

2024 Gateways to Blue Skies Competition: Advancing Aviation for Natural Disasters **Q&A Session #1 November 2, 2023**

3:30–5:00 PM Eastern

(Please mute all mics.)



The Gateway to Blue Skies: Clean Aviation Energy Competition is sponsored by NASA's Aeronautics Research Mission Directorate's (ARMD's) University Innovation Project (UI) and managed by the National Institute of Aerospace (NIA).



Session Agenda



- Welcome & Introductions
- Context for and Discussion of 2024 Theme
- General Technical Remarks
- General Programmatic Remarks
- Questions Received in Advance
- Additional Questions (Time Permitting)
- Wrap Up



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Context for and Discussion of 2024 Theme:

Advancing Aviation for Natural Disasters

Context for and Discussion of 2024 Theme



Through the 2024 Blue Skies Competition, collegiate-level student **teams will conceptualize applications of new and existing capabilities that can be deployed through aviation to aid in one of the management phases of a selected natural disaster to improve capabilities.** This challenge seeks to investigate aviation-related capabilities that, if developed further or approached differently, could play a major role in modernizing existing disaster management practices, thereby mitigating loss of life, property, and/or natural resources due to natural disasters.





Risk

Wildland fires are more frequent and larger leading to increasingly negative impacts on the economy, public health, and natural ecosystems

Damage

5 of the largest fire seasons on record have occurred within the last 10 years (with over 9M acres burned)





- Climate change affects wildfire risk
- Wildfires affect Climate (e.g., CO2, black/brown carbon)
- Wildfires are costly to US economy
- Wildfires are increasingly impacting where people live

Gaps Assessment Workshops



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NASA, in collaboration with the U.S. Forest Service, conducted a series of workshops to understand the state-of-the-art, needs, and opportunities to improve wildfire management

- May 2021 Workshop Focused on pre-fire fighting, during fire fighting, and post-fire needs
- Feb. 2022 Workshop Focused on understanding barriers in integrating science and technology into wildfire management
- March 2022 Workshop Focused on understanding top safety-oriented risks, gaps, and enabling technologies

Main Findings

- Need for cross-agency coordination and a clear plan to mature research for operational use
- Lack of persistent surveillance for fire detection and tracking, and reliable communications
- Lack of persistent aerial operations particularly under poor visibility
- Lack of airspace technologies to enable multiple types of aircraft operating simultaneously
- Need for enhanced situation awareness and timely access to information
- Current fuels map of limited utility for operational management
- Need to reduce debris flow prediction uncertainty including landslides, floods, impacts to watersheds
- Fire behavior models do not have the necessary fidelity and/or timeliness to accurately predict fire behavior and fire spread to support operational fire management
- May 2021 Workshop report available at https://nari.arc.nasa.gov/sites/default/files/attachments/NASA%20ARMD%20WILDFIRE%20MANAGEMENT%20WORKSHOP 6.1.2021 v13.pdf
- Feb 2022 Workshop report available at https://aam-cms.marqui.tech/aam-portal-cms/assets/ki2yd52vavkccskc
- March 2022 Workshop report available at https://ntrs.nasa.gov/citations/20220014721

Findings offer insights where research and development could make a significant impact

Advanced Capabilities for Emergency Response Operations



8 ACERO



Key Stakeholder Barriers and Impacts

Unclear Technology Integration Path

Duplicative and non-harmonized stakeholder technology investment

Reliability of Fire Monitoring and Communications Decisions limited by outdated and incomplete information

Limited Aerial Suppression Support

A lack of aerial suppression support for degraded visual environments limits effectiveness in reducing fire intensity and containment



<u>GOAL</u>: Develop, integrate, demonstrate, and transition to operations, NASA and industry aviation technologies to identify, monitor, and mitigate wildland fires and other emergencies, to enhance safety, improve efficiency of operations, and minimize economic loss.

