Aviation R&D Landscapes

Presented to: REDAC Subcommittees

By: FAA R&D Management Division

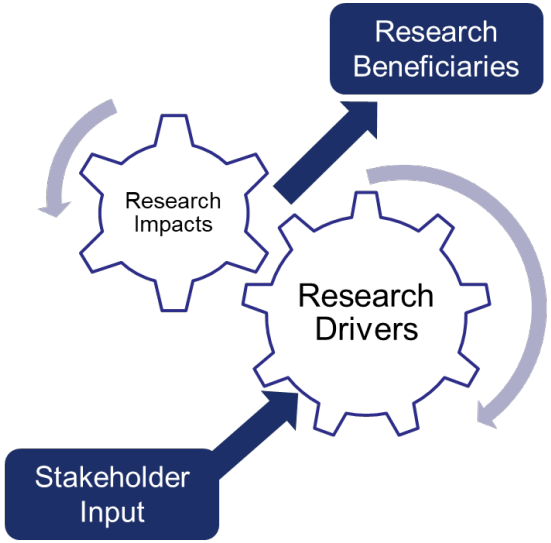
Date: Summer/Fall Season, 2019

Federal Aviation Administration

What is a Landscape?

A Landscape is a collection of research drivers that provides information about their potential impacts to the industry.

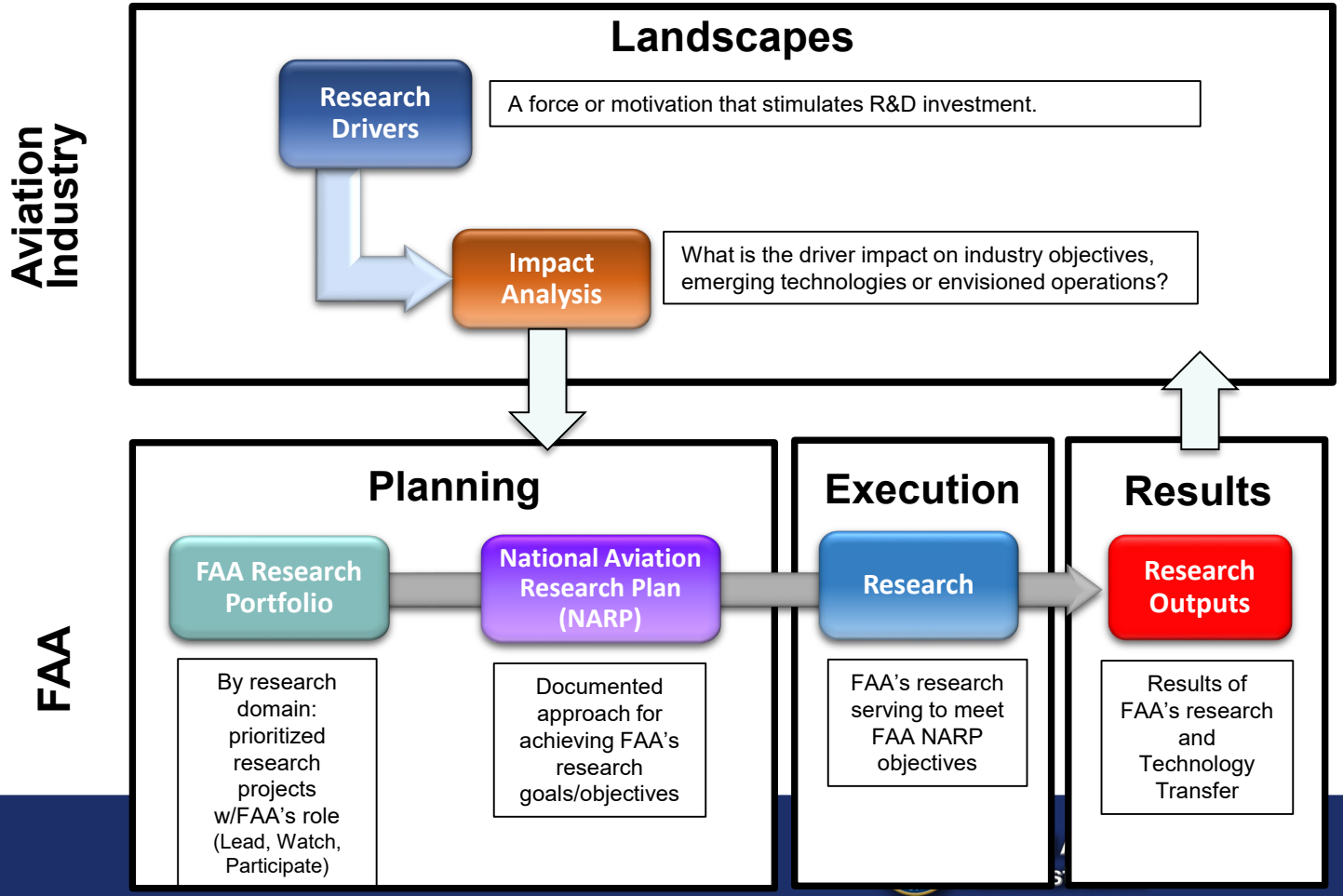
- Research Drivers
  - A force or motivation that stimulates R&D investment
- Impacts
  - Industry Objectives
  - Emerging Technologies
  - Envisioned Operations



