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The Future of the NAS Starts Here

Research Landscape

To: REDAC Aircraft Safety Subcommittee (SAS)

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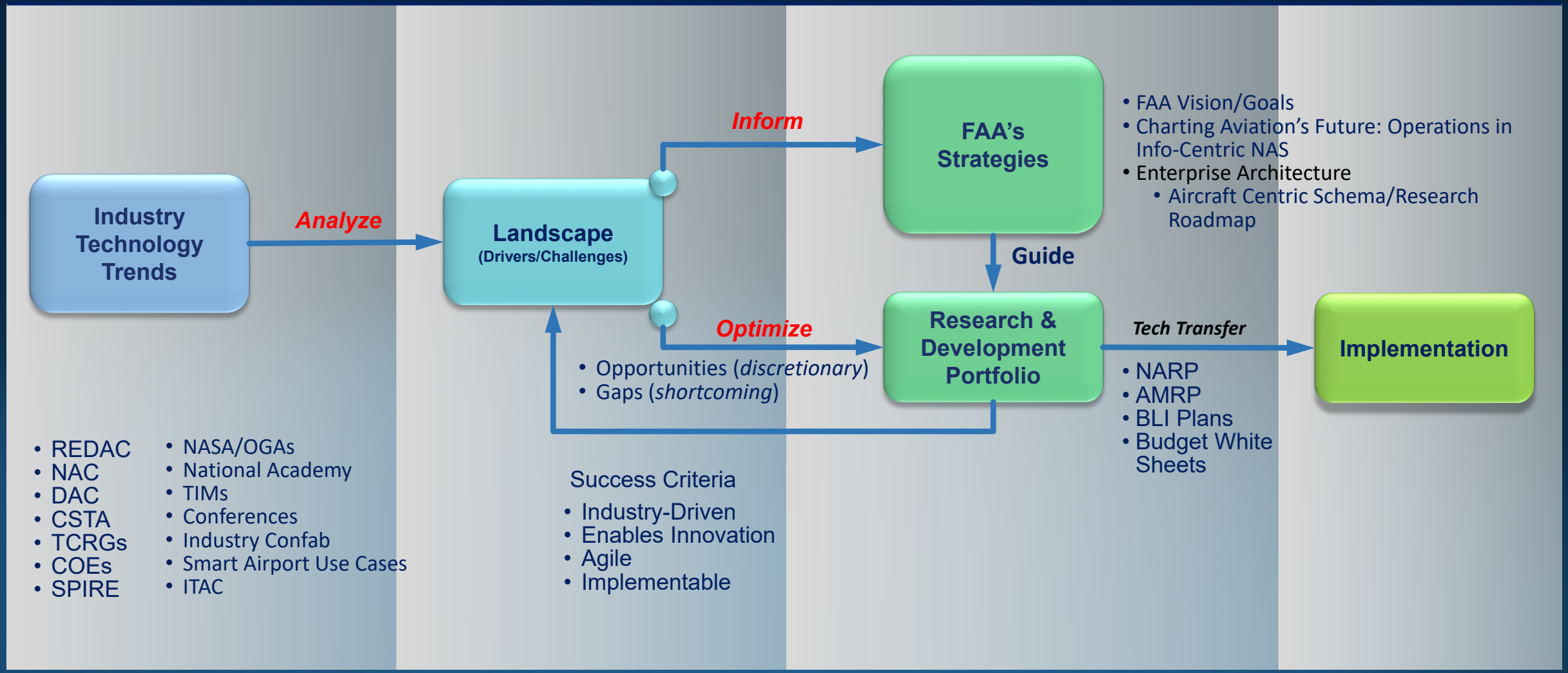
Research Landscape

To provide an informational overview and update on the Landscape process and address questions raised in the Findings and Recommendations to the Administrator from the Summer/Fall REDAC.

