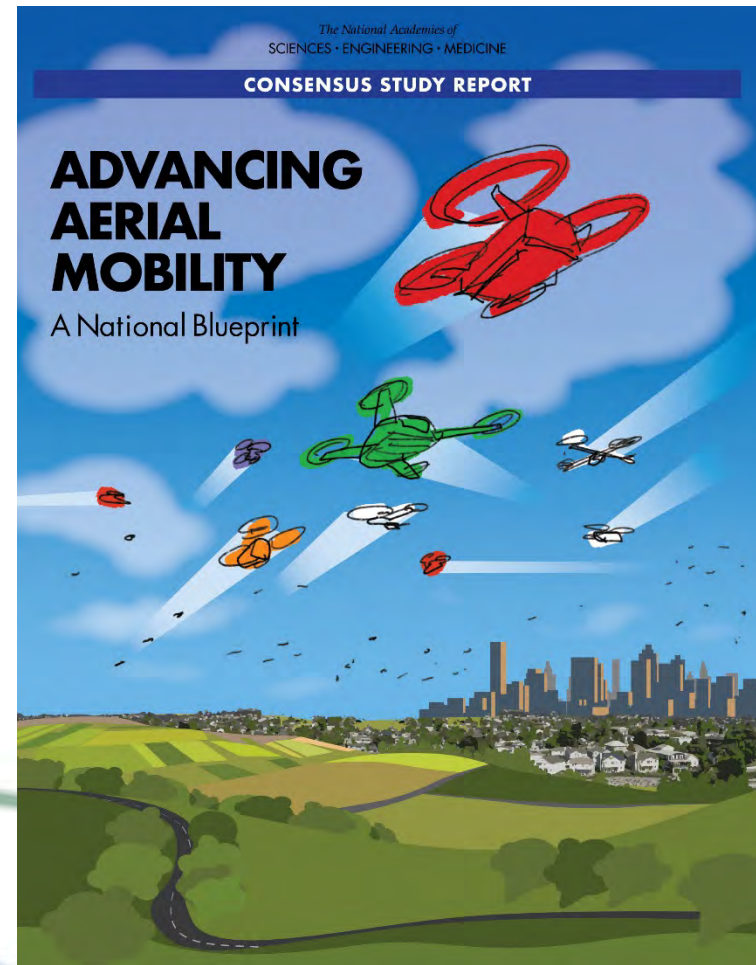


Advancing Aerial Mobility: A National Blueprint

The Committee on Enhancing Air Mobility
Chair: Nick Lappos



Report Summary August 2020

Outline of this Debriefing

- Committee Tasking and Committee Activities
- The Committee's Vision for Advanced Aerial Mobility
- Recommendations to Achieve this Vision



Committee Statement of Task

Prepare a report that will:

- o Develop and **discuss a recommended national vision** for UAM.
- o Identify and prioritize by group the **key technical, economic, regulatory, and policy barriers** to achieve the vision.
- o **Assess the potential impact of highly entrepreneurial approaches**, including those that could be implemented by non-aviation industry entrants, in achieving the vision.
- o **Recommend key research projects** that NASA, other government agencies, industry, and academia could employ to overcome the barriers and facilitate likely approaches to achieving the vision.
- o **Assess the potential and benefit for a public-private partnership** in addressing the technical, economic, regulatory, policy, and other related (e.g., urban planning) requirements.

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Committee Members

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- Nicholas D. Lappos, Chair, Sikorsky Aircraft (Lockheed Martin)
- Ella M. Atkins, University of Michigan
- James G. Bellingham, Woods Hole Oceanographic Institution
- Atherton A. Carty, Lockheed Martin Corporation
- Daniel DeLaurentis, Purdue University
- Nancy G. Leveson, Massachusetts Institute of Technology
- George Ligler, GTL Associates
- Lourdes Quintana Maurice, DLM Globala Strategies
- Paul E. McDuffee, Boeing
- Vineet Mehta, AIRXOS (a GE Venture)
- Constantine Samaras, Carnegie Mellon University
- Peter Shannon, Radius Capital

