magnitude (10x) for UAS. Those two crewed metrics are:

- U.S.-Owned Commercial Carrier Fatalities per 100 million Persons on Board: 5.4 (FY21)
- U.S. General Aviation Fatal Accidents per 100,000 Flight Hours: 0.96 (FY21)

The FPV Freedom Coalition asserts neither of these metrics should be adopted for UAS because they are irrelevant. Our rationale for this is explained below in detail. We propose separate air risk and ground risk metrics that can be measured, will be viable for the next decade during large UAS usage growth and we feel they are aspirational and relevant to UAS operators and pilots.

II. Summary of FPV Freedom Coalition’s proposal
Tasking Group 11 should recommend Safety Objective values for two areas:

Air Risk: Acceptable # of collisions between UAS and crewed aircraft per year
Ground Risk: Goal of $ amount / year of property damage due to UAS crashes

III. Rationale:
Don’t use fatalities / year for any of the UAS Risk Metrics
The number of fatalities per year is not relevant and does not advance the Safety Culture of UAS or the public’s perception of UAS. In its comments to the Remote ID NPRM, DJI estimated all sUAS in the USA logged 10.3 million flight hours in 2019. The White Paper proposes we create a UAS framework that’s central premise is UAS should have safety objectives which are an order of magnitude better than crewed aircraft. For GA fatal accidents per 100,000 flight hours have an objective of 0.96. Converting that to UAS per the FAA’s “Order of Magnitude” better for UAS, that means 0.96 fatalities per 1 million flight hours. Considering the 2019 calculations by DJI, we had 10 million flight hours and zero fatalities. Key metrics, including safety objectives should be aspirational and should advance the industry and acceptance of aircraft. This metric would do neither.

For Ground Risk, consider $ damage caused by UAS crashes
Looking back to DAC Tasking #8, Safety Culture, six tenets were identified and agreed to by the entire Tasking Group:

- Safety Ownership
- Safety Modeled by Leadership
- Organizational Values
● Learning Culture
● System wide approach
● Trust

In addition, based on a research paper which considered the psychology of transforming a community to accept safety, the paper cited these elements are key to shift a community:

1. Leader commitment and prioritization of safety;
2. Policies and resources of safety;
3. Group cohesion;
4. Psychological safety;
5. Safety knowledge;
6. Employee/member sense of control; and
7. Individual commitment to safety.

Considering these two lists, there is a recurring theme on trust between the public and UAS pilots/operators and education of operators and public. Because of this, a simple metric for safety objectives for ground risk would be to communicate the property damage done by crashed drones. This would encourage industry to improve drone safety and it would provide an aspirational goal which the public could understand.

**Air Risk, # of collisions per year**
Like fatalities, the number of UAS and crewed aircraft collisions is small. We have heard Jay Merkle cite six over the last ten years (best recollection from a talk Jay gave). Further, none of the six collisions resulted in any fatalities or disabling of the crewed aircraft. Given the risk to low flying crewed aircraft, a safety objective focused on keeping this number in single digits and without fatalities is our proposal.

**Appendix 7.0  Individual Industry Position Paper: RoboticSkies**

*Submitted by Brad Hayden, CEO*

*Primary Focus, Aircraft Maintenance*

Unmanned Aircraft (UA) are being introduced into the national airspace, and as such, there are multiple areas of operational consideration which result in the identification of unique risks and mitigation to those risks. The introduction of UA begins at the design stage, progressing to the flight operations stage, the incorporation of UA into the national airspace and finally, the continued airworthiness of these unique aircraft. But much like the introduction of turbinepowered flight in 1958, the regulatory structure of 14 CFR parts 43, 65, and 145 are well established and designed to manage the introduction of new and novel aircraft.
The maintenance performance regulations are contained within 14 CFR part 43 and are agnostic, by design, to the type of aircraft being maintained and are generic enough to appropriately address any nuance as to unique design features of the aircraft. 14 CFR part 43 simply requires that maintenance be performed following maintenance manuals or Instructions for Continued Airworthiness published by the manufacturer. The aircraft certification standards for the development and publication of Instructions for Continued Airworthiness (14 CFR 21.50) are adequate to facilitate the publication of complete instructions for the maintenance which the technician follows to provide effective continued airworthiness of the aircraft.

The maintenance technician regulations are again agnostic to the type of aircraft being maintained. 14 CFR 65.81 mandates that a certificated mechanic must receive training (formal or On-The-Job) on any new task or technology before they are approved to supervise or return to service the maintenance action. This regulation is designed to address the broad range of aircraft from ultra-small personal piston-powered aircraft to large passenger carrying turbine powered commercial aircraft and every system powering these aircraft. Unlike aircraft operations, the introduction of electric power, fly-by-wire, and hybrid propulsion systems typical in UA are simply an evolutionary progression of legacy systems to which the technician has continuously adapted as the development of aircraft and associated systems have progressed.

The marriage of the maintenance regulations of 14 CFR part 43 and the technician regulations or 14 CFR part 65 come together in the certificated maintenance organization of 14 CFR part 145. While the repair station regulations certificate the maintenance and repair organization, the performance of maintenance contained in 14 CFR part 43 is standardized and consistent regardless of who is performing the maintenance. The repair station takes the basics of 14 CFR parts 43 and the technician standards of 14 CFR part 65 and add a well-established Quality Management System which provides for the delivery of airworthy aircraft in a consistent and safe manner. As such, the Quality Management System imbedded in part 145 adds a layer of confidence by assuring that the technicians are “capable of performing their assigned task” (14 CFR 145.163) regardless of aircraft type or technology. The Quality Management System of 14 CFR part 145 repair stations (14 CFR 145.211) further reduce the risk of assuring continued airworthiness of these new aircraft in support of their intended operational capabilities.

