NASA Advisory Council Aeronautics Committee Meeting
November 10, 2020
Virtual Meeting Originated at NASA's Mary W. Jackson HQ
Washington, D.C.

Welcome

Mr. John Borghese, committee chairman, called the meeting to order, offered some words of welcome, asked Ms. Irma Rodriguez to provide the standard advisory committee guidance.

Capability and Workforce Strategic Planning

Mr. Anthony Springer, ARMD director of the Integration and Management Office, provided an overview on NASA Aeronautics' current capabilities – people, facilities, computers, aircraft, etc. – and their relevant issues. How best to manage and maintain those capabilities and ensure those capabilities are properly funded are the two key questions to address in this area.

To do this it is important to have accurate forecasts that predict what missions will be pursued and then consider if existing capabilities will suffice, whether present capabilities need updating, or if new investments must be made. The timeframe might be in the short term or the long term. Each timeframe requires its own capability decisions. Workforce considerations are of paramount importance. Ageing research facilities and supporting infrastructure at all of NASA's field centers are of particular concern at present.

Mr. Springer described NASA's approach to how facilities of different sizes are managed by different organizations, programs, or centers. Larger facilities spread across the centers that can be used by any mission directorate or handled by agency level portfolios, while other hardware (such as aircraft) or smaller facilities might be managed by a particular center, directorate, or even program.

Mr. Springer spent time talking about how a specific directorate – ARMD -- is looking at its capabilities needs now and for the future, and how best to plan for that future. Mr. James Kenyon, director of the Advanced Air Vehicles Program, provided more specific examples of how this program is addressing its capabilities needs.

Mr. Jon Montgomery, ARMD's deputy associate administrator for policy, noted that a big reason why there is so much attention on capabilities strategy – as noted by inclusion in this meeting – is that the agency is facing intractable problems where large infrastructure, both in size and quantity, have had their maintenance persistently deferred for budgetary reasons. This puts any mission that relies on those facilities at risk.

Discussion

Mr. Borghese asked about the cost of using facilities and who pays those fees. There has been concern that potential users of NASA's national research assets could not afford to use these government facilities. He noted how the use of larger facilities can be absorbed by NASA but wondered how smaller facilities are handled.

Mr. Springer responded that for those class of facilities there is no agency-level funding stream, but other funding options exist. This includes outright user fees, money coming from center budgets, or funds provided by a mission directorate/program/project. Some maintenance expenses for facilities managed by one directorate can be offset by those facilities being used and paid for by other directorates.

Mr. Tom Shih asked about the ability to accurately forecast workforce needs and expertise levels so as to meet future mission needs. Mr. Montgomery noted that workforce planning is key to mission success. Understanding what training and knowledge is needed for what a workforce will be doing 10 or 25 years from now is an important part of that forecast.

Finding

The committee applauds NASA's Aeronautics Research Mission Directorate (ARMD) for its planning to meet future needs regarding workforce and facilities. This approach of "leaning forward" is a necessary and welcome initiative that will make it possible for NASA to maintain its position as a global leader in the aviation research community. At the same time, the committee is concerned that key facilities will not receive the funding needed to properly maintain and upgrade them. The Landing and Impact Research Facility at NASA's Langley Research Center in Virginia is just one example of a facility the committee is particularly concerned about.

COVID and Cabin Air Flow Modeling

Dr. John Cavolowsky, manager of the Transformative Aeronautics Concepts Program (TACP), provided a briefing on how NASA can provide its expertise to help industry recover from the existing pandemic, regain public confidence in air travel, and better prepare for the next health crisis. He detailed a particular area NASA can help with, which is modeling the flow of air within a passenger airliner cabin.

He described NASA's role as facilitating the conversation among those who do this kind of modeling, identify any gaps in available data, and determine what additional research is necessary.
Dr. Cavolowsky described the preliminary results of a recent workshop involving more than 50 stakeholders who met on four days over the course of three weeks. Together they attempted to determine the current state of modeling cabin air flow, what still need to be researched, and a timeline for doing the work – among many other variables.

Specific roles for NASA moving forward were identified and included building a common, open modeling environment; creating a dashboard that collects relevant data to help with validation of models and risk assessments; providing expertise in peer review of new studies; and continuing to facilitate organization of the various efforts so that any needed course corrections can be understood by all.

The ultimate goal is to provide passengers with a sense of security that aircraft systems are in place to significantly minimize the chance of infection.