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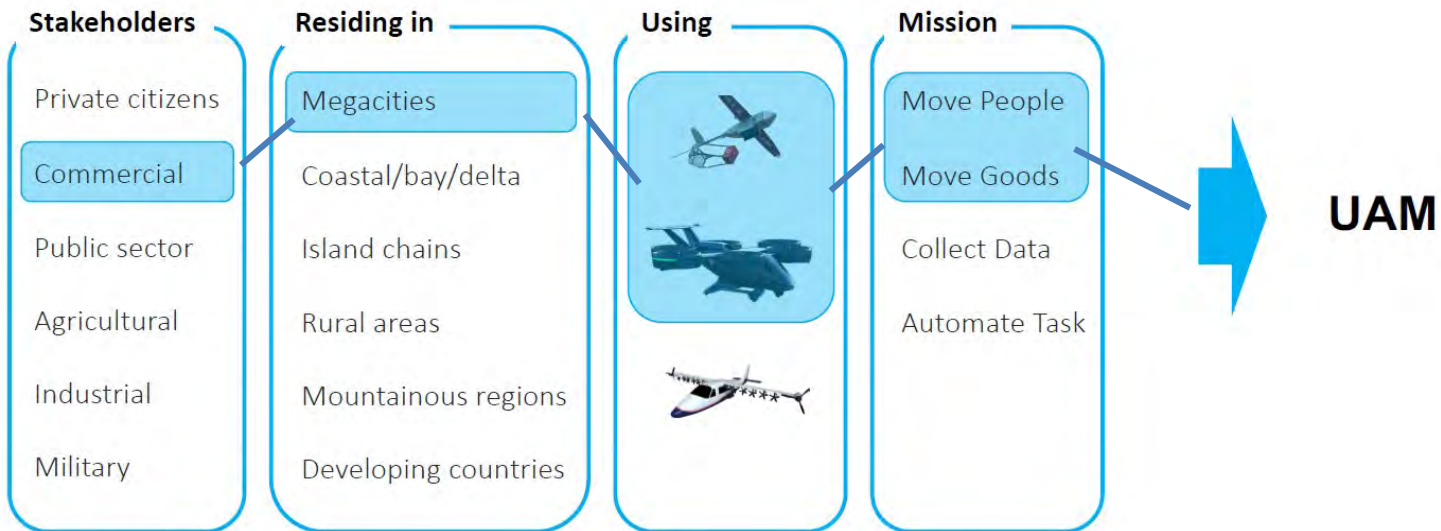
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Limited Case: Urban Air Mobility

ADVANCED AERIAL MOBILITY SERVICE POSSIBILITIES
URBAN AIR MOBILITY (UAM) IS JUST ONE APPLICATION



Proprietary and Confidential

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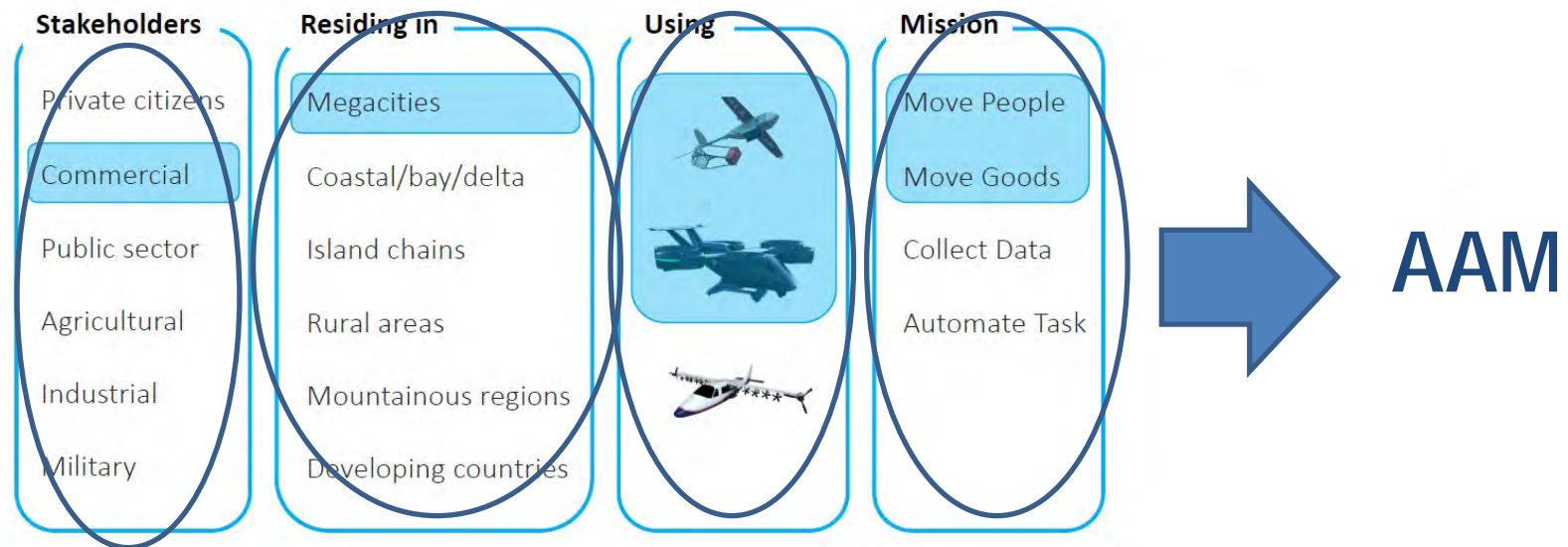
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General Case: Advanced Aerial Mobility

