



NASA Update E&E REDAC Meeting

August 31, 2016



6 Strategic Research and Technology Thrusts



Safe, Efficient Growth in Global Operations

- Enable full NextGen and develop technologies to substantially reduce aircraft safety risks



Innovation in Commercial Supersonic Aircraft

- Achieve a low-boom standard



Ultra-Efficient Commercial Vehicles

- Pioneer technologies for big leaps in efficiency and environmental performance



Transition to Low-Carbon Propulsion

- Characterize drop-in alternative fuels and pioneer low-carbon propulsion technology



Real-Time System-Wide Safety Assurance

- Develop an integrated prototype of a real-time safety monitoring and assurance system



Assured Autonomy for Aviation Transformation

- Develop high impact aviation autonomy applications

ARMD Programs with Strategic Thrusts



MISSION PROGRAMS

Airspace Operations and Safety Program

- Safe, Efficient Growth in Global Operations
- Real-Time System-Wide Safety Assurance
- Assured Autonomy for Aviation Transformation

Advanced Air Vehicles Program

- Ultra-Efficient Commercial Vehicles
- Innovation in Commercial Supersonic Aircraft
- Transition to Low-Carbon Propulsion
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Integrated Aviation Systems Program

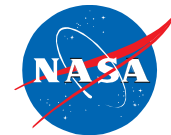
- Flight Research-Oriented Integrated, System-Level R&T support all six thrusts
- X-Planes / Test Environment

SEEDLING PROGRAM

Aeronautics Concepts Program

- High-risk, leap-frog ideas supporting all six thrusts
- Critical cross-cutting tools and technology development

NASA Aeronautics Ready for Flight



NASA Aero Vision
and Strategy
Established

Roadmaps
Completed

2008-2013

2014/15

2016/17

2018-2026

N+3 Subsonic &
Supersonic
Concept/Technology
Studies

Ground Testing of N+3 configurations and
technologies

LBFD
PDR
Completed

UEST PDR
Completed



N+2 Environmentally
Responsible Aviation
(ERA) Project
Initiated

8 Integrated Tech Demos Completed, Tech
transitioned to industry. HWB ready for Flight
Dem/Val.

Ready for X-Plane Integration &
Demonstration

NASA FAA
NextGen Research
Transition Teams
(RTTs) Initiated

Technology Transitions to FAA: MSP,
EDA, PDR, TSAS

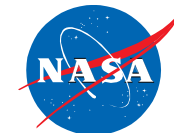
ATD-1 Completed
and transferred to
FAA

ATD-2, 3
Completed
& Transferred to
FAA

Ready for NextGen TBO Integration &
Demonstration



Ten Year Investment Plan—FY 2017 Budget Accelerates Key Components of NASA Aeronautics Plan



Fund the Next Major Steps to Efficient, Clean and Fast Air Transportation Mobility



New Aviation Horizons

Start a continuing series of experimental aircraft to demonstrate and validate high impact concepts and technologies. Five major demonstrations over the next 10+ years in the areas of Ultra-Efficiency, Hybrid-Electric Propulsion, and Low Noise Supersonic Flight

Major New Initiative within IASP



Enabling Tools & Technologies

Major series of ground experiments to ready key technologies for flight

Research and ground demonstration for an advanced small engine core for very high bypass engines and as a hybrid-electric propulsion enabler

Development of next generation physics-based models needed to design advanced configurations

Increases to AAVP and TACP



Revolutionizing Operational Efficiency

Accelerate demonstration of full gate-to-gate Trajectory Based Operations

Increase to AOSP



Fostering Advanced Concepts & Future Workforce

Increased investment in new innovation through the NASA workforce and Universities

Leverage Non-Traditional Technology Advances

Pursue challenge prizes in areas such as energy storage, high power electric motors, advanced networking and autonomy

Increase to TACP



UAS

Strong continued research leadership in enabling UAS integration into the National Airspace. Extending the UAS in the NAS project for an additional 4 years