Context for and Discussion of 2024 Theme





Last year... 18 Confirmed Disasters *Costing 178 Billion Total*

This year... 24 Confirmed Disasters

Costing Over 1 Billion Each

https://www.ncei.noaa.gov/access/billions/



This map denotes the approximate location for each of the 24 separate billion-dollar weather and climate disasters that impacted the United States through September 2023.

General Technical Remarks



Proposal and Video Expectations

- What are we looking for in the proposal?
- What are we looking for in the video?
- What we **DO** want to see in the Competition:
 - High-level systems concepts,
 - Understanding of current natural disaster & response landscape,
 - Consideration of operational environment (physical and logistical),
 - End-user consideration and engagement,
 - Decisive and scoped concept choices (one system does not fit all solutions)
 - The ability to close gaps in current aviation-related natural disaster responses
- What do we **NOT** want to see in the Competition:
 - Detailed aircraft design studies
 - Physical prototypes



Programmatic Remarks



Guidelines PDF

- Primary Faculty Advisor must sign the Proposal.
- Finalists selected based on Proposal and Video Submission.
 - Final scoring starts with research paper/infographic and ends with presentation at the Forum. In other words, you CAN and NEED TO provide updates between the proposal and final research paper!
- Be sure to read the Competition Guidelines in full before diving into analysis.
 - The Competition Guidelines are the foundation upon which your submission will be judged!
 - Carefully review the evaluation criteria.
- Remember: You will need to submit a W-9/Vendor Form with your Proposal.
- YOU are selling your proposed concept to the judges!





- What weather conditions should be considered? Should a certain kind of natural disaster be emphasized? (i.e. earthquake, flooding, wildfire, etc.)
 - Teams should frame their proposal by selecting one natural disaster and one phase of disaster management (preparation, response, or recovery) - See Step 1 on Page 5 of the <u>Competition Guidelines</u>. Remember that the competition encourages teams to select a natural disaster that they are passionate about or that may affect them regionally or personally.

Due to available analysis space, teams should focus on one phase, though they may mention how solutions spill over into other disaster management phases (if applicable). Weather conditions impacting the proposed solution should be directly relevant to the selected natural disaster.





- Should our plan be integrated into current facilities and/or devices or can it be entirely new and independent designs?
 - Teams can develop concepts that integrate into current operations or suggest new and independent technologies and designs. Remember that this competition is designed to develop concepts that modernize the approach to disaster management with the goal of closing gaps and improving operations. Proposals of new technology that creates new operational gaps or raises more questions than answers will not be as strong in this competition. Remember that teams are encouraged to consider high-potential technologies and systems that aren't currently mainstream or are not currently highly regarded as becoming mainstream in the future.





- Can the concept include both air and space? Or do we have to choose just one.
 - The concept must involve aviation related systems. The additional use of space systems would be up to the group and their concept. However, make sure to consider the development cost and timeline of any potential new systems when considering feasibility and ease of use.
- Are satellites or similar "low-orbit" technologies considered aeronautics? And are those technologies allowed in this competition?
 - For the scope of this competition, satellites and objects in low earth orbit (LEO) are not considered aviation/aeronautics systems. However, this does not mean that these technologies are not allowed to be used in addition to any aviation/aeronautics systems. Be sure to consider the development cost and timeline of any potential new systems when considering feasibility and ease of use.



- Are there any physical constraints in terms of mass or materials used?
 - The <u>Competition Guidelines</u> do not set such constraints. Mass and materials, if considered, are up to the group to determine and justify, based on research.
- Will the navigation facilities, such as Instrument Landing System (ILS), Very High Frequency Omni-Directional Range (VOR), and Distance Measuring Equipment (DME) be operable? Similar Question: Will surveillance aids such as radar, Automatic Dependent Surveillance-Broadcast (ADS-B), or Airport Surface Detection Equipment (ASDE) be available to us? Similar Question: What resources can we consider available for purposes of our technology? More specifically, will cell reception/internet and/or electric/power be available?
 - Based on the natural disaster, weather conditions, theoretical locations, outages assumed, or other variables, groups may determine, set, and justify the operability of various systems.