ADVANCED AERIAL MOBILITY SERVICE POSSIBILITIES
URBAN AIR MOBILITY (UAM) IS JUST ONE APPLICATION



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ASSUMPTIONS AND GUIDING PRINCIPLES

Guiding principles (selected examples)

- Safety is the highest priority consideration
- Social acceptance is a key factor extending beyond the technical attributes of the system
- Cyber-physical security plays a critical role in safety, resilience and public trust
- We cannot know today the full set of applications for which end customers will leverage AAM
- Infrastructure plays a key role in AAM deployments

Execution dynamics (selected examples)

- Innovation and capital will rapidly respond if provided clarity from regulators
- Expect new capabilities to deploy in phases
- Private industry will exploit and apply each capability into numerous unforeseen areas to create value

The Ultimate Vision for Advanced Aerial Mobility

The committee envisions that the Nation can achieve an advanced aerial mobility system that can:

- Support high-scale flight operations for a number applications
- Shared airspace occupied by many classes of vehicles, separated by networking technologies
- Use a variety of vehicles, developed by both new entrants and well-established entities
- Carry passengers and/or cargo
- Operate both in metropolitan or rural areas
- Maintain the highest level of safety as expected of the National Airspace System
- Inherently Flexible
- Environmentally responsible
- Capable of All-Weather Operations

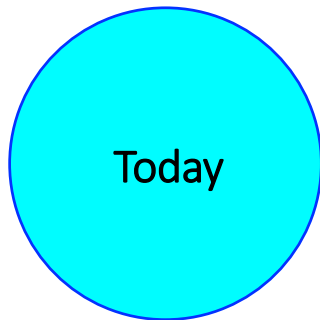
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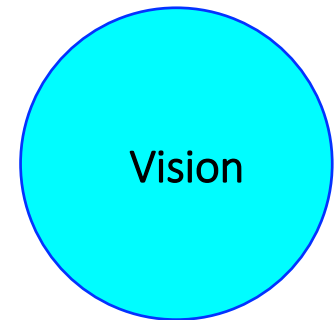
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GAPS IN SYSTEM CHARACTERISTICS



Safety
Security
Resilience
Air Traffic Management
Communications
Integration of Autonomy
Scalability
Flexibility
Infrastructure
Airspace and Flight Data
Air Vehicles

