NASA Advisory Council Aeronautics Committee Meeting
March 17, 2021
Virtual Meeting Originated at NASA's Mary W. Jackson HQ
Washington, D.C.

Welcome

Mr. John Borghese, committee chair, called the meeting to order. Introductions were made and guidelines regarding the meaning and intent of providing recommendations or findings were reviewed. Once again, due to the restricted travel rules necessitated by the COVID pandemic, this meeting was conducted virtually.

Innovation in the NASA Aeronautics Portfolio

Dr. John Cavolowsky, NASA's director of the Transformative Aeronautics Concepts Program (TACP) introduced the topic of how the TACP program in particular, and more generally the entire Aeronautics Research Mission Directorate (ARMD), is approaching the desire to focus on innovation and implement projects and activities that do indeed provide innovative solutions to challenges faced by the aviation community.

Ms. Angela Surgenor from TACP summarized the activities and presentations made during the first-ever TACP showcase that integrated content from all three of the TACP projects. She solicited input from the Committee on the types of metrics that would be helpful to have to gauge the success of this and future showcases, and noted the entire showcase is available to watch online.

While Dr. Cavolowsky described large participation and audience numbers during and after the showcase, Mr. Borghese expressed concerns about the pre-event outreach, noting that many within the industry, including himself, were not aware of the showcase. Ms. Surgenor acknowledged the concern in saying many lessons were learned and more aggressive strategic communication outreach is expected for the next showcase, possibly in early 2022.

Mr. Mark Ballin from NASA provided an overview of what innovation in NASA Aeronautics means, how it is advanced within the research portfolio, and how that strategy may be fine-tuned in the future.

A key area influencing how innovation will come about will be the convergence of a lot of industries and disciplines, many of which are non-traditional especially from an aviation standpoint. This will require future research that is more distributed, more connected, and increasingly democratized, Mr. Ballin said.

How NASA responds to that, and the plans in place to encourage this innovation culture, in many ways will require NASA to take the lead in coordinating the research

efforts of others. In response to a question from the committee about how to decide which ideas to invest in or not, Mr. Ballin and Dr. Cavolowsky noted the process that results in ARMD's Strategic Implementation Plan and that such a decision process continues to evolve.

Mr. Ballin described in detail the innovative, more transformative, and longer-term higher-risk research activities in work within the three major projects of the Transformative Aeronautics Concepts Program – namely the Convergent Aeronautics Solutions (CAS) project, the Transformative Tools and Technologies project, and the University Innovation project.

Discussion

Dr. Eric Allison recalled his experience with innovation in biomedical devices and wondered aloud if some of the same kind of efforts used to systemize innovation in that area, or more generally other areas outside of aviation, could be something for NASA to look into as it continues to find new ways to innovate within its own research portfolio.

Dr. Allison continued by noting how venture capitalists invest in innovation fully expecting a large percentage to fail. The importance of being willing to try something new knowing it might not lead to success is a key feature of truly being innovative. This theme must be considered as NASA moves forward. Dr. Cavolowsky, and others, agreed with this sentiment and noted how this willingness to identify and accept failure has already happened.

Part of the discussion in this area included noting the importance of being able to identify metrics and then track those as an indication of a project's progress toward innovation, making sure in the process that these metrics are used in a way that is perceived as positive by the research workforce. This discussion is what directly led to the finding noted here.

Finding

The Committee finds that NASA's Aeronautics Research Mission Directorate (ARMD) has a powerful vision for the future of air travel that will require increasingly bold attempts at innovation to realize. To that end, ARMD managers should consider establishing metrics that define a project's progress both in terms of success and what traditionally is perceived as failure but instead should be embraced as learning. While the Convergent Aeronautics Solutions project has worked to incorporate a mindset that recognizes value when things do not go as planned, the Committee believes establishing a method for objectively measuring the value of negatively perceived outcomes – and tying it to some tangible incentive for its workforce – would motivate a more ostentatious spirit of innovation across ARMD, and perhaps the entire agency.