Further supporting the continued airworthiness of the aircraft, commercial operations conducted under 14 CFR part 135 are eligible for a Continued Airworthiness Maintenance Program (CAMP) which better assures airworthiness of the aircraft and a resultant reduced risk. The introduction of these new aircraft into the national airspace will certainly challenge the Air Traffic Management system and identifying the additional risks – and mitigating those risks – is warranted. However, the maintenance and continued airworthiness of these aircraft are well-established in the regulatory structure and do not, if consistently adhered to, require a risk mitigation strategy. When considering maintenance and continued airworthiness, due to the robust and well-established performance standards of the maintenance regulations, there are no new or novel levels of risk because of the introduction of UA aircraft.
Appendix 8.0  Individual Industry Position Paper: Drone Service Provider’s Alliance

We would like to express our appreciation for all the members of Task Group 11 providing feedback to the FAA for the Acceptable Level of Risk paper from the FAA. We wanted to highlight a few issues with the final report from our task group.

We believe that in the continuum of risk, operations with the lowest ground and air risk should have the lightest touch from the FAA. In essence, these types of operations should face the minimum amount of scrutiny and require little to no mitigations. For example, most local BVLOS or sheltered operations should not require further technical mitigations beyond requirements of
remote ID and/or LAANC. In those instances, both air risk and ground risk are known and can be controlled.

The DSPA also believes that the FAA should consider changing the definition of visual line of sight to airspace awareness. For example, with smaller drones, visual line of sight of the drone can be lost quite quickly simply because of the dimensions of the aircraft. However, a remote pilot could have full situational awareness of the surrounding airspace and what is underneath the drone. A good example would be agricultural inspections where ground risk is minimal and in most instances, a remote pilot has a good understanding of the location of the drone from the ground station.

We support Task Group 11’s report with the exception of the requirement of type certification or special airworthiness on certain types of aircraft.

Sincerely,
Kenji Sugahara
President/CEO
Drone Service Providers Alliance

Appendix 9.0 – Individual Industry Position Paper: General Aviation Manufacturers Association

GAMA DISCUSSION REGARDING “ACCEPTABLE LEVELS OF RISK”

GAMA’s Role & Representation
The General Aviation Manufacturers Association (GAMA) represents over 130 of the world’s leading manufacturers of business and general aviation airplanes, rotorcraft, engines, avionics, components, and related services and technologies. GAMA members are also providers of maintenance and repair services, fixed-based operations, pilot and maintenance training, and aircraft management. Additionally, GAMA represents companies in the emerging sector of advanced air mobility, which includes the development of vertical take-off and landing (VTOL) aircraft as well as electric, hybrid and hydrogen propulsion and autonomous systems for civil purposes. GAMA member companies have facilities in over 30 countries.

GAMA’s purpose is to foster and advance the general welfare, safety, interests, and activities of general aviation to include the growth and promotion of new general aviation technologies, aircraft, and operations. GAMA engages with member company technical experts and develops industry-wide positions and recommendations to policy makers and regulators to address the issues facing the global general aviation industry through its committees. Long standing committees of the GAMA Board of Directors focus on advancing safety and technical policy issues related to the design, certification, production, maintenance, security, and operations of GA aircraft. Since 2015, the Electric Propulsion & Innovation Committee (EPIC) was established to support the introduction of hybrid & electric propulsion, increased automation and other key innovations, products, and operations into general aviation. The GAMA EPIC, which is most closely linked to discussion of the Drone Advisory Committee
(DAC), also supports concepts and changes to modernize technical, operational, integration and licensing obstacles which may exist in the Advance Air Mobility (AAM) sector.

One foundational concept amongst all GAMA initiatives to advance the general welfare, safety and interests of GA, and a pillar to how GA approaches risk, is the safety continuum.

**Safety Continuum**
The level of safety in the aviation system is established by FAA regulation, guidance and oversight which should be applied and change as necessary based on risk and societal expectations of safety. The safety continuum should result in the application of an appropriate level of safety from small UAS to large transport category aircraft. The differing level of safety balances the needs of the flying public, applicants and operators while facilitating both the advancement of safety and the encouragement of technological innovation. The idea of how to address risk in new air mobility concepts is often discussed relative to the safety continuum. The safety continuum conceptually seems easy to understand, but there is often an inconsistent understanding and/or application of this concept across the broad range of general and commercial aviation aircraft and operation and new concepts.

Complex technologies across the spectrum of aircraft highlight the importance of the risk in the safety continuum. The initial reactions from authorities have been to levy very conservative requirements on certification and operations of this equipment. The risk was not equivalent to existing equipment but expected to be better than the existing equipment. The problem with this approach is two-fold. First it ignores relative safety, meaning the level of safety it’s replacing and what that earlier technology had to meet (level of safety). And second, it ignores that there is a
sweet spot for the “appropriate” level of safety. If the requirements are too low, the risk of accidents goes up and will probably allow for an unacceptable accident rate. At the other extreme, if the requirements are too high, the cost goes up and new, innovative safety enhancements don’t get installed on the aircraft. Or worse, there aren’t any new innovative aircraft or equipment. The sweet spot is where the requirements and/or oversight is balanced to allow for the safety benefits to be included in the aircraft at a cost that will allow for widespread safety benefit. (See the following figure).