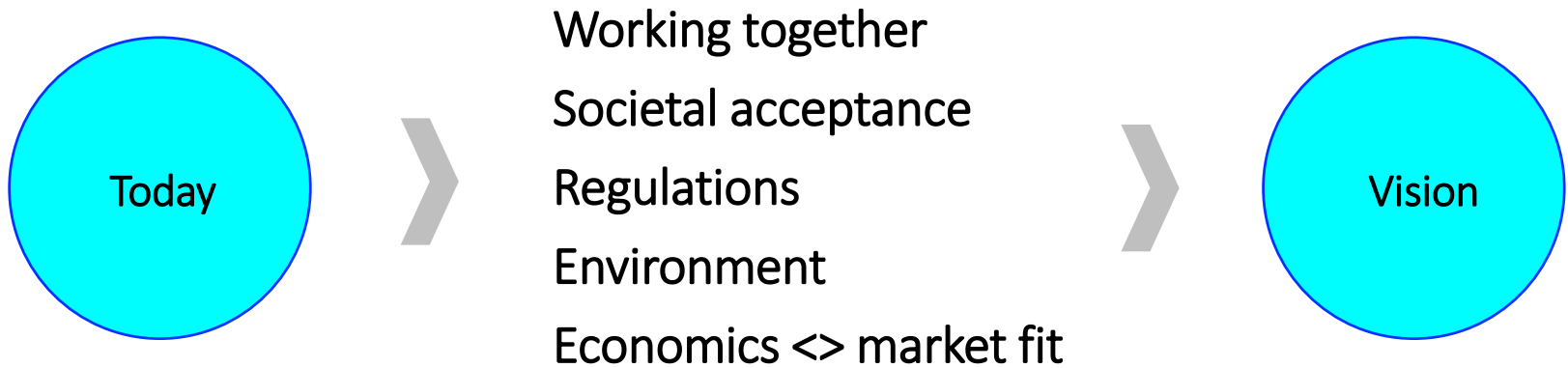


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BARRIERS TO EXECUTION

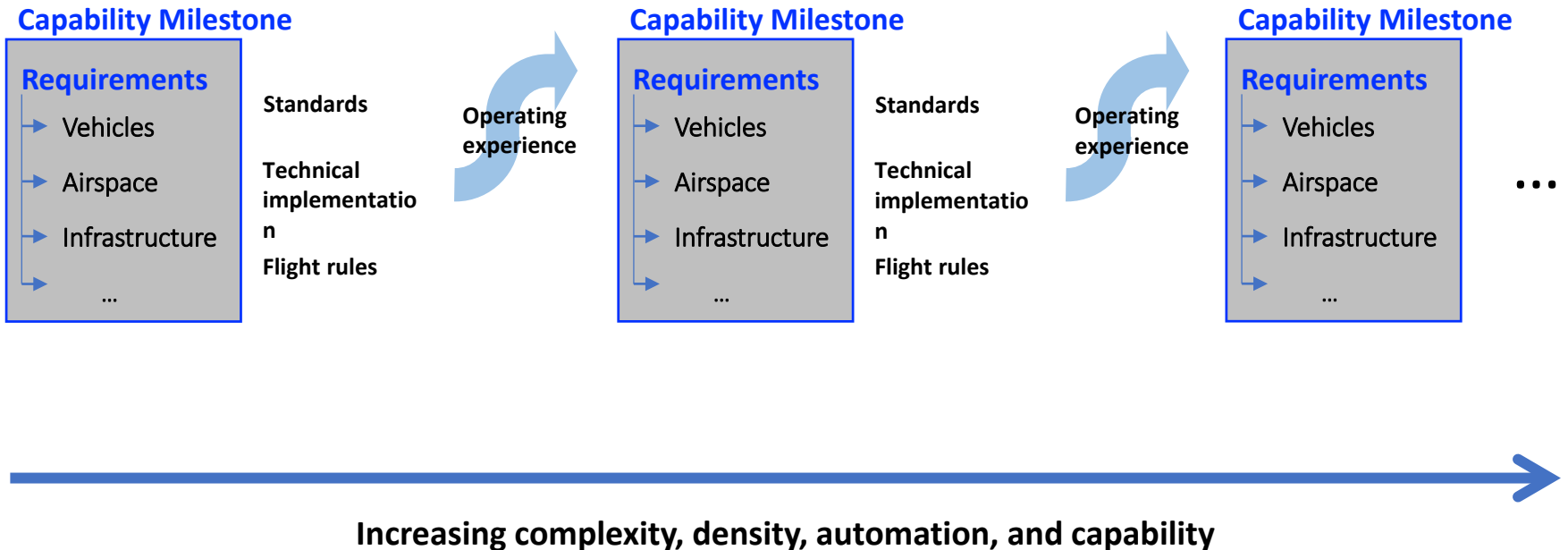


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CAPABILITY MILESTONES FORM A ROADMAP



American Leadership Potential

- **The US is poised to continue its leadership** in the development of new aviation technology
- The committee has heard from a broad cross-section of industry experts: it is clear that **this market is geared for massive and rapid evolution if the regulatory framework is there to support it**
- **US industry possesses the resources, capital, and capability** to execute on addressing the challenges posed by implementation of advanced aerial mobility at increasing levels of complexity and density.
- **U.S. leadership in advanced aerial mobility is in no way assured**, despite our strong legacy in aerospace. The new technologies enabling advanced air mobility are widespread across developed and developing countries, drawn in many case to their lack of regulatory frameworks. Their fundamental nature lowers the barrier to entry, despite the complex systems engineering involved.

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COMMITTEE RECOMMENDATIONS

Process to facilitate progress and collaboration

Form a Coordinated, Joint National AAM Plan

Prepare the National Airspace System to Integrate AAM

Use the NASA Grand Challenge to Formalize Best Practices

Establish Public-Private Partnerships

Forward-looking applied research

Research to Address Societal Impact

Address Safety in Software Intensive Systems

Develop Cybersecurity Applied to AAM

Develop Certification Techniques for AAM

Research and Develop Contingency Management

Establish Data Protocol Standards

Facilitating near-term execution and U.S. competitive advantage

Develop the Marketplace for First Adopters

Create AAM Test Facilities

In Sum

In the development of these new technologies, what the committee recommends is **strong and knowledgeable government regulatory establishment, with FAA, DOD and NASA technologists who are prepared to lead with guidelines.** What is needed to assure continued U.S. leadership is a **clear statement of national will, and a clear master plan and national commitment to execute it.**



Call to Action

In order to implement the recommendations of The National Academies report of 2/2020, “Advancing Aerial Mobility,” direction and funds are provided to:

- NASA and the FAA, to form a team of Government and Industry experts, to prepare an AAM/UAM Master Plan for the United States by the end of 2020.
- FAA and NASA, working in conjunction with Industry experts, to begin the design and development of a scalable, digital ATM Network that can integrate AAM/UAM into the 21st century NAS



Thank you for Your Attention.

Questions?

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