Hypersonics

Increased investment to ensure a strong National fundamental research capability

Increases to IASP and AAVP

Build off of major current developments and accomplishments

Continue to incentivize new innovation

FY 2017 Budget

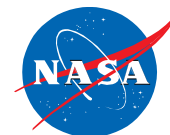


\$ Millions	Enacted											
	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026
Aeronautics	\$642.0	\$640.0	\$790.4	\$846.4	\$1,060.1	\$1,173.3	\$1,286.9	\$1,294.2	\$1,307.6	\$1,218.1	\$829.7	\$839.5
Airspace Operations and Safety	154.0		159.4	159.2	176.2	189.1	221.5	198.7	200.9	193.2	175.5	167.8
Advanced Air Vehicles	240.6		298.6	277.4	308.8	311.6	312.6	321.3	315.0	318.9	317.7	326.7
Integrated Aviation Systems	150.0		210.0	255.4	381.4	493.0	556.7	591.5	612.2	525.0	203.8	210.6
Transformative Aeronautics Concepts	97.4		122.3	154.4	193.8	179.7	196.2	182.8	179.4	181.0	132.7	134.4

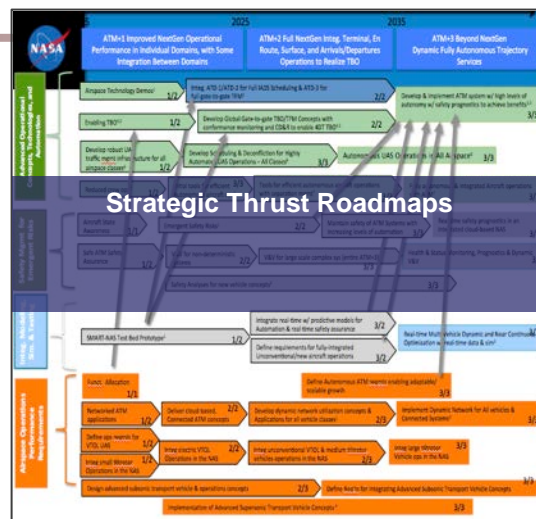
Aeronautics budget includes paid-for 10-year mandatory funding from the Administration's 21st Century Clean Transportation Plan. See appendix for additional detail.

Mandatory Budget Authority						
\$ Millions	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	Outyears
21st Century Clean Transportation Plan	100	200	400	500	600	1900
<i>Airspace Operations and Safety</i>	<i>18</i>	<i>20</i>	<i>35</i>	<i>45</i>	<i>75</i>	<i>170</i>
<i>Advanced Air Vehicles</i>	<i>30</i>	<i>41</i>	<i>79</i>	<i>80</i>	<i>65</i>	<i>305</i>
<i>Integrated Aviation Systems</i>	<i>37</i>	<i>84</i>	<i>196</i>	<i>300</i>	<i>370</i>	<i>1170</i>
<i>Transformative Aeronautics Concepts</i>	<i>15</i>	<i>55</i>	<i>90</i>	<i>75</i>	<i>90</i>	<i>255</i>
Low Boom Flight Demonstrator	56					
<i>Integrated Aviation Systems</i>	<i>56</i>					

NASA Aeronautics Strategic Portfolio Model



SIP Outcomes
Drives Top-Down
Planning



Roadmaps Provide
Guidance for
Project / Center
Innovation and
Planning



6 Strategic Thrusts



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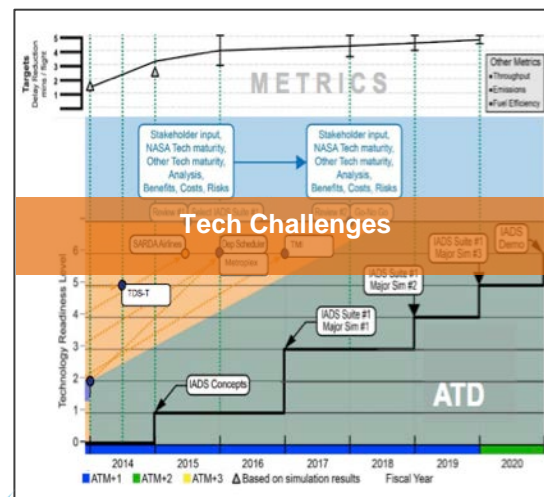