This approach was first institutionalized in the FAA’s AC 23.1309 System Safety Analysis and Assessment for Part 23 Airplanes in 2011. Applying the appropriate level of safety in the requirements, based on risk and the aircraft’s location in the safety continuum, allowed cost effective technology to be certificated in part 23. The safety benefits of this approach after 10 years are very clear, with significant safety improvements.

The FAA Aviation Safety (AVS) Strategic Plan FY20-FY24 further institutionalizes and embraces the application of safety continuum in order for FAA to better anticipate and accommodate change:

The key to safety lies in effectively managing risk. The successful approach to risk management is not one-size-fits-all. Too little rigor and oversight can leave the system exposed to safety risks that would require mitigation. Too much rigor and oversight can tax resources and stifle safety enhancing innovations. The optimum real-world level of safety is achieved by applying the right level of rigor at the right time and place for any given situation—a tailored approach. The safety continuum is a data-driven model that informs this balance. (AVS Strategic Plan, pg. 19)

In addition to the discussion in the FAA’s strategic plan, the specific focus on the safety continuum was captured in the FAA’s doctrine document titled “The Safety Continuum – A
Doctrine for Application” and published in 2014. This document provided an explanation of how to implement the safety continuum.

Aircraft today range from very small drones, up to several hundred passenger transports. Each aircraft and associated operation benefits from the application of “appropriate” requirements. This is necessary to maximize safety features and operations.

Many factors play a role in risk and determination of safe operations. For example,

- What is the mission?
- How often does it fly?
- What are the required maintenance intervals?
- Where is it operated?
- Who flies the aircraft?

Looking forward, we need to do a better job of addressing risk to allow more flexibility and more resolution across the limited buckets we’ve developed based on historical and current aircraft and operations. While they worked well over the past 80 years, new technology and new types of operations are blurring the lines between these buckets. Moreover, those buckets, reflected in retrospective thinking, are hindering the introduction of safety enhancing innovation and new utility across the wide spectrum of aircraft being introduced in the aviation markets.

For further information please contact Lowell Foster at lfoster@gama.aero and Walter Desrosier at wdesrosier@gama.aero.
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
Drone Advisory Committee
October 27, 2021

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:

September 17, 2021

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 Advisory Committee at any time.
Opening Remarks

Bradley Mims
FAA Deputy Administrator
Agenda Review

Jay Merkle
Designated Federal Officer
FAA Drone Advisory Committee
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<td>FAA – Greetings &amp; Logistics</td>
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<td>DFO – Read Official Statement of the Designated Federal Officer</td>
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<td>FAA – Response to Task Group #9: Situational Awareness</td>
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Official Remarks from the DFO

Jay Merkle
Designated Federal Officer
FAA Drone Advisory Committee
Official Remarks from the DAC Chair

Houston Mills
Acting Chair
FAA Drone Advisory Committee
FAA Response to DAC Task Group #9
Situational Awareness

Emanuel (Manny) Cruz
Manager, Implementation Branch
UAS Integration Office
DAC Tasking:

Engage operators in low altitude airspace to obtain feedback on how remote identification might be used to increase situational awareness and use this feedback to develop recommendations on how the FAA can address responses to the RFI.
DAC Actions:

Established
Task Group 9
(3 Sub-groups)

Examined
• Specific question
• Spirit of the question

Explored
Ways to increase situational awareness in low-altitude airspace

Provided
4 High-Level Recommendations
High-level Recommendations

1) Avoid technology-specific recommendations related to the use of remote identification. Emphasize the accessibility of publicly available remote identification information.

2) Piloted aircraft practices and procedures should be voluntary. Should conform with existing electronic flight bag or onboard display technologies. Human-factors considerations should be investigated first.

3) UAS industry (partnering with the FAA and piloted aircraft community) should:
   • Develop integration strategies that foster maximum cooperation in low altitude airspace
   • Create avenues for piloted aircraft to access information regarding UAS operations.

4) Review existing policies related to piloted aircraft technologies to assess their adaptability to UAS use cases. Place emphasis and encouragement on UAS and piloted aircraft integration efforts already underway. Where possible, the FAA and industry should rely upon already-existing technology (such as ADS-B).
FAA Assessment of Recommendations:

• Thank you!
• We concur
• To address these recommendations, we commit to:

  Human Factors
  Investigate Human Factor Considerations

  Existing Tech Policies
  Review existing policies related to piloted aircraft technologies.

  Develop Strategies
  UAS industry collaborating with FAA and piloted aircraft industry should develop strategies to foster maximum awareness
FAA Assessment of Recommendations

Four Parameters on Actions Taken:

• Voluntary
• Emphasis on data accessibility
• Focus on existing integration efforts
• Rely on existing technologies
FAA Assessment of Recommendations

4 Parameters on Actions Taken

- **Voluntary**
  - Practices and procedures should be voluntary

- **Data Accessibility vs Tech**
  - Should avoid recommending technology, instead emphasize accessibility of data

- **Focus Area**
  - Focus on areas where integration efforts are underway

- **Existing Tech**
  - Rely on existing technologies
FAA Response

• Thank you!
• We concur
• To address these recommendations, we commit to:
  
  • Presenting these recommendations to the Drone Safety Team (DST) and recommending the DST establish the UAS industry workgroup that leads this effort.
  
  • Providing a white paper on human factors considerations to the industry workgroup.
  