FAA's Industry-Driven Research 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

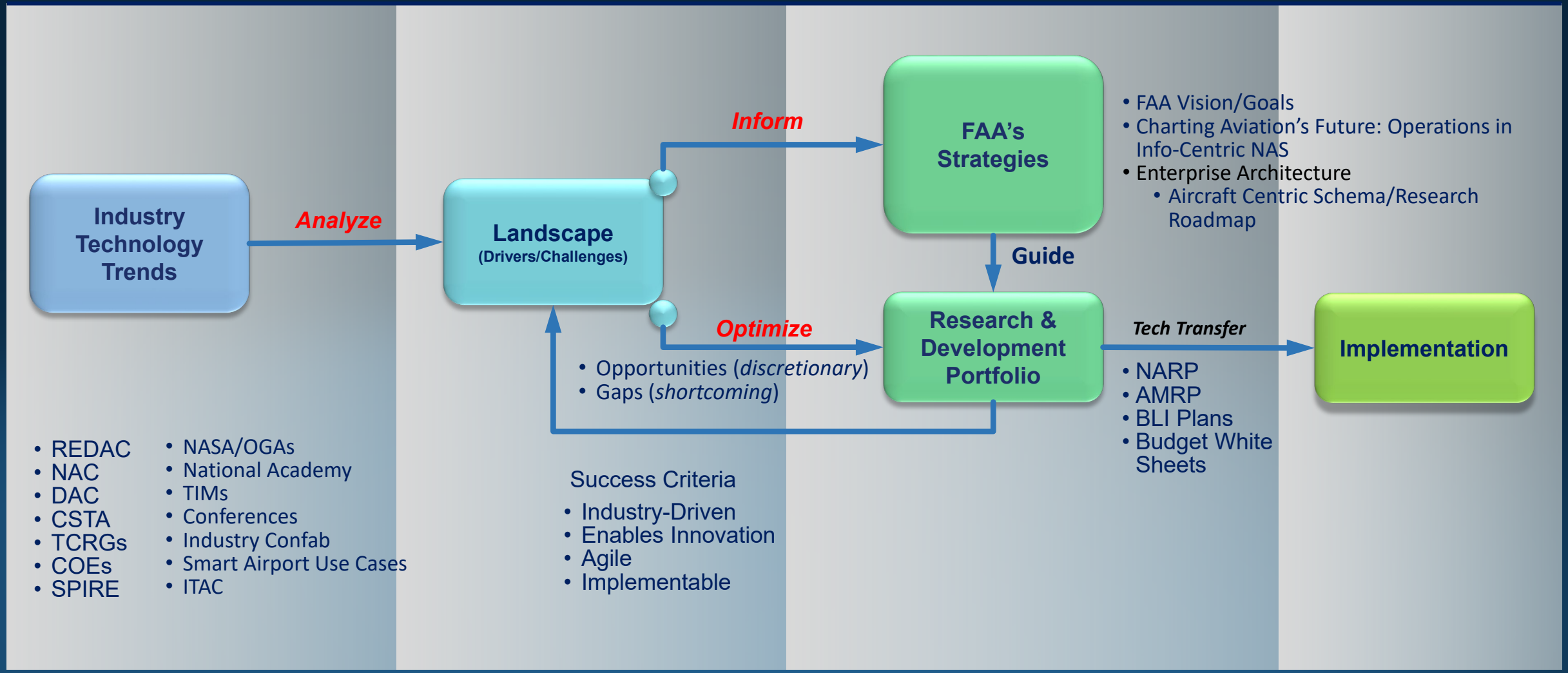
- Aircraft Command and Control Using Automation and Remote Sensing Technologies
- Certification using New Technologies, Standards, or Processes
- Future Fuel Technologies
- Infrastructure Resiliency and Continuity of Operations
- New Medical Technologies and New Medications
- New Vehicles or Components 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