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Assured Autonomy for Aviation Transformation
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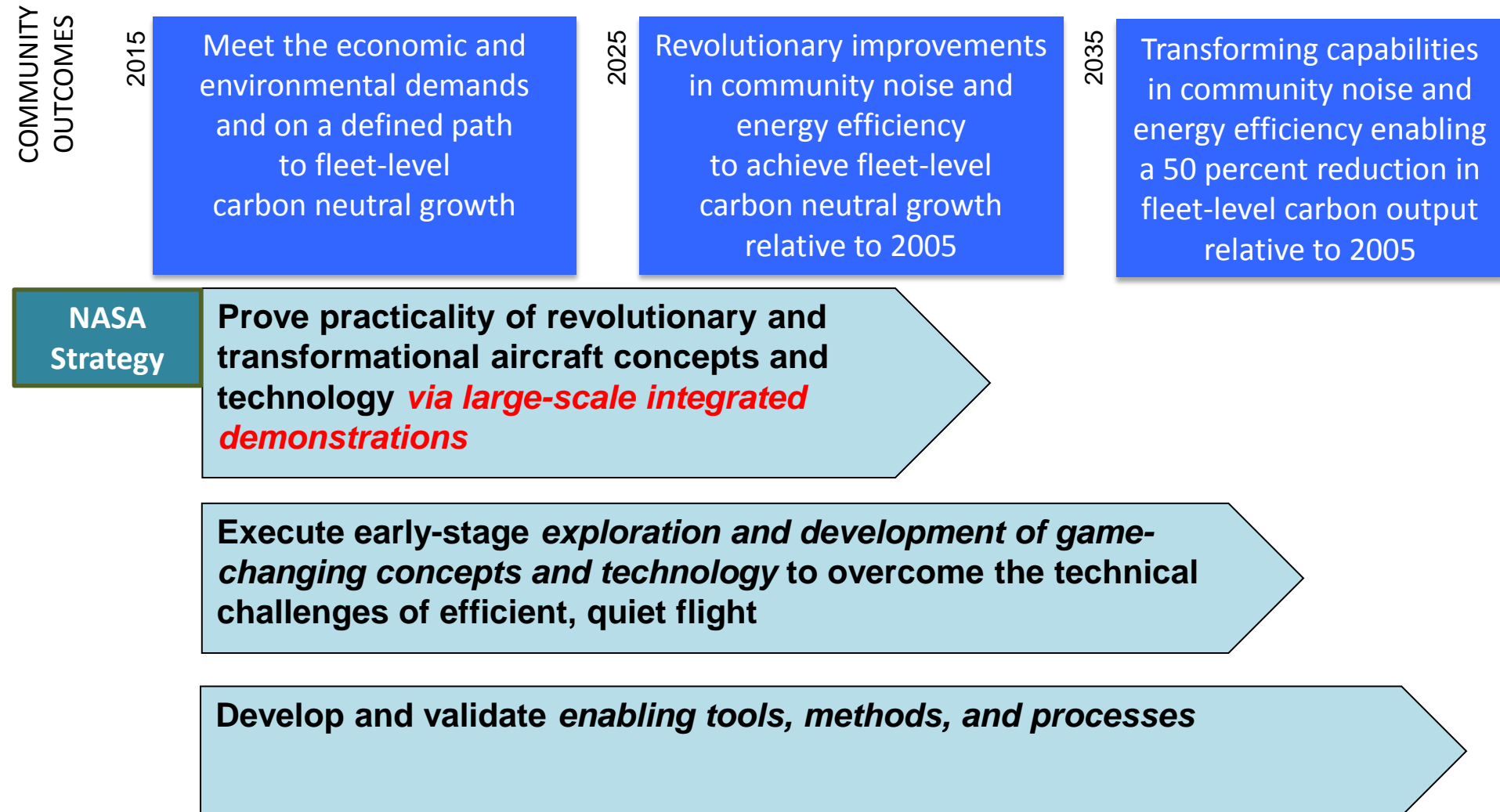
Partnerships &
Performance Create a
Feedback Loop