Landscape Purpose:

Highlight operational drivers and challenges over the next 10 years, which can be used to identify research questions or priorities

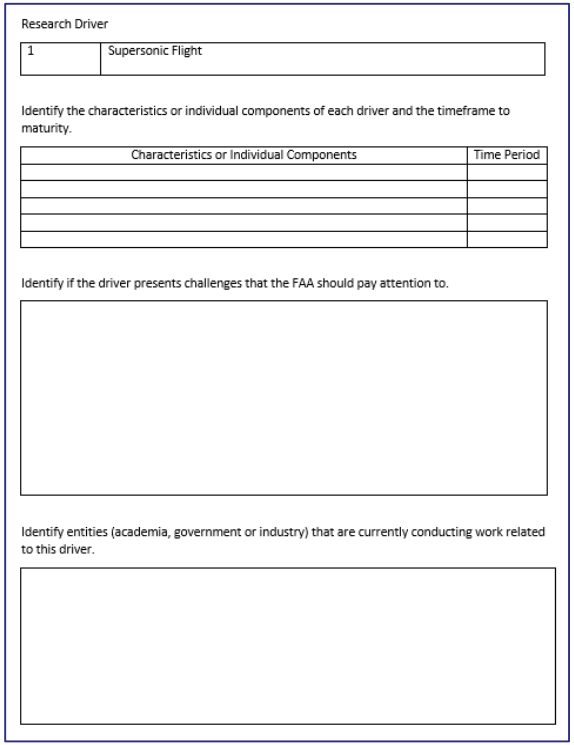
Research Landscapes and Planning



Subcommittee Input – Winter/Spring Season

Help FAA understand the aviation industry's strategic focus

- Requested subcommittee input on 25 research drivers through a subcommittee workbook.
  - Review the driver list and identify any missing items.
  - Identify the characteristics or individual components of each driver and the timeframe to maturity.
  - Identify if the driver presents challenges that the FAA should pay attention to.
  - Identify entities (academia, government, or industry) that are currently conducting work related to this driver.



Research Driver

1	Supersonic Flight

Identify the characteristics or individual components of each driver and the timeframe to maturity.

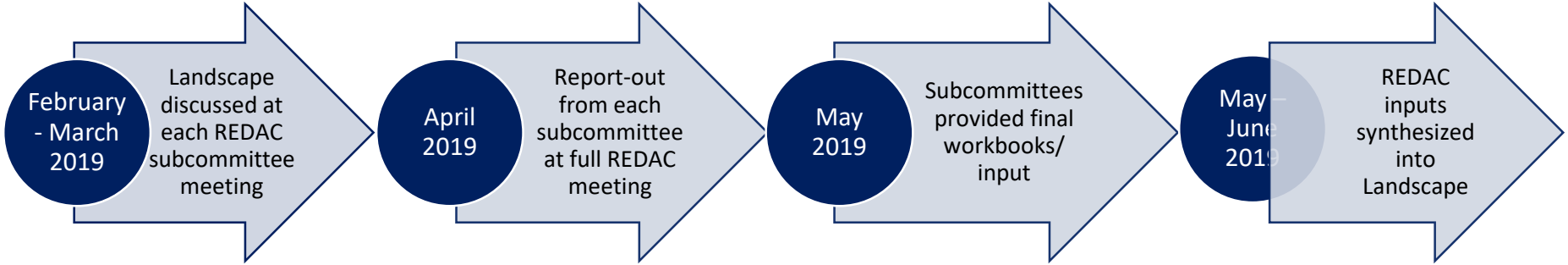
Characteristics or Individual Components	Time Period

Identify if the driver presents challenges that the FAA should pay attention to.

Identify entities (academia, government or industry) that are currently conducting work related to this driver.

