



# NASA Aeronautics Research Mission Directorate

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# NASA Aeronautics

NASA Aeronautics Vision for Aviation in the 21<sup>st</sup> Century



## 3 Aviation Mega-Drivers



## 6 Strategic Thrusts



Safe, Efficient Growth in Global Operations



Transition to Low-Carbon Propulsion



Innovation in Commercial Supersonic Aircraft



Real-Time System-Wide Safety Assurance



Ultra-Efficient Commercial Vehicles



Assured Autonomy for Aviation Transformation

**U.S. leadership for a new era of flight**



# ARMD Organization – Strategic Thrusts & Programs

## Airspace Operations and Safety Program



AOSP

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

## MISSION PROGRAMS

## Advanced Air Vehicles Program



AAVP

- Ultra-Efficient Commercial Vehicles
- Innovation in Commercial Supersonic Aircraft
- Transition to Low-Carbon Propulsion
- Assured Autonomy for Aviation Transformation

## Integrated Aviation Systems Program



IASP

- Flight research-oriented, integrated, system-level R&T that supports all six thrusts
- X-planes/test environment

## Transformative Aeronautics Concepts Program



TACP

- High-risk, leap-frog ideas that support all six thrusts
- Critical cross-cutting tools and technologies development

## SEEDLING PROGRAM

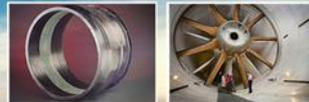
# NASA Aeronautics Programs

## Transformative Aeronautics Concepts Program



NASA Aeronautics is committed to transforming aviation by dramatically reducing its environmental impact, improving efficiency while maintaining safety in more crowded skies, and paving the way to revolutionary aircraft shapes and propulsion.

## Advanced Air Vehicles Program



## Airspace Operations and Safety Program

### Vehicle Health



### Visual Analysis

0301 3576  
2355 4333  
2463 system check ok

### Data

## Integrated Aviation Systems Program



# Advanced Air Vehicles Program



**Cutting-edge research that will generate innovative concepts, technologies, capabilities & knowledge to enable revolutionary advances for a wide range of air vehicles.**

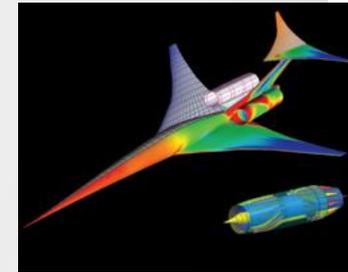
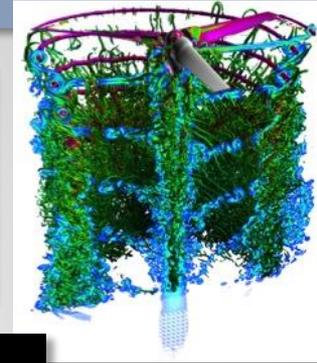
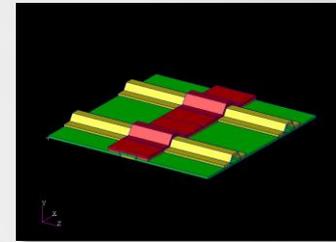
**Advanced Air Transport Project (AATT)** Conducts fundamental research to improve aircraft performance and minimize environmental impacts from subsonic air vehicles

**Revolutionary Vertical Lift Technology Project (RVLT)** Develops and validates tools, technologies & concepts to overcome key barriers, including noise, efficiency, & safety for vertical lift vehicles

**Advanced Composites Project (AC)** Conducts research to reduce the timeline for development and certification of composite structures for aviation

**Commercial Supersonic Technology Project (CST)** Develops tools and explores concepts for potential advanced capabilities & configurations for low boom supersonic aircraft.

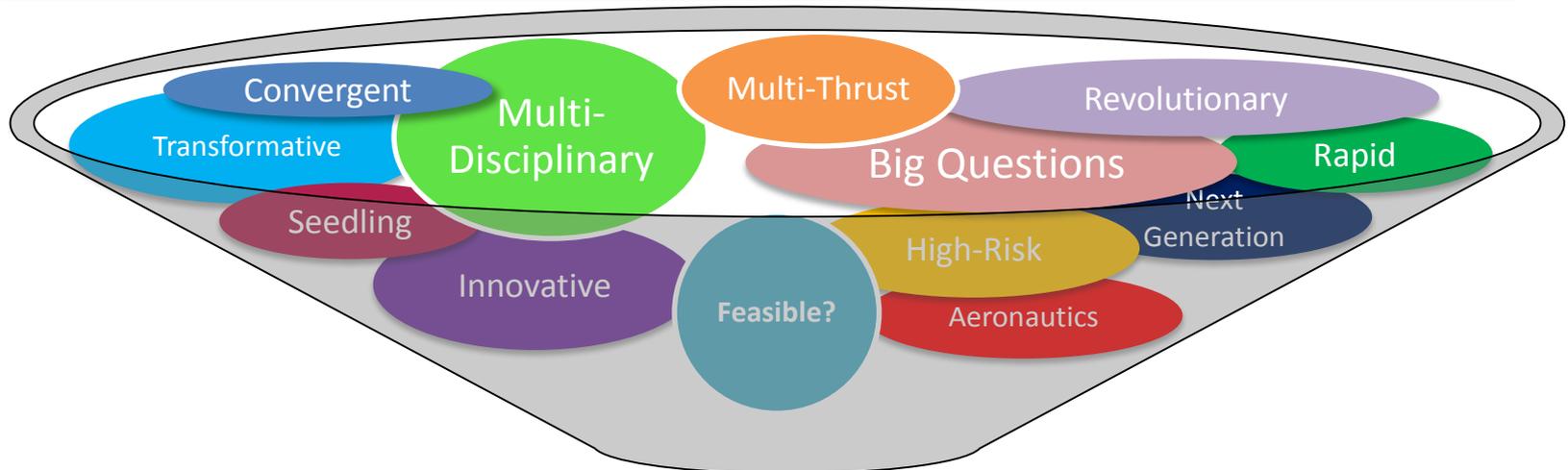
**Aeronautical Evaluation & Test Capabilities Project (AETC)** Ensures the strategic availability, accessibility, & capability of a critical suite of aeronautics ground test facilities to meet Agency & national aeronautics testing needs



# The ARMD Seedling Program – Transformative Aeronautics Concepts (TAC) Program

**VISION: “Aviation is transformed”**

**MISSION: Cultivate concept and capabilities that inspire new solution paths, enable innovative design, and lead to breakthrough technologies that transform aviation**



## TAC Program GOAL:

- Cultivate concepts and technologies to enable aviation transformation

## OBJECTIVES:

- Support and challenge strategic & tactical planning via early convergent innovation
- Provide transformative advancements within single disciplines and advanced methods

## APPROACH:

- Provide environment to explore feasibility
- Explore never-done-before tools
- Invest in advanced technologies
- Challenge external communities
- Converging advancements in aeronautics and non-aeronautics sectors

# Transformative Aeronautics Concepts Program

Project/Area Sound bite	“What”	“Why”	“How”
<b>Transformational Tools &amp; Technologies (TTT):</b> Transformative knowledge base	Perform deep R&D on: <ul style="list-style-type: none"> <li>• First-of-a-kind capabilities to analyze, understand, predict, and measure performance</li> <li>• Tall-pole technologies</li> </ul>	Step-