Wildfire Mitigation Team

Dr. Parimal Kopardekar, principal investigator for the Unmanned Aircraft Systems Traffic Management (UTM) project, briefed the committee on how technologies developed from ARMD programs and projects are helping firefighters combat wildfires. The centerpiece of this discussion involved how the distributed, service-based UTM system developed by NASA and now being adapted for Advanced Air Mobility operations could be used in coordinating the use of drones for firefighting operations. This idea, as Dr. Kopardekar explained, is being tested and demonstrated by a CAS activity known as STEReO, or Scalable Traffic Management for Emergency Response Operations.

In response to a question from Mr. Borghese, Dr. Kopardekar noted that building a unified concept of operations, with associated setting of standards and requirements, that could be used in any wildfire fighting situation – no matter who is doing the work – is a key goal of STEReO and potential follow-on work.

(Editor's note: For a more thorough explanation of STEReO and examples of where it has been tested, see https://www.nasa.gov/ames/stereo.)

Discussion

The committee very briefly discussed this topic, the summary of which is incorporated into the wording of this finding.

Finding

The Committee applauds NASA's engagement in assisting with wildfire detection and mitigation. Efforts to fully take advantage of capabilities enabled by Advanced Air Mobility, with integration from other NASA sensors from space, should continue. The Committee also suggests NASA embrace a leadership role in building a common concept of operations that would standardize procedures and sharing of data across involved organizations in order to more quickly and efficiently combat wildfires wherever they may rise up.

Hypersonics Market Studies

Mr. Charles Leonard, project manager of NASA's Hypersonic Technology project, briefed the committee on a pair of market studies regarding the interest in commercial hypersonic flight. He first began with an overview of the different applications for hypersonic flight and when they might be expected to be put in use. These include

military, civilian, and commercial use cases. NASA's primary interest in working with industry will include commercial point to point travel and civil space access.

Mr. Borghese asked for a clarification of what defines hypersonic speed, and while Mr. Leonard said the standard definition mostly agreed to by everyone was anything at Mach 5 and above, there are some technical phenomenon that happen at Mach 4 which would make a case for that speed being the beginning of the hypersonic region.

Mr. Leonard described the Hypersonics project as conducting the fundamental research that enables the broad spectrum of hypersonic systems and leads to U.S. supremacy in the field of hypersonics. An important focus of that is seeding the future by engaging and training the next generation of engineers.

Mr. Leonard reviewed the findings of the market study, which was inspired by and the result of a one-day, invitation-only hypersonics workshop held in January 2020 and which focused on the point-to-point segment of commercial hypersonic air travel. In addition to economic viability, the two awarded studies each were to address technical, environmental, and even passenger satisfaction considerations – and to do so at different speed levels.

The two studies wound up producing many similar and many different conclusions regarding a host of variables that included length of trip, speeds flown, fares charged, number of available routes depending on what criteria was used, aircraft costs, type of markets (passenger or cargo), and geopolitical and economic considerations.

Mr. Leonard said additional meetings about the studies and their influence on NASA's research portfolio were planned, after which decisions could be made and the full details of the studies released to the public.

Discussion

The Committee's deliberations on this topic – which considered many variables in markets, speeds, distances, price points, and more – are directly summarized in this finding.

Finding

The Committee recognizes the potential of commercial hypersonic air travel as detailed in the studies NASA presented yet proposes additional analysis and clarification of criteria is needed. The suggestion that there is a difference between saving time and going fast summarizes some of the concerns the Committee has about this market's viability to the extent that it yet warrants any significant research investment by NASA Aeronautics. A clear understanding of the benefits of commercial hypersonic flight

considering the nation's drive toward sustainability and carbon neutrality needs to be articulated.

Sustainability of Aviation

Mr. Robert Pearce, NASA's associate administrator for Aeronautics, opened the multipart presentation by reflecting on the increasing importance of this topic to the overall research strategy of NASA Aeronautics. Although the major focus in this area is on a more sustainable single-aisle subsonic airliner, the need for the entire aviation community to become more sustainable going forward will result in new approaches across the entire ARMD portfolio.

Mr. Pearce said NASA's goal for sustainable aviation is to reach a 50 percent net reduction in carbon emissions from aviation by 2050 – compared to a 2005 baseline – with a net zero emissions goal by 2060.

Mr. David Hyde, director of environmental policy for the Aerospace Industries Association, echoed Mr. Pearce's comments, and emissions goals, saying sustainability is at the top of the priority list for the aviation community. He said that partnerships between industry and government will be more important than ever in achieving these environmental goals.