Dr. Naveed Hussain provided additional perspective from his view at Boeing on the problems and potential solutions of virus transmission within an aircraft interior. This led to a rather detailed discussion about virus size, available filters, air flow rates and directions, and research already conducted on cabin air flow.

Discussion

Mr. Borghese raised the possibility of NASA using its expertise and demonstrated ability to use technology to solve complex problems – in both aeronautics and space – by finding a way to detect the presence of a virus in real time and apply a method to kill the virus or at least deactivate its harmful properties, also in real time. This led to a brief conversation about capabilities and available resources across the agency that might be available to tackle these goals, assuming it was determined NASA should pursue it. Because of the potential benefits such capabilities might have specific to the aviation community, the committee decided to express its opinion in a Finding as noted here.

Finding

The COVID-19 pandemic continues to disrupt the aviation community. As the commercial air travel industry looks ahead with hope for a return to normalcy, a key variable will be how quickly the flying public will feel safe sitting in the enclosed and relatively limited volume of an airliner cabin. The committee continues to recognize NASA's public stature as a trusted government entity and encourages the agency to offer its expertise where possible. To this end, the committee suggests ARMD consider spearheading a multi-disciplinary research initiative – perhaps involving the academic community – that could enable real-time detection of a potentially harmful virus in an aviation setting, such as an aircraft interior.

Autonomy Plans

Dr. Cavolowsky, TACP director; Mr. Lee Noble, director of the Integrated Aviation Systems Program (IASP); and Mr. Akbar Sultan, director of the Airspace Operations and Safety Program (AOSP), updated the committee on progress made during the past year as it relates to NASA acting as a catalyst to advance autonomous aviation systems and ensure U.S. competitiveness.

Each director described how projects and sub-projects within their respective programs are focused on particular areas of autonomy, especially as it relates to vehicles and systems that contribute to realizing operational use cases expected as Advanced Air Mobility (AAM) is safely integrated into the National Airspace System. [Note that Urban Air Mobility (UAM) is considered a subset of AAM.]

Within TACP much of this work is concentrated in the Transformational Tools & Technologies project. The focus: enabling the scaling of operations to achieve the full vision and potential of AAM, which includes removing onboard pilots and increasing the number of aircraft that can be operated by the same number of people

Within IASP, the AAM project (not to be confused with the over-arching AAM mission) is looking into at least two technical challenges related to UAM. The first one is to develop, evaluate, and make recommendations for how to certify an initial, integrated suite of key vehicle automation functions to enable simplified piloting in urban environments. The second one is to develop and evaluate a reference architecture for operating a vertiport within a high-density urban environment. The main activity within AOSP, put simply, is to safely integrate all of this into the NAS using a service-oriented digital architecture.

Dr. Cavolowsky noted the intention of the way this collaborative work is organized is to be sure the research portfolio within each program is aligned with the other programs, the goal being to meet the objectives of ARMD's Strategic Thrust No. 6 – Assured Autonomy for Aviation Transformation.

Discussion

Discussion focused on the UAM Maturity Levels (UML) identified by NASA to measure progress in increasingly complex use of vehicles within busier airspace over ever-denser population centers. Committee members expressed concerns that many members of the AAM community have not heard of or bought into precisely how NASA has defined each of the UML. Industry research activities and investment plans could be influenced depending on these UML definitions. Committee members suggested the Federal Aviation Administration would be less cautious about embracing the UML paradigm as defined by NASA if there was a better understanding and agreement about what each UML means. (See this report for a detailed description of the UML descriptions as of 2020.)

Recommendation

The committee recommends NASA find an appropriate venue through which to best work with industry (UAM and conventional legacy aviation operators) on agreeing to clear definitions and goals of each of the agency's Urban Air Mobility maturity levels. The committee believes it is important that industry be fully engaged and aligned with these goals as they develop their technologies and systems. Among other benefits, this

will be key to ensuring the successful execution of the Advanced Air Mobility National Campaign planned by ARMD.

Low-Boom Flight Demonstration Mission Update

Mr. Peter Coen provided an overview of the Low-Boom Flight Demonstration (LBFD) mission and its X-59 Quiet SuperSonic Technology demonstrator aircraft, noting progress made since making a similar presentation a year ago.

Key advancements during the previous year include significant progress on construction and assembly of the airframe, delivery of the jet engine that will power the X-59 and making progress on plans for the community overflights to gather public perception data. At the same time, challenges sparked by COVID-19 required replanning and some delays in meeting major milestones. First flight is now expected mid-year of 2022.