REDAC Landscape Coordination

- **Recap of effort since last meeting:**



- **Summary of Subcommittee Inputs:**
  - **Airports:** A workbook for highest impact drivers; Overview table including high-level concerns/issues
  - **Aircraft Safety:** Multiple workbooks collectively addressing all drivers; Recommended additional drivers
  - **Human Factors:** Recommended Human Factors Emerging Issues List (March 2018) as reference
  - **Environment and Energy:** Workbooks for four select drivers
  - **NAS Operations:** Feedback captured from subcommittee discussion

REDAC Landscape Input

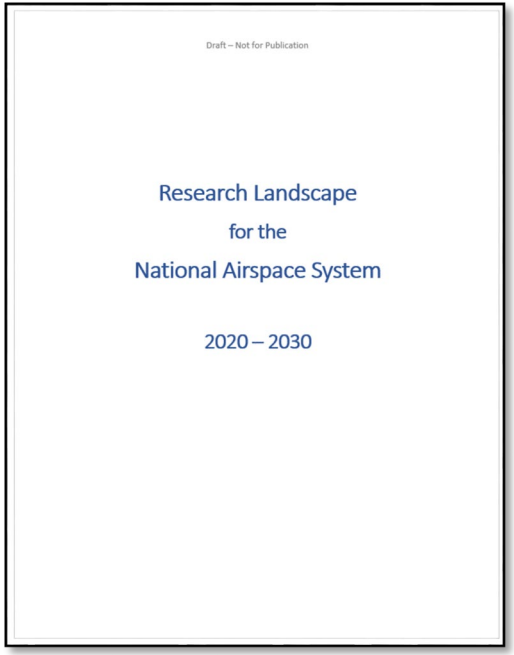
- **Feedback from the REDAC informed the Landscape by:**
  - Validating the list of drivers
  - Identifying challenges each driver may pose
  - Informing the expected time to maturity
- **In some cases feedback was addressed more implicitly or noted for future reference:**
  - Some recommendations for additional drivers were included under similar existing drivers or in Conclusion section
  - Challenges spanning multiple drivers addressed in Conclusion section (e.g., Human Factors considerations)
  - Entities currently working on challenges noted for future reference

The Landscape

Each of the 25 industry-focused drivers grouped into three categories

1. Advances in New Vehicles and New Missions
2. Advances in Technology and Materials
3. Advances in Data and Processing Power

- **Challenges for each driver listed in three areas***
  - Airport and Ground Operation
  - Operational and Safety
  - Environmental
- **Drivers marked by expected time to maturity**
  - Near-Term (0-3 years)
  - Mid-Term (3-5 years)
  - Far-Term (5-10 years)



Added Fourth Category - System Wide Advancements and Improvements

- Industry-focused drivers not comprehensive of all future FAA research areas
- Focus on FAA priorities/objectives and continued improvements to the NAS

**Not all drivers will have challenges in each area*

Landscape: Research & Development Drivers

- Non-Traditional NAS Access Points
- Routine Small Unmanned Aircraft Systems (UAS) Operations Beyond Visual Line of Sight (BVLOS)
- Space Operations
- Autonomous Ground Service Equipment at Airports
- Growth of Mixed Operations (Piloted, Autonomous, Unmanned)
- New Mission Types
- Supersonic Flight
- Urban Air Mobility

Advances in New Vehicles/New Missions

- Big Data Analytics and Techniques
- Crowd Sourcing Weather Data
- Increased Connectivity by Cyber-Physical Systems (Internet of Things [IoT])
- Information Assurance and Cybersecurity for All Operations
- Risk-Based Decision-Making Techniques and Analytics
- Artificial Intelligence (AI)
- Human-Machine Teaming and New Technology Interfaces

Advances in Data and Processing Power

- Aircraft Command and Control Using Automation and Remote Sensing Technologies
- Certification using New Technologies, Standards, or Processes
- Future Fuel Technologies
- Infrastructure Resiliency and Continuity of Operations
- New Medical Technologies and New Medications
- New Vehicles or Components Which Make Use of New Technologies, Software, or Materials
- Position, Navigation, & Timing (PNT) Technologies
- Remote and Virtual Technologies
- New Technologies for Airport Pavement Infrastructure and Design
- Advances in Electric or Hybrid Electric Propulsion

Advances in Technology and Materials

- New Methods and Technologies (Air Traffic Safety, Efficiency, Noise, Emissions, Fuel Use, and Airport Surface Movements)
- Methods for Increased Flexibility of Operators
- Performance-Based Capabilities
- Advancement of Global Standards or Requirements
- Human Response to Traffic and Congestion Management
- Development of the Workforce of the Future
- Advances in Aeromedical Certification
- Changing Public Demographics and Requirements

System Wide Advancements/Improvements

Next Steps

- **Landscape will be used to:**
  - Identify the aviation industry's evolving research areas
  - Inform FAA research priorities, discussions and decisions
  - Provide alignment with strategic research plans

- **Landscape will be regularly updated through continued REDAC input and FAA expert review to ensure consistency with latest industry efforts**