Dr. Ed Waggoner, NASA's deputy associate administrator for Aeronautics programs, centered on describing the four major technology areas in support of sustainability: transonic truss-braced, high-aspect ratio wing; electrified aircraft propulsion; small core jet engines; and high-rate composite manufacturing.

(Editor's note: For more on each of these technologies, see https://www.nasa.gov/aero/nextgen-aircraft-design-is-key-to-aviation-sustainability)

Dr. Waggoner also emphasized the importance of involving the academic community in sustainable aviation research through the University Leadership Initiative in order to benefit from the creative ideas these younger researchers will bring to bear.

Discussion

Mr. Mike Hirschberg noted that technologies derived from research efforts to benefit a new single-aisle transport also will benefit vertical flight.

Mr. Borghese asked about the place sustainable aviation fuels has within NASA's research. Dr. James Kenyon, NASA's Advanced Air Vehicles Program director, said this is a "vexing challenge" as to the exact role NASA does or should have in this area. Currently NASA is not involved with production research and development but has

tested the effects of using sustainable aviation fuels in jet engines and found positive results.

Mr. Peter Bunce raised the question of how NASA is characterizing its sustainable research compared to the terms used by industry and even the FAA. He described these “pillars” as being sustainable aviation fuels, technology, infrastructure and operations – with an additional one called market-based measures, which is a catch-all for a number of possible measures. His concern was that the way NASA has organized its sustainable research doesn’t match up with what seems to be becoming an industry standard of sorts, based on the Air Transport Action Group’s recent report “Blueprint for a Green Recovery.” Mr. Pearce and others responded that NASA is aware of this point and that this discussion is helpful as ARMD continues to build its messaging and long-term research plans.

Recommendation (Requires NASA response)

Based on the presentation about NASA’s current research into sustainable aviation – which centered on technologies associated with single-aisle transports – the Committee recommends NASA include areas such as air traffic management and Advanced Air Mobility as being part of making aviation more sustainable, both in its research portfolio and its external messaging. The Committee suggests NASA consider framing the discussion of sustainability in the same way industry is doing so as shown in the Air Transport Action Group’s recent report “Blueprint for a Green Recovery.”

Public Comments

A public comments period was offered as required. No public comments were received.

List of Webex Attendees

Committee Members

1. Mr. John Borghese, Chair
2. Mr. Darin DiTommaso, Vice Chair
3. Mr. Andy Cebula
4. Mr. Anil Nanduri
5. Dr. Eric Allison
6. Mr. Eric Fanning
7. Ms. Lisa Ellman
8. Dr. Tom Shih
9. Dr. Karen Thole
10. Mr. Mike Hirschberg
11. Dr. Naveed Hussain
12. Mr. Peter Bunce

NASA

13. Akbar Sultan
14. Alicia Wesley
15. Angela Butcher
16. Ann Harkey
17. Anthony Springer
18. Brian Pitman (USAF Detailee)
19. Charles Leonard
20. Cheryl Quinn
21. Curtis Armstrong
22. Dave Hinton
23. Dan Lockney
24. Edgar Waggoner
25. Eric Cooper
26. Huy Tran
27. Irma Rodriguez
28. James Kenyon
29. Jay Fletcher
30. Jennifer Kibler
31. Jessica Culler
32. Jon Montgomery
33. John Cavolowsky
34. Justin Tilman
35. Kenny McCombs
36. Laura Kennedy
37. Lee Noble
38. Mary Dijoseph
39. Maureen Kudlac
40. Melissa Rivers
41. Michael Patterson
42. Michael Rogers
43. Nateri Madavan
44. Paul Krasa
45. Peter Coen
46. Richard Wahls
47. Robert Pearce
48. Roger Kantz
49. S Melissa Rivers
50. Sasha Ellis
51. Sharon Jones
52. Shawn Engelland
53. Sherilyn Brown
54. Steven Clarke
55. Steven Hirshorn
56. Tiffany Blake
57. Vanessa Aubuchon
58. William Johnson

External (affiliation identified if provided)

59. John Tylko (Aurora)
60. Steve Cook (Northrup Grumman)
61. Steve Moran (Spire Global)
62. Natalie Alms (Federal Computer Week)

FedWriters (NAC meeting support)

63. Jim Banke
64. John Gould