Mr. Coen noted that these schedule delays are not expected to prevent NASA from delivering its promised dataset to the Committee on Aviation Environmental Protection (CAEP), although the number of community overflight deployments might be affected. Currently the LBFD mission has five opportunities to complete four community test deployments. Should the CAEP experience a domino effect in schedule delays due to COVID, an additional community test deployment might be possible.

Discussion

Mr. Peter Bunce asked if the X-59 has autoland built into it. Mr. Coen was reasonably sure it isn't and explained that the XVS vision system – a cockpit feature made necessary because the pilot's forward view is blocked – is a key operational enhancement for safety. Developers have worked with the FAA and provided information about the XVS which could be used to support a possible future effort to certify it.

Dr. Karen Thole asked about the availability of computer tools used to characterize the X-59's sonic signature and if that tool is proprietary or might be restricted from use by the international community. Mr. Coen said they are open tools. He noted that Lockheed Martin has put a lot of its own intellectual capital into some of the design tools, and that could lead to proprietary classification in the future as the tools are evolved for a possible future commercial supersonic airliner.

Finding

The committee continues to be impressed by NASA's approach to and progress with the Low-Boom Flight Demonstration mission and its X-59 Quiet SuperSonic Technology demonstrator aircraft. Opening new markets for commercial supersonic air travel over land will have benefits that go beyond passenger convenience and airline economics to

inspiring a new generation of students to pursue STEM-related careers in aviation. The committee encourages NASA to keep industry informed on when to expect test data and then share that data as rapidly as possible when available.

Software Usage Licensing

Mr. Dan Lockney, Technology Transfer Program executive, briefed the committee on NASA's software release policy and process. He noted that the agency produces about 1,800 inventions each year, one-third of which are in the form of software. Cataloging and distributing these products is complicated. Challenges associated with copyrights, licensing, patents, open-source code, and other legal issues related to NASA's ability to release software to various user groups were presented and various solutions identified.

Discussion

Dr. Eric Allison said his questions about software availability, especially as it relates to open-source code and cases where small companies who are not a NASA contractor would like to use that software for commercial purposes. He recommended this non-NASA webpage to read more information about government considerations regarding open-source software:

Public Comments

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

Committee Deliberations

During the discussion about workforce and facility capabilities and how forecasting future needs is key to future mission success, Mr. Andy Cebula encouraged that when projecting those future needs not to forget the importance of planning for what's required to develop new air traffic management technology.

Dr. Karen Thole expressed support for NASA's workforce development activities but noted there remains a challenge in recruiting graduates who are more excited, for example, about turbines and engines on airplanes for aeronautical purposes rather than about being rocket scientists and working on space applications.

Several committee members asked about the communication links that enable UTM to operate in terms of quality of service, security, and the implications of more widespread deployment and use of 5G networks as more and more UAS enter the market and UTM becomes operational. Mr. Sultan acknowledged all these areas are important considerations as work on UTM and its contributions to other NASA projects is expanded.

Mr. Peter Bunce expressed his concerns about aviation safety with respect to the deployment of 5G networks and frequency allocations that affect radar altimeters. This led to the recommendation listed below.

Recommendation

The committee recommends that appropriate officials from NASA and the Federal Aviation Administration (FAA) meet to discuss industry concerns about the effect of the announced spectrum allocation for 5G wireless networks on the safe operation of radar altimeters used by the aviation community. The purpose of the conversation would be to determine if the FAA would desire NASA to conduct research that might provide credible and objective technical data to inform any position the FAA would take in this regulatory matter.

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. Cheryl Quinn
20. Curtis Armstrong
21. Dave Hinton
22. Dan Lockney
23. Edgar Waggoner
24. Eric Cooper
25. Huy Tran
26. Irma Rodriguez
27. James Kenyon
28. Jay Fletcher
29. Jennifer Kibler
30. Jessica Culler
31. Jon Montgomery
32. John Cavolowsky
33. Justin Tilman
34. Kenny McCombs
35. Laura Kennedy
36. Lee Noble
37. Mary Dijoseph
38. Maureen Kudlac
39. Melissa Rivers
40. Michael Patterson
41. Michael Rogers
42. Nateri Madavan
43. Paul Krasa
44. Peter Coen
45. Richard Whals
46. Robert Pearce
47. Roger Kantz
48. S Melissa Rivers
49. Sasha Ellis
50. Sharon Jones
51. Shawn Engelland
52. Sherilyn Brown
53. Steven Clarke
54. Steven Hishorn
55. Tiffany Blake
56. Vanessa Aubuchon
57. William Johnson

External (affiliation identified if provided)

58. Eric Daning
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