  • Providing a white paper on existing policies related to piloted aircraft technologies to assess their adaptability to UAS use case to workgroup.
Discussion
FAA Response to DAC Task Group #10
Gender Neutral Language for the Drone Community

Abby Smith
Executive Director, Aviation Policy and Plans
Office of Policy, International Affairs and Environment
Background

• On February 24, 2021 the FAA presented the following task to the DAC:
  • The DAC to develop recommendations for gender neutral language as an alternative to gender specific terms currently used in the drone industry and aviation community.
  • The DAC to take the lead to facilitate the adoption of gender neutral language throughout the drone community and provide recommendations that organizations across the industry and community can implement.

• At the June 23, 2021 DAC meeting, Task Group #10 provided four recommendations to the FAA.
DAC Recommendations 1-2

1. Recommended that FAA adopt gender-neutral language in the drone industry, rather than gender-binary language.

2. Recommended replacing “unmanned” with “uncrewed” in order to maintain the use of “U” in acronyms (short-term). Drone is recommended as optimal for long-term use.
   • Consider working with Congress on a revised definition of “UAS” that more accurately describes these aircraft systems.
DAC Recommendations 3-4

3. Recommended that changes to adopt gender-neutral language take on two priorities:
   • All new documents and materials use gender-neutral language.
   • Rework of existing documents and materials be prioritized by the number of individuals exposed to the material, as well as the effort required to update them.

4. Recommended that FAA expand beyond drones to aviation more broadly.
FAA Response: Overview

• The FAA greatly appreciates the time and thought the DAC applied to this task. We understand this is a complicated topic and acknowledge the research and attention to detail the DAC put into this recommendation.

• To achieve this, we will need everyone to work together. Embracing diversity and inclusion will have a significant impact on bringing all voices into the conversation.

• The FAA acknowledges that many of the terms that the DAC has proposed are not new words. Nor are they new to aviation.
FAA Response – Short Term Actions

• The FAA is grateful for the DAC’s recommendations and agrees that diversity, equity, and inclusion are critical building blocks for unleashing and maximizing innovation.

• FAA has already begun taking steps to embrace gender neutral terms in documents. On July 20, 2021, the FAA published the draft Advisory Circular 150/5200-28G, Notices to Air Missions (NOTAMs) for Airport Operators, for public comment. This redefines the acronym NOTAM to no longer represent a gendered term.
FAA Response – Short Term Actions

• In addition, where possible and appropriate, the FAA will begin to use the term “drone” versus “Unmanned Aircraft System” or “UAS.”

• FAA is planning a systematic review and update to all agency programs, policies, procedures, orders, and regulations. FAA acknowledges transitioning to gender-neutral terminology will take time. Many terms are defined in statute and/or regulations, or for other reasons cannot be changed quickly. These updates will take multiple years.
Inclusive Language Summit

• The FAA is hosting a virtual Inclusive Language Summit to present and discuss recommendations the Agency has received that promote the institution of inclusive language throughout the FAA.

• The Summit will provide a platform for the public to comment and provide additional recommendations to the FAA as it develops an enterprise-wide initiative to adopt language that is both gender-neutral and inclusive.
Inclusive Language Summit

• In the spirit of bringing all voices to the conversation, the FAA seeks participation from all members of the public.

• DATES: The virtual meeting will be held on November 10, 2021 from 10:am to 12:30pm Eastern Time.

• ADDRESSES: This will be a virtual meeting and livestreamed on FAA’s social media platforms for members of the public to observe. To observe, follow FAA social media platforms on the day of the event at https://www.facebook.com/FAA, https://www.youtube.com/FAAnews, or https://twitter.com/FAANews.
FAA Response – Long Term Actions

• We acknowledge that the effort and time to fully implement these recommendations will be significant.
  • Long-term benefits will enhance safety in the national airspace system and benefit the future of aviation.

• FAA’s Office of Policy, International Affairs, and Environment and Office of Civil Rights will lead Agency development, coordination, and execution of any new policies or orders.
Discussion
10 Minute Break
Task Group #11 Presentation: Recommendations to FAA Acceptable Levels of Risk White Paper

Bob Brock
Director, Division of Aviation
Kansas Department of Transportation
TASK GROUP 11
ACCEPTABLE LEVELS OF RISK

- Members
- Charter
- Scope
- Framework
- Sub-groups
- Action Plans
- Position Papers

