

NASA Advisory Council Aeronautics Committee Meeting
6 June 2023
NASA Headquarters Mary W. Jackson Building
Washington, DC

Welcome

Dr. John-Paul Clarke, committee chair, called the meeting to order. Introductions were made and information regarding the purpose and scope of the Committee's discussions, findings, and recommendations were described. This meeting was conducted in a hybrid style, with some attending in person at NASA Headquarters in Washington, DC and others attending virtually.

Future of Vehicle Technology Development

Dr. James Heidmann, acting director of the Advanced Air Vehicles Program, gave an overview of current research activities in the Sustainable Flight National Partnership (SFNP). He discussed how, all conditions the remaining the same, Aeronautics Research Mission Directorate (ARMD) leadership anticipates a future wedge in the budget following the closing out of several current activities.

Dr. Heidmann prompted brainstorming of what new tall-pole missions and projects could feasibly be pursued. He explained how SFNP projects were born out of the N+3 studies of the 2000s – and that this anticipated budget wedge provides an opportunity to “rinse and repeat” that model of engaging the aviation community to identify future audacious goals.

While covering NASA's current research, he postulated about ideas for future research including, but not limited to, various concepts in Hydrogen propulsion; electrified aircraft propulsion; materials, structures, and manufacturing; high-speed supersonic flight; and others.

Discussion

Mr. Robert Pearce, NASA's associate administrator for Aeronautics, mentioned NASA's Gateway for Blue Skies competition. He commended the participating teams and their out-of-the-box ideas, such as the winning aluminum powder concept. He highlighted the value of getting some of these ideas on the table whether they come to fruition or not.

Dr. Helen Reed asked what the mechanism would be for bringing these out-of-the-box ideas into the NASA pipeline. Mr. Pearce answered the University Leadership Initiative (ULI) is a mechanism, and it is the next level up for teams participating in such research competitions.

Dr. Clarke brought up the process used by the NASA Innovative Advanced Concepts (NIAC), which enables these smaller teams with more out-of-the-box ideas, like powdered aluminum, to be brought in; comparatively, ULI is broader and more multi-university than NIAC. Dr. Reed concurred and stated support for bringing in smaller teams.

Mr. Jay Dryer asked, in the context of reusing the N+3-style approach to field new research areas, whether NASA has intentions to collaborate with other agencies such as the FAA or the Department of Energy on these advanced, out-of-the-box future research ideas. He gave the example of powdered aluminum, which would present logistics challenges outside NASA's focus. He explained how a whole-of-government approach would be required and that NASA has the credibility to lead such an effort. He emphasized that asking "what will it take to operationalize this?" leads to collaboration with government and industry that identifies holes in the process and anticipate challenges before they arise.

Dr. Clarke and Dr. Reed agreed with Mr. Dryer. Dr. Clarke noted that in some areas such as fuel, the FAA is not actually the agency with the bulk of regulatory control, and that identifying and tying in other appropriate agencies is a worthwhile idea.

Dr. Reed asked whether NASA has considered the operationalization of high-speed supersonic flight, and what it would take to fully enable it. She pointed out that someone must lead the community through the challenge of reaching that intended end goal of a holistic, operational system. She emphasized that future challenges, such as regulatory hurdles, should start to be addressed now.

Findings:

1. The Committee finds NASA would benefit from clearly articulated mechanisms to transition promising out-of-the-box ideas, such as those presented in the recent Gateway to Blue Skies competition, into the research mainstream (e.g. providing internships and pathways opportunities, as well as hiring students who have distinguished themselves, developing internal research efforts and NASA Research Announcements based on promising ideas, etc.).
2. The Committee finds NASA should, when determining "what NASA could do," consider leading all-encompassing, whole-of-government efforts (e.g. research and development, policy, lifecycle analysis, operations, etc.). For example, as it pertains to the Sustainable Flight National Partnership, NASA might consider leading and coordinating government-wide research and development in alternative energy and propulsion that may fall under the regulation of an agency other than the FAA.

Future of Flight Demonstrations

Mr. Lee Noble, director of the Integrated Aviation Systems Program, gave an overview of NASA's flight demonstration activities, including the X-59 aircraft and the Sustainable Flight Demonstrator (now referred to as the X-66A).

In much the same thread as Dr. Heidmann's presentation, Mr. Noble directed attention towards the future, with particular focus on potential future flight demonstrations and goals given the anticipated opening of the budget in several years' time. He explained the process by which ARMD identifies and selects flight demonstrations.