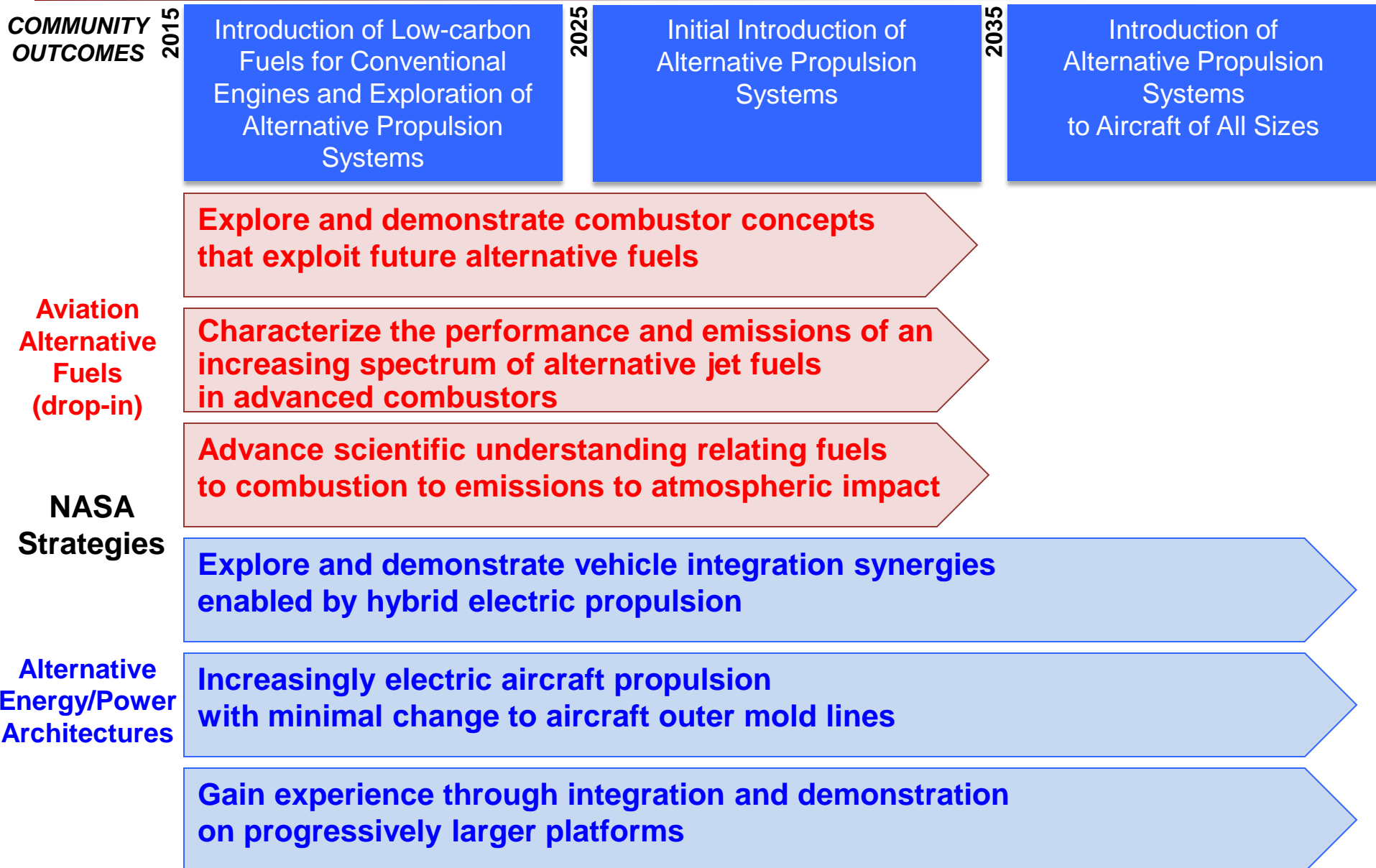
NASA Efficient Vehicle – Subsonic Transport: Research Strategy, 2015-2035+



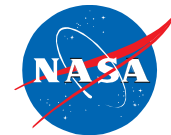
NASA strategy supports each of the three Community Outcomes (2015-2025, 2025-2035, 2035+)



NASA Low Carbon Propulsion: Research Strategy, 2015-2035+



Summary – A New Era for NASA Aeronautics



Investing In Our Future - Investments in NASA's cutting edge aeronautics research today are investments in a cleaner, safer, quieter and faster tomorrow for American aviation:

- A future where Americans are working in stable, well-paying jobs.
- A future where we fly on aircraft that consume half as much fuel and generate only one quarter of current emissions.
- A future where flight is fueled by greener energy sources.
- A future where our air transportation system is able to absorb nearly four billion more passengers over the next 20 years without compromising the safety of our skies.
- A future where our airports are better neighbors because aircraft noise is contained well within the airport boundary.
- A future where people can travel to most cities in the world in six hours or less in an airplane that can fly faster than the speed of sound on bio-fuels.