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<tr>
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<td>Director, Division of Aviation</td>
<td>Kansas Department of Transportation</td>
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<td>Jeffrey Brown</td>
<td>Aviation Chief Operating Officer</td>
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<td>David Carbon</td>
<td>Vice President, General Manager</td>
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<td>Lorne Cass</td>
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<td>Mark Colburn</td>
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<tr>
<td>Christopher Cooper*</td>
<td>Senior Director, Regulatory Affairs</td>
<td>AOPA</td>
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<tr>
<td>Brandon Torres Declet</td>
<td>CEO/Co-Founder; CEO/Board Director</td>
<td>MEASURE; AgEagle</td>
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<tr>
<td>Brad Hayden</td>
<td>Founder/CEO</td>
<td>RoboticSkies</td>
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<tr>
<td>Ben Ivers</td>
<td>Director of Autonomous Systems</td>
<td>Boeing</td>
</tr>
<tr>
<td>Robert King*</td>
<td>Aircraft/Equipment Risk Sub-Group Leader</td>
<td>UPS</td>
</tr>
<tr>
<td>Michael Leo</td>
<td>Captain</td>
<td>New York City Police Department</td>
</tr>
<tr>
<td>Dave Messina</td>
<td>President/CEO</td>
<td>FPV Freedom Coalition</td>
</tr>
<tr>
<td>Houston Mills, DAC Chair</td>
<td>Vice President, Flight Operations and Safety</td>
<td>UPS</td>
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<tr>
<td>Anthony Nannini*</td>
<td>Technical Program Manager</td>
<td>Wing</td>
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<td>Josh Olds</td>
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<td>Unmanned Safety Institute</td>
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<td>Vas Patterson</td>
<td>First Officer</td>
<td>Airline Pilots Association</td>
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<tr>
<td>Ric Peri</td>
<td>Vice President, Government and Industry Affairs</td>
<td>Aircraft Electronics Association</td>
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<tr>
<td>Jenn Player</td>
<td>Director of Regulatory Affairs</td>
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<tr>
<td>Mark Reed</td>
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<tr>
<td>Joel Roberson</td>
<td>Partner, Public Policy and Regulation Practice</td>
<td>Holland &amp; Knight</td>
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<tr>
<td>Mark Robbins</td>
<td>Executive Vice President, Government and Public Affairs</td>
<td>AUVSI</td>
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<tr>
<td>Scott Schofman</td>
<td>Drone Policy and Operations Consultant</td>
<td>Drone Service Providers Alliance</td>
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<tr>
<td>Jimmy Smith</td>
<td>UAS Representative</td>
<td>NATCA</td>
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<tr>
<td>Kenji Sugahara</td>
<td>President/CEO</td>
<td>Drone Service Providers Alliance</td>
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</tbody>
</table>
ACCEPTABLE LEVELS OF RISK

- Members
- Charter
- Scope
- Framework
- Sub-groups
- Action Plans
- Position Papers

Air / Ground Risk
Operator Risk
Aircraft / Equipment Risk
Principles & Tenets:

• A UAS regulatory framework needs to be:
  • **Clear**: Easy to understand, easy to implement, easy to measure
  • **Consistent**: Metrics are stable and applicable to entire UAS industry
  • **Useful**: Metrics that open a broad range of use cases, operational environments and platforms
  • **Effective**: Achieve a sufficient level of safety that the public trust is honored and maintained

• Use proven aviation & replacement risk data to justify UAS safety targets
Recommendations:

• Authorize an emergency-use provision for emergency/life-saving operations
• Implement a risk-based SORA-like approach to authorize operations outside 107 operations that includes pre-defined risk assessments (PDRA’s)
• Use rate-based safety targets relevant to all UAS operations
• Publish a map of low, medium, high risk airspace based on FAA traffic data
• Encourage Part 135 operators to use an SMS to track UAS safety events
• Emphasize Aviation Safety Reporting System (ASRS) use by UAS operators
Recommendations:

- UA for BVLOS operations. Require *risk-appropriate aircraft scrutiny* to establish airworthiness without defaulting to TC as the only method of aircraft performance assessment.
- Highest level of aircraft scrutiny should *only* be utilized for high-risk operations, higher risk UA (examples may include: higher weight, kinetic energy, size, etc.), and/or higher risk operating areas.
- Establish a risk-based quality system for production of aircraft and replacement parts, regardless of type design requirements.
Methodology:

- Support recommendations for the type of operator safety goals needed for UAS using historical analysis of aviation safety goals, e.g., commercial air carrier and general aviation
- Consider/compare/contrast other transportation safety performance objectives to support recommendations for the type of operator safety goals needed for UAS
Target Level of Safety Principles for Operator Risk Assessment

• When determining average and specific risk targets, consideration of the operational and economic impacts of such target should be taken into consideration. In addition, the unique and appropriate variables for the specific operator should be considered. Finally, consistent and predictable standards are needed to reduce risk prior to, and being approved for, requested operations.
Recommendations:

- 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.

- *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.

- Adjust the current operational approval process to *minimize duplication of effort* wherever possible.
• Formalize requirements that quantify or qualify go/no-go criteria
  • “Ask Better Questions”

• Organize and leverage FAA data so it is useful to all lines of business
  • “Be Transparent”

• Embrace SORA-like risk-based systems to credibly allow mitigations to offset risk
  • “Be True to the Data”
Questions/Comments
Task Group #12 Presentation: Integrating UAS Operations into K-12 Curriculums

Paul Hsu, Chairman, HSU Educational Foundation
Brian Wynne, Chief Executive Officer, AUVSI
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 to develop recommendations on how to integrate Uncrewed Aircraft Operations into K-12 curriculums.

Co Leads:
Paul Hsu, Chairman, HSU Educational Foundation
Brian Wynne, CEO, AUVSI
Our Approach on a 6 Month Timeline:
Phase 1 - Outline Objectives/Strategies by Sub-Group
Phase 2 - Discovery (Our Current Phase)
Phase 3 - Report Recommendations

• Leveraging a diverse and experienced team with representatives from these organizations:

<table>
<thead>
<tr>
<th>Academy of Model Aeronautics</th>
<th>FPV Freedom Coalition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Line Pilots Association, International</td>
<td>Global Drone Air Academy</td>
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<td>Moss Photography</td>
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<td>Dallas Police Force</td>
<td>Robotic Skies</td>
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<tr>
<td>Flite Test</td>
<td>United Parcel Service – Flight Forward</td>
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</tbody>
</table>
Phase 2 – Discovery:

- Research Existing Curricula & UAS Youth Education
- Current & Potential Integration Approaches into Core Classes and Exams
- Adoption of Standards Across National, State, and Local Agencies
- Non-Traditional Learning: After-school, Home-school, Extracurricular
- Financial & Business Justification
What we have learned:

• Potential Impact:
  o There are 50.6 million K-12 students in the USA, projected to grow in numbers by ~ 2% over the next five years.
  o Aviation STEM brings future opportunities to workforce development: employers, students, and teachers.
  o UAS implementation is necessary, timely and feasible for inclusion into all core and non-core curriculum.