He presented to the Committee a handful of hypothetical research options based on current goals and commitments to sustainable aviation, Advanced Air Mobility (AAM), and commercial supersonic transportation – none of which have been explicitly committed to by ARMD, rather just considered as potential options.

Discussion

Dr. Reed asked about funded space act agreements (FSAAAs) and suggested continuing the idea of a construct by which industry gets to have “more skin in the game” of developing and conducting flight demonstrations.

Mr. Dryer asked whether the FSAA will still be the most advantageous construct for future flight demonstrations, particularly with regards to demonstrations involving multiple partners and/or safety-related activities. He explained how lessons learned from going through different acquisition approaches could be shared across the government since other agencies conduct them, as well.

Dr. Clarke asked whether lessons learned from prior demonstrations and X-planes are recorded, mentioning how at various points in the past, such insight and institutional memory was not captured by its participants. He suggested ARMD document what it has learned from conducting these flight projects and missions, for better or for worse, to best inform the execution of future activities – giving the examples of the X-57 Maxwell and X-59 as something to be scrutinized.

Dr. Reed and Dr. Clarke discussed workforce involvement and opportunities. Highlighting the workforce and generating excitement as a priority, they suggested involving more young people and expanding the access they have in performing research with NASA – not just as an involvement opportunity, but as a future career. Dr. Clarke gave the example of the access CubeSats give to students.

Dr. Clarke introduced and suggested the concept of an “X-system.” He elaborated how while an X-program is generally considered to be developing a vehicle, it could be broadened into an X-system that demonstrates capabilities from Air Traffic Management, Unmanned Aircraft Systems Traffic Management (UTM), or other autonomy-related activities. He pointed out a city or region could potentially agree to participate in such a program. He suggested building the student and workforce-related out-of-the-box thinking and involvement from that. He stated this multi-vehicle, multi-testing real operating environment is an X-level challenge.

Dr. Clarke also suggested the idea for an X-plane of bio-inspired variable sweep wings that naturally finds the right sweep for the right condition without reliance on control mechanisms.

Findings:

1. The Committee finds lessons learned from prior demonstration projects such as the X-57 Maxwell and X-59 aircraft should be curated and documented to reduce the learning curve for future endeavors and the next-generation workforce. There is also benefit in incorporating best practices and lessons learned from demonstrations by other agencies.
2. The Committee finds there may be value in not just X-planes, but also X-systems that address challenges in Advanced Air Mobility, autonomy, airspace management, and digital platforms, as well as generating attention and excitement from students.

NASA Support to Certification

Mr. Pearce opened with brief remarks about ARMD’s conversations with the FAA and drive to identify more areas of robust collaboration and partnership, particularly on AAM and autonomy-related challenges. He shared that ARMD is stepping up its role in supporting Beyond Visual Line of Sight and is working towards revectoring some of its work to do so.

Mr. Akbar Sultan, director of NASA’s Airspace Operations and Safety Program, Dr. Heidmann, and Mr. Noble gave a presentation on NASA’s certification efforts pertaining to AAM activities. They outlined all the areas NASA and the FAA interface and collaborate via offices, projects, activities, research transition teams, and more. They elaborated on how the new vehicle configurations and infrastructures in NASA and the FAA’s visions for the National Airspace System present challenges, and some ways these challenges may be addressed.

Discussion

Dr. Clarke asked whether cybersecurity is being considered and pointed back to the idea of an X-system. Mr. Natesh Manikoth answered cybersecurity is not necessarily tied to current demonstrations but is being worked on extensively via trust frameworks and their global harmonization – and the work today is more robust than a few years ago.

Mr. Dryer concurred with Dr. Clarke and asked whether cybersecurity is more of an FAA task or if NASA is building it into the research earlier. Mr. Manikoth replied the FAA is more active, though NASA is considering cybersecurity early in the cycle within such activities as UTM.

Mr. Dryer and Dr. Reed emphasized the importance of working cybersecurity hand in hand with all the research early on. Dr. Clarke added this would prevent having to face the costly and lengthy process of coming back to address it later. Ms. Susan Pflugstler stated that carriers are also beginning to address the process of weaving cybersecurity into their systems.

Mr. Dryer brought up potential certification challenges associated with concepts such as electrified propulsion and others. He asked whether NASA foresees itself having the bandwidth to pivot and address these, or if it would be a case of a balance between NASA and the FAA on a dialogue to do so. Mr. Dryer also pointed out that assuming the Department of Defense is working this problem is not a foregone conclusion, as it may not be working them from the same perspective or for the same purposes.