NextGEN

FAA's Industry-Driven Research Landscape

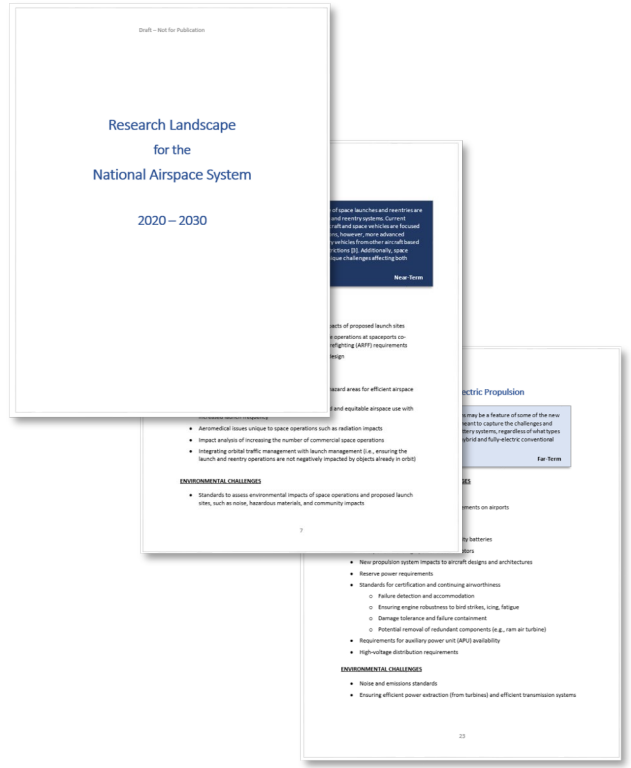


Questions/Discussion

Federal Aviation Administration

The Landscape

- **Each of the 25 industry-led drivers grouped into three categories**
  - Advances in New Vehicles and New Missions
  - Advances in Technology and Materials
  - 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)
- **System Wide Advancements and Improvements**
  - Fourth category of drivers added to focus on FAA priorities or continued agency functions



Not all drivers will have challenges in each area

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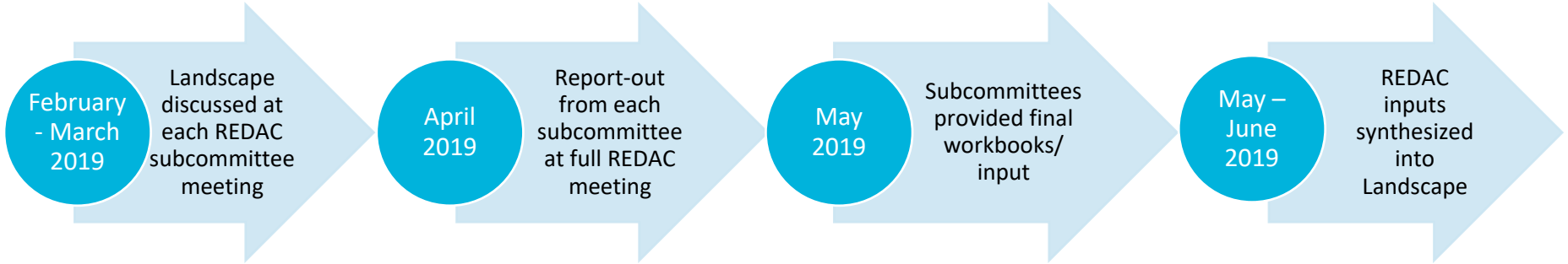
REDAC Landscape Coordination

- **Landscape purpose is to:**
  - Highlight operational drivers and challenges over the next 10 years, which can be used to identify research questions or priorities

- **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

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Applied Research Project Classifications

- **Legislatively Required Research**
  - Specific research FAA is obligated to perform due to regulatory requirements and/or legislation.
  - Driven by Congressional needs
- **Operations Research (Near Term 0-3 years)**
  - Research conducted to supply Agency decision makers with information for improving or optimizing performance and/or safety
  - Driven by FAA Goals and Objectives
- **Emerging Technology Research (Long Term*)**
  - Research to support and enable technology development for new and significant advancements in the NAS
  - Driven by industry needs

* unlikely to result in a final rulemaking action within 5 years, or in initial installation of operational equipment within 10 years after the date of the commencement of such project