• Approaches for Integration of Uncrewed Aviation into STEM:
  o Utilizing UAS platforms and applications to teach existing STEM standards provides a starting point.
  o Career and Technical Education courses and certifications allows for depth of UAS related training.
  o After school, home school and extracurricular programs supplement core class teachers.

• Elements of Successful Programs:
  o Simple, hands-on thoughtful applications provide greater student engagement and make it fun to learn!
  o Schools and teachers are incentivized by measurable results. Cross subject cooperation among teachers is most ideal.
  o Subject matter expert and mentor involvement leads to greater understanding and value for these fields of study.
Task Group 12 potential recommendation areas:

• FAA to create inter-agency working group to develop UAS-specific curricula standards and framework for K-12 which may be easily adopted by Dept. of Education and local school systems
  • TG12 outlining initial opportunity areas in line with existing core curriculums and career technical training

• FAA to create UAS-STEM Levelized Certifications
  • Establish a criteria to achieve FAA certification in variety of leveled UAS applications
  • FAA to utilize TRUST to implement and promote UAS-STEM Certifications
  • Minimal cost to FAA

• FAA to encourage greater access and identification listing of Subject Matter Experts, Mentors and Industry Partners willing to help foster UAS and aviation education.

**TG12 Final Recommendations to be presented at next DAC**
Questions/Comments
New Business/Future Agenda Topics

Houston Mills
Acting Chair
FAA Drone Advisory Committee
Closing Remarks

Jay Merkle
Designated Federal Officer
Executive Director, UAS Integration Office
Adjourn

Houston Mills
Acting Chair
FAA Drone Advisory Committee
AMENDED DAC CHARTER

Charter of the Drone Advisory Committee
U.S. Department of Transportation

1. **Committee's Official Designation.** The Committee's official designation is the Drone Advisory Committee (DAC).

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 DAC 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 Unmanned Aircraft Systems (UAS) into the National Airspace System. In response to FAA requests, the DAC may provide the FAA and DOT with information that may be used for tactical and strategic planning purposes.

4. **Description of Duties.** The DAC 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 DAC 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 provide input to DOT and the FAA on the overall DAC structure (including the structure of subcommittees and or task groups).

5. **Agency or Official to Whom the Committee Reports.** The DAC reports to the Secretary of the U.S. Department of Transportation (DOT) through the FAA Administrator.

6. **Support.** The FAA will provide support as consistent with the act, including funding for the Committee. The UAS Integration Office is the primary entity within the FAA responsible for supporting the DAC.

7. **Estimated Annual Operating Costs and Staff Years.** The FAA's annual operating costs to support the DAC 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 DAC Designated Federal Officer (DFO). The DAC 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 DAC 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.**

    a. DAC estimates meeting three times a year to carry out its responsibilities. DAC 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 1120.3B.

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 DAC is terminated, the FAA will give as much advance notice as possible of such action to all participants.

12. **Membership and Designation.** DAC shall comprise members appointed by the U.S. Secretary of Transportation upon recommendation by the FAA Administrator. All DAC members serve at the pleasure of the Secretary of Transportation.
a. The DAC will have no more than 35 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 manned aviation operators; UAS hardware component manufacturers; UAS manufacturers; corporate UAS operators; citizen UAS Operators; UAS software application manufacturers; advanced air mobility and industry associations or other specific areas of interest as determined by the DAC DFO.

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.

13. Subcommittees. The FAA Administrator has the authority to create and dissolve subcommittees as needed. Subcommittees must not work independently of the DAC. They must provide recommendations and advice to the DAC, not the FAA, for deliberation, discussion, and approval.

14. Recordkeeping. The records of the DAC 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 DAC will be available for public inspection at https://www.faa.gov/uas/programs_partnerships/drone_advisor_y_committee/.

15. Filing Date. This charter is effective June 12, 2020, and will expire 2 years from that date on June 12, 2022. The amended charter is effective January 13, 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 Drone Advisory Committee (DAC) 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. DAC members assume the following responsibilities:

- Attend ¾ of all DAC public meetings during membership term.
- Provide oversight, deliberation, comments and approval of the DAC 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 DAC and any subcommittee or working group recommendation reports.
- Inform the DAC Chair and the DFO when he or she can no longer represent his or her organization/association on the DAC.
  - Members may continue to serve until a replacement has been appointed or removed.
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.
Captain Houston Mills

UPS Vice President Flight Operations & Safety,

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 one of 35 executives on the newly formed FAA Drone Advisory Committee, where he brings an airline and pilot 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, and member of the International Air Transport Association (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 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 serves on the national Board of Directors of the Marine Toys for Tots Foundation, Association for Unmanned Vehicles Systems International (AUVSI), Aero Club of Washington Board of Governors, 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 June 23, 2021, from 12:00 PM to 2:30 PM EST. This meeting was held virtually and livestreamed because of the COVID-19 emergency.