- Do we need to be concerned with conducting approaches without navigation equipment into the disaster airport?
 - If various realistic conditions/potentialities for operations in certain conditions are not considered in papers or presentations, it may raise questions on the judging panel.
- Would the plans fall under control of any regional federal agencies (such as the FAA) or should we disregard local regulations?
 - Existing authorities, laws, regulations, agencies, etc. should be considered when preparing the conops of the system.





- Are high altitude platform station aircraft allowed?
 - High altitude aircraft are allowed to be considered as part of a system.
- How long does our technology need to operate for? Should it be seen as temporary, or, after implementation, something permanent?
 - This is for the group to determine in relation to the selected natural disaster, phase, and other aspects of their proposal. Consider costs and operability needs.





- What is NASA's current disaster management technology and what changes are anticipated in the next decade? Specifically, how is NASA planning to improve its drone technology by 2035?
 - For the answer to this question, refer to remarks made by Dr. Marcus Johnson at the beginning of the Q&A Session, Competition Context & Theme.
- If we want to create a systems level technology implemented by 2035, then what level of development do the technologies within the system have to be at right now?
 - It would be easier to feasibly assume that a currently mid-high technology readiness level (TRL) end technology would be able to be produced and implemented by 2035. However, the timeline of technology development is not the same for all technologies.





- To submit the Proposal & Video, do we need to show the results including all datasets? How in depth do we have to go for our metrics in our project proposal?
 - The proposal needs to reflect the total scope planned for the final paper, addressing all aspects described in the <u>Competition Guidelines</u>, page 5 (Competition Theme Description and Details). It should be at the "convincing" level - demonstrating a strong basis of research analysis having already been conducted. Include enough detail to convince the judges that your proposed concept has been well researched and developed, that it is credible and viable with sound justification, and provide confidence that your team can further refine and develop your concept if selected as a finalist. Remember, special emphasis should be placed on analyzing innovative energy sources.





- To submit the Proposal & Video, do we need to present a workable AI model or to what extent should the proposed model go for the proposal?
 - Without details about the specific AI model this is hard to answer. However, we were not originally thinking/looking for AI models as part of this competition.
- Does implementation of our technology need to be capable of nationwide and/or worldwide deployment?
 - Natural disasters are a global phenomenon, exacerbated by climate change. Responses around the world can have similarities, differences, and varying opportunities. How your team chooses to frame your solution is up to you, but consider that judges may ask questions about opportunities for global deployment in their evaluations and during finalist team presentations.





- Are we expected to submit a single design concept or a range of designs?
 - The competition is not limited to a single system; teams may present more than one if desired. However, it is not required nor expected to submit more than one solution. A team that chooses to examine more than one solution likely will do so if the systems are interrelated or required to help close the disaster management improvement opportunity that's been identified. Your page space is limited, so more designs will limit the amount each design can be spoken for.





- Is a conceptual design the final product or will we have to provide a preliminary design?
 - The proposal will focus on preliminary aspects of your final concept. It should paint the picture, in a convincing manner, of the intended system and analysis required to prove its relevance, feasibility, and viability in the natural disaster management landscape. To be selected as a finalist, teams must present as credible a proposal as possible. Finalists will have the opportunity to further develop their concepts as they work toward a final technical paper, infographic, and in-person presentation.





- Can our concept change between submitting our Notice of Intent and submitting our Proposal?
 - Absolutely. Teams will develop new insights as they research this project, and are not limited to the concept written in their NOI. It is anticipated and expected that concepts will at least evolve, if not change entirely between NOI and Proposal deadlines.
- Are physical prototypes allowed for presentation?
 - Physical prototypes are not required for the presentation, but could be welcome depending on size. Finalist teams will receive additional direction regarding prototypes, if applicable. Teams do not earn extra points for physical prototypes. In this competition, the *how* of a system is likely more relevant than the *what*.