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Driver-Project Mapping

- **As part of FY22 prioritization effort, researchers identified the research drivers for each project**
  - Objective: Evaluating our R&D portfolio against the Landscape provides a tool to evaluate resource alignment and possible opportunities for research

- **Lessons Learned:**
  - Need better socialization with researchers regarding landscape drivers – definition, utilization, etc.
  - Tool for input should allow for multiple drivers to be selected, allow for easier identification of drivers

Driver-Project Mapping, Grouped by Category

Advances in New Vehicles/New Missions

Driver	Timeframe	# Projects
Non-Traditional NAS Access Points	Near	3
Routine Small Unmanned Aircraft Systems (UAS) Operations Beyond Visual Line of Sight (BVLOS)	Near	4
Space Operations	Near	0
Autonomous Ground Service Equipment at Airports	Mid	0
Growth of Mixed Operations (Piloted, Autonomous, Unmanned)	Mid	18
New Mission Types	Mid	1
Supersonic Flight	Mid	7
Urban Air Mobility	Mid	7

Advances in Data and Processing Power

Driver	Timeframe	# Projects
Big Data Analytics and Techniques	Near	5
Crowd Sourcing Data	Near	1
Increased Connectivity by Cyber-Physical Systems (Internet of Things [IoT])	Near	0
Information Assurance and Cybersecurity for All Operations	Near	1
Risk-Based Decision-Making Techniques and Analytics	Near	7
Artificial Intelligence (AI)	Mid	1
Human-Machine Teaming and New Technology Interfaces	Far	10

Advances in Technology and Materials

Driver	Timeframe	# Projects
Aircraft Command and Control Using Automation and Remote Sensing Technologies	Near	6
Certification using New Technologies, Standards, or Processes	Near	15
Future Fuel Technologies	Near	4
Infrastructure Resiliency and Continuity of Operations	Near	1
New Medical Technologies and New Medications	Near	3
New Vehicles or Components Which Make Use of New Technologies, Software, or Materials	Near	16
Position, Navigation, & Timing (PNT) Technologies	Near	2
Remote and Virtual Technologies	Near	2
New Technologies for Airport Pavement Infrastructure and Design	Mid	9
Advances in Electric or Hybrid Electric Propulsion	Far	0

System Wide Advancements/Improvements

Driver	Timeframe	# Projects
New Methods and Technologies (Air Traffic Safety, Efficiency, Noise, Emissions, Fuel Use, and Airport Surface Movements)	NA	32
Methods for Increased Flexibility of Operators	NA	3
Performance-Based Capabilities	NA	6
Advancement of Global Standards or Requirements	NA	8
Human Response to Traffic and Congestion Management	NA	5
Development of the Workforce of the Future	NA	17
Advances in Aeromedical Certification	NA	7
Changing Public Demographics and Requirements	NA	12

Driver-Project Mapping, Grouped by Timeframe

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Non-Traditional NAS Access Points	Near	3
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Certification using New Technologies, Standards, or Processes	Near	15
Future Fuel Technologies	Near	4
Infrastructure Resiliency and Continuity of Operations	Near	1
New Medical Technologies and New Medications	Near	3
New Vehicles or Components Which Make Use of New Technologies, Software, or Materials	Near	16
Position, Navigation, & Timing (PNT) Technologies	Near	2
Remote and Virtual Technologies	Near	2
Big Data Analytics and Techniques	Near	5
Crowd Sourcing Data	Near	1
Increased Connectivity by Cyber-Physical Systems (Internet of Things [IoT])	Near	0
Information Assurance and Cybersecurity for All Operations	Near	1
Risk-Based Decision-Making Techniques and Analytics	Near	7

Driver	Timeframe	# Projects
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Human-Machine Teaming and New Technology Interfaces	Far	10
New Methods and Technologies (Air Traffic Safety, Efficiency, Noise, Emissions, Fuel Use, and Airport Surface Movements)	NA	32
Methods for Increased Flexibility of Operators	NA	3
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