Dr. Clarke stated certification is just one part; there is also an opportunity for NASA to engage on continued airworthiness, operations, risk assessments, and more related to both vehicles and the whole Air Traffic Management system. He suggested reviewing the National Academy's Transport Aircraft Risk Assessment Model report.

Mr. Dryer added another aspect of understanding what it takes to operationalize technology – as well as getting something to market. He posited NASA has more bandwidth than some give it credit for; pivoting to focus on key long poles not necessarily focused on in the past could inform some prioritization. He also stated the value of NASA's participation in various committees, commending this presentation's comprehensive linking of NASA/FAA areas of collaboration as an example.

Findings:

1. The Committee finds NASA should integrate cybersecurity into Advanced Air Mobility's research pipeline earlier. NASA may be able to bring, with its multidisciplinary approach, developmental research tools and systems to put in

the hooks for others to tackle cybersecurity challenges. NASA should explore partnerships with other organizations such as the Department of Homeland Security, the Intelligence Community, industry, and others to help address such challenges and leveraging existing agency and industry efforts around cybersecurity – as cybersecurity challenges faced by Advanced Air Mobility do not exist in a vacuum.

2. The Committee finds that interactions between NASA and the FAA are both extensive and robust and commends NASA for its work in fostering this relationship.
3. The Committee finds greater collaboration should be pursued with the FAA on continuing airworthiness, operationalization, and risk computation and management given NASA's expertise in managing risk.

Public Comments

A public comment period was offered as required.

Mr. Jeff Engler, chief executive officer of Wright Electric, Inc., introduced himself and his small business focusing on megawatt-level electrified propulsion with ongoing government contracts.

He advocated for three items related to supporting small businesses: 1) continued support and funding for research facilities such as the NASA Electric Aircraft Testbed (NEAT), which reduces costs for small businesses by having existent facilities to use; 2) continued support for risk reduction for any new projects NASA advances, which helps determine where the state of the art of the industry is; and 3) having multiple winners and companies selected for these efforts, such as how NASA's Environmentally Responsible Aviation project had numerous winners compared to X-59 or SFD's one winner.

Discussion

A discussion ensued on how facilities such as NEAT are organized, funded, and assessed, where the demand lies for them, and how they may potentially be optimized in the future.

Dr. Reed mentioned how there is a drive to include more small business in government operations, and that the space side of NASA does so. She agreed with Mr. Engler's inputs and suggested they be considered to effectively engage small businesses, also

pointing out the earlier discussion on more inclusion of early-stage research ideas. Dr. Clarke concurred.

Finding

1. The Committee finds NASA has been supportive, and must continue to support, early stage and non-traditional businesses. In general, exploring additional ways to meaningfully enable, engage, and sustain commercial business involvement should be pursued.

Conclusion

The meeting of the Committee was concluded with discussions on the timeline and plans for future meetings.

MEETING ADJOURNED

List of Attendees

Committee Members:

1. Dr. John-Paul Clarke (Chair)
2. Mr. Jay Dryer
3. Mr. Michael Dumais
4. Ms. Lisa Ellman
5. Dr. Nicole Key
6. Mr. Natesh Manikoth
7. Ms. Susan Pfingstler
8. Dr. Helen Reed

NASA

9. Brian Card
10. John Cavolowsky
11. Fay Collier
12. Michele Dodson
13. Shannon Eichorn
14. John Gould (FedWriters)
15. Kelley Hashemi
16. Tristan Hearn
17. James Heidmann
18. Stephen Jensen
19. Sharon Jones
20. Devin Kaucher (SAIC)
21. Maureen Kudlac
22. Nateri Madavan
23. Samantha Magill

24. Jon Montgomery
25. Lee Noble
26. Michael Patterson
27. Robert Pearce
28. Andrew Ramos (SAIC)
29. Irma Rodriguez
30. Naseem Saiyed
31. Akbar Sultan
32. Alicia Wesley (Venesco)
33. Rich Wahls
34. Kevin Witzberger

External (Affiliation Identified if Provided)

35. Anusha Vallepalli
36. Jeremy Fehrenbacher (Moog)
37. Jeff Engler (Wright Electric)
38. Chad Kirk (AIA)
39. Gene Mikulka
40. Igor Alvarado (Applied Research and Technology, Collins Aerospace)
41. Tasha Kelley (Rolls-Royce North America)
42. Thomas Edwards