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 turned the meeting over to the Acting Deputy Administrator, Mr. Bradley Mims. Capt. Mims expressed his thanks to the DAC members for their hard work. He then introduced Captain Houston Mills as the new DAC Chair and Mr. Jeffrey Brown as a new DAC member. Capt. Mims highlighted the different manners in which UAS technology is being used by the public. He highlighted the number of drone registrations and drone pilots and emphasized that the work of integrating drones into the National Airspace System (NAS) will only become harder as we take on the challenges of beyond visual line of sight (BVLOS) operations. Capt. Mims closed his remarks by saying he looked forward to receiving even more great feedback from the DAC in the coming year. After finishing his remarks, Capt. Mims turned the meeting back over to the DFO. Mr. Merkle then discussed the agenda for the meeting. Lastly, Mr. Merkle asked for a motion for approval of the October 2020 meeting minutes. There were no objections and the motion passed.

After concluding the housekeeping items, Mr. Merkle began his opening remarks. Mr. Merkle welcomed the new Chair and DAC member. He highlighted significant activities and achievements that have taken place since the last meeting such as the UAS Symposium, the creation of a BVLOS Aviation Rulemaking Committee (ARC), and the establishment of the Recreational UAS Safety Test (TRUST). He thanked the DAC members for their hard work in developing the recommendations that will be presented at the meeting. He then turned the meeting over to the DAC Chair.

View the DFO’s remarks (link is timestamped for DFO Opening Remarks):
https://youtu.be/xRRI-LcedoA?t=628

DAC Chair Opening Remarks

DAC Chair, Houston Mills, began his remarks by thanking everyone for attending the virtual DAC meeting. He said he was proud of the work that the DAC has done. He highlighted that
the blending of traditional and non-traditional representatives on the DAC allows the FAA to stay ahead of the curve and create a regulatory environment that keeps safety as our North Star while simultaneously embracing innovation. After his opening remarks, Capt. Mills turned the meeting over to Task Group 9 for their presentation.

View the DAC Chair’s remarks: (link is timestamped for DAC Chair Opening Remarks):
https://youtu.be/xRRi-LDedoA?t=855

Task Group #9: Situational Awareness

Presenters:
James Burgess, Wing; Matthew Satterley, Wing; Chris Cooper, Aircraft Owners and Pilots Association (AOPA); Chad Budreau, Academy of Model Aeronautics (AMA); Jenn Player, Skydio; Mark Colborn, Retired Dallas Police Department; Sam Ewen, Skyward.

Mr. Burgess opened the presentation and provided a broad overview of the tasking. He then turned the presentation over to Matthew Satterley to brief how the task group developed their recommendations. Mr. Satterley described the process the task group took in establishing three sub-groups and briefed the four high level recommendations. He then turned the briefing over to each of the three sub-group leads to provide further detail on their specific recommendations.

The DAC eBook provides the official set of Task Group 9’s recommendations and presentation.

Following the presentation, there was a DAC Task Group 9 discussion.

Upon completion of the discussion, the DAC Chair entertained a motion to accept the recommendations and forward them to the FAA. The motion passed with no objections.

View this presentation and discussion (link is timestamped for Task Group 9: Situational Awareness presentation):
https://youtu.be/xRRi-LDedoA?t=954

Unmanned Aircraft Safety Team (UAST) Briefing

Presenter:
Pete Dumont, President and CEO, Air Traffic Control Association (ATCA)
Mr. Pete Dumont presented an information briefing on the UAST. He spoke about the UAST's history and mission. He then provided a brief description of each of the UAST’s five working groups, which are: data analysis, safety assurance, safety mitigation, strategic communication, and the newly created beyond visual line of sight (BVLOS).

Following the presentation, there was an opportunity for a short discussion about the UAST.

View this presentation and discussion (link is timestamped for Unmanned Aircraft Safety Team (UAST) Briefing: https://youtu.be/xRRrLDeoA?t=3667

**DAC Task Group #10 – Gender-Neutral Language for the Drone Community**

**Lead:** Trish Gilbert, Executive Vice President National Air Traffic Controllers Association (NATCA)

**Presenters:** Michelle Schwartz, Los Angeles World Airports (LAWA), Chris Anderson, 3DR, Mark Baker, President & Chief Executive Officer (CEO), AOPA

The DAC Chair called upon Trish Gilbert to present on Task Group 10, Gender-Neutral Language for the Drone Community. Ms. Gilbert began the presentation reviewing the tasking and outlining why gender-neutral language is important. She turned the presentation over to Michelle Schwartz to present the first of the four recommendations. Mr. Chris Anderson presented the second and third recommendations and Mr. Mark Baker presented the fourth recommendation.

The DAC eBook provides the official Task Group 10 recommendations report and presentation slides.

Following the presentation, there was a Task Group 10 discussion and question and answer period.

Upon completion of the discussion, the DAC Chair entertained a motion to accept the recommendations and forward them to the FAA. The motion passed with no objections.

FAA Deputy Administrator Mr. Bradley Mims then thanked the task group for their efforts and said the FAA is committed to reviewing these recommendations for not only the drone community, but across the entire aviation community. Capt. Mims acknowledged that some recommendations will require a longer timeline than others to implement due to regulatory procedures.
Capt. Mims also took the opportunity to welcome the newly appointed Assistant Administrator for Airports, Shannetta Griffin.

