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.
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.
**REDAC Landscape Coordination**

- **Recap of effort since last meeting:**
  - February - March 2019: Landscape discussed at each REDAC subcommittee meeting.
  - April 2019: Report-out from each subcommittee at full REDAC meeting.
  - May 2019: Subcommittees provided final workbooks/input.
  - May – June 2019: REDAC inputs synthesized into Landscape.

- **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

Advances in New Vehicles/New Missions
- 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 Data and Processing Power
- 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 Technology and Materials
- 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

System Wide Advancements/Improvements
- 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
Research Landscapes and Planning

**Research Drivers**
A force or motivation that stimulates R&D investment.

**Impact Analysis**
What is the driver impact on industry objectives, emerging technologies or envisioned operations?

**Planning**
- FAA Research Portfolio
  - By research domain: prioritized research projects with FAA's role (Lead, Watch, Participate)
- National Aviation Research Plan (NARP)
  - Documented approach for achieving FAA’s research goals/objectives

**Execution**
- Research
  - FAA’s research serving to meet FAA NARP objectives

**Results**
- Research Outputs
  - Results of FAA’s research and Technology Transfer
National Aviation Research Plan Goals/Landscape R&D Drivers

- Improve Airport Operations, Air Traffic, and Air Space Management Capabilities
- Capitalize use of NAS, airport and spaceport infrastructure
- Improve the operation of the human component of the system
- Accelerate use of new technologies for aerospace vehicles, airports and spaceports

- Advances in New Vehicles/New Missions
- Advances in Data and Processing Power
- Advances in Technology and Materials
- System Wide Advancements/Improvements
Next Steps

- Landscape will be used to:
  - Identify the aviation industry’s evolving research areas
  - Inform FAA research planning

- REDAC’s contributions to landscape drivers will facilitate FAA’s understanding of industry's latest efforts