- We have two teams from our institution, mentored by two different faculty. We were wondering if the two teams will be allowed to come up with different components of a larger solution.
 - Integrating concepts across university teams is a great idea! Bear in mind that each proposal must stand on its own, adhering to the full scope of the requirements and guidelines. As long as these criteria are met, integrated solutions from two different teams are welcome. The <u>Competition Guidelines</u> and <u>Evaluation Matrix</u> are how proposals will be evaluated by the judging panel to select finalist teams.





- What resources are available to us from you if we were to be selected in the final process of the competition?
 - Teams are expected to identify and use their own resources in their proposals. Peer-reviewed academic and scientific resources written by subject matter experts are recommended sources in your information search. Information sources may include:
 - FAA (<u>Research Reports</u>, <u>Aerospace Medicine Technical Reports</u>, <u>Fire Safety</u> <u>Reports</u>, etc.),
 - FEMA Reports & Data,
 - NOAA (<u>National Centers for Environmental Information</u>, <u>National</u> <u>Environmental Satellite</u>, <u>Data</u>, and <u>Information Service</u>, etc.),
 - National Technical Reports Library,
 - <u>NASA Open Source</u>, the <u>NASA Technical Report Server</u>, etc.





- Can teams work with and have contact with industry professionals on technology used in their specific workplaces?
 - Absolutely! It is highly encouraged to work with industry professionals to understand the opportunities and needs that exist within your chosen natural disaster/management phase.
- Are there any limitations regarding the (overall theoretical project) budget?
 - NASA has not prescribed theoretical budget limitations. Agency budgets are typically tight, and cost is often a factor in technology adoption. Rather than prescribe a budget, teams should look at costs of current systems as well as the cost of the proposed service, technology, or capability and analyze whether it is affordable for the agency proposed as end user.





- Since none of us are videographers, can we have students outside of our group help film the video so long as the content is our own?
 - Videos should be produced by the team. Multi-disciplinary teams will be the most successful in this competition (consider the creative aspects of building an infographic, for example), so if it makes sense to add a creative member to the team, it may help position the team for success with the video and infographic. That said, just as teams may (and should) seek subject matter experts for their research, teams may access outside resources to guide the development of the video.





- Some undergraduate members of this group are graduating with Bachelors in May 2024 and are not seeking a Master's degree after graduation. Will they be able to participate? If so, would the prize include an opportunity for full time employment offers instead of internship?
 - Team members who have active student status during the course of the 2023-24 school year are eligible to participate. In terms of internship prize eligibility, graduates in May 2024 are eligible to enter an internship, however, they may have already established post-graduate plans by the time winners are determined at the end of the Forum. The prize cannot be converted from internship into full time employment for a variety of reasons. However, taking an internship with NASA positions individuals for success in the application process!





- Can non-U.S. Citizens participate in the competition? Even if they are legally allowed to work in the U.S.?
 - Non U.S.-Citizens may compete in the competition. This year, non-U.S. Citizens should not have any trouble traveling to and participating in the Forum, even if it is held at a NASA Center, because Ames Research Center does not restrict who can access its Conference Center (a valid ID is required). However, non-U.S. Citizens may not be able to participate in the Center Tour, due to additional clearance requirements, and would not be eligible for a NASA internship.





- Our team does not yet have an advisor secured. Is that a problem?
 - A mentor/faculty advisor can be secured at any time in the proposal development process. It's encouraged to have one in place during concept development, but at minimum, they must be secured prior to submitting a proposal to fulfill several duties, including: signing off on the proposal, accepting finalist stipend awards and distributing them to teams according to university policy, and guiding the development of final deliverables for finalist teams. See the <u>FAQs</u> for more information on the roles and responsibilities of a faculty advisor.



Live Q&A



Open Call for Additional Questions Use the "Raise Hand" Function or type your question in the Chat!



Future Questions?



PLEASE SEND ALL FUTURE QUESTIONS TO: BLUESKIES@NIANET.ORG

Each question will be responded to directly, as well as posted on the FAQ Webpage for everyone to see.

We encourage you to visit the FAQ Webpage frequently for updates: https://blueskies.nianet.org/faq/

Scan the QR Code to view the 2024 Gateways to Blue Skies Competition Guidelines Document.