View the presentation and discussion (link is timestamped for Task Group 10 recommendations): https://youtu.be/xRRI-LDedoA?t=5779

New DAC Taskings

Presenter:
Jay Merkle, DFO and Executive Director, FAA UAS Integration Office

Mr. Merkle, shared that the FAA is issuing a new tasking for the DAC. The tasking presented by Mr. Merkle asks the DAC to provide comments and validate a White Paper titled “Acceptable Level of Risk for UAS Operations.”

The DAC Chair entertained a motion to accept the FAA tasking. The motion passed with no objections.

The tasking was turned over to the Operations and Technology Subcommittee and their report was scheduled for the next DAC meeting in October, 2021.

Mr. Merkle presented a second tasking to the DAC. He asked the DAC to develop recommendations on how to integrate UAS Operations into K-12 curriculums. Mr. Merkle went into additional detail on the importance of this tasking and answered questions from DAC members.

After the presentation the DAC Chair entertained a motion to accept the FAA tasking. The motion passed with no objections.

The tasking will be assigned to the Operations and Technology subcommittee for a recommendations report to be presented at the October, 2021 DAC meeting.

View the presentation and discussion (link is timestamped for New DAC Tasking): https://youtu.be/xRRI-LDedoA?t=7757
New Business/Agenda Topics

The Chair opened the floor to DAC members to bring up any new business topics or agenda topics. Mr. Kenji Sugahara brought up an item regarding a recent Low Altitude Authorization and Notification Capability (LAANC) system outage. Mr. Tim Arel, FAA Air Traffic Organization, was available to answer questions regarding this outage. Mr. Vic Moss raised an issue of maintaining the safety of drone operators. Mr. Merkle agreed to meet at a later time to discuss the best course of action. Dr. Paul Hsu thanked the FAA for selecting his organization as one of the TRUST administrators.

View the discussion (New Business/Agenda Topics):
https://youtu.be/xRRI-LDedoA?t=8161

Closing Remarks and Adjourn

Mr. Merkle began his closing remarks by thanking all those who help make the DAC possible, and by welcoming the new DAC Chair. He acknowledged that he is looking forward to working with him and is excited to see all the great work that the DAC will accomplish in the future. Mr. Merkle thanked the task groups for their work and emphasized that the Task Group # 10’s recommendations are a template for other groups to use throughout the aviation community. He closed with a call for anyone that is interested to submit their applications to become members of the DAC or one of its subcommittees. He then turned the floor over to the DAC Chair.

Capt. Mills thanked the FAA and the DAC members for their effort in making this meeting happen. Capt. Mills shared he was proud of the work that the DAC has done and wished everyone continued success.

After concluding his remarks, the Chair asked for a motion to adjourn the meeting. The motion was approved and the meeting was adjourned.

View the closing remarks (Closing Remarks and Adjourn):
https://youtu.be/xRRI-LDedoA?t=8578
# Appendix A: FAA Meeting Attendees

<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</td>
<td>FAA</td>
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<tr>
<td>Bradley Mims</td>
<td>Deputy Administrator</td>
<td>FAA</td>
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<tr>
<td>Angela Stubblefield</td>
<td>Chief of Staff</td>
<td>FAA</td>
</tr>
<tr>
<td>Laurence Wildgoose</td>
<td>Assistant Administrator, Office of Policy, International Affairs and Environment</td>
<td>FAA</td>
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<tr>
<td>Ali Bahrami</td>
<td>Associate Administrator, Aviation Safety</td>
<td>FAA</td>
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## Confirmed FAA/DOT Observers

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Written Public Comments Submitted Since Last DAC Meeting
DAC Members,

I read the NATCA newsletter with the article “Drone Advisory Committee Stresses the Importance of Gender-Neutral Language” and then watched the presentation by Task Group 10. In the example/style guide Airmen and NOTAM were in the harder to change category. I feel that those terms do not need to be changed. The definition of Airmen in the Merriam-Webster dictionary makes no mention of gender.

The push to make everything gender-neutral, I believe, is going the wrong direction. Men or man is the core in most terms describing people. Far fewer definitions of man specify a gender than are gender-neutral. Mankind is one of the most common terms used to include everyone and not discriminate between male and female. Does the word human need to be changed?

Only in recent history does the term man exclude anybody. Everyone was man, and a woman was a man that could bear children. If we go to a time when nurses were all female due to culture, that does not mean the term nurse is only for females. When males becoming nurses was more common the term male nurse was used and was offensive to both sexes. Many languages such as Spanish and French give words a masculine or feminine emphasis, but that does not define if something is male, female, nonbinary, etc.

Instead of making an already complex language more complex and creating more words that create exclusion, I suggest the FAA and aviation industry start a trend and make a stand to make things simpler. Even if people do not agree with my examples, consider the result of creating new words labeled as gender-neutral. If a gender-neutral term gets created to replace airmen, by default airmen gets defined as having a gender assigned to it. This creates division and more language for exclusion. If the definition for airmen is clarified that it has no gender, then there is only a word that includes everyone, and inclusion is the only option.

Adding a definition to the beginning of the affected documents would be easier to implement than replacing the affected words in all the documents and publications. As stated in the presentation and following comments for the Task Group 10 recommendations, there is already a lot of effort and resources being put into reaching out to underrepresented groups. During these events and programs, a clarification could be made that these words are all inclusive and are not excluding anyone.

If everyone could take a step back and really think if a word is truly gender specific or if recent culture has made us think these words are gender specific. This same process could be applied to words besides airmen and the FAA could be part of a cultural shift that is truly inclusive and not creating more words and more division. I feel the changing of these words will only hurt and complicate the long term goal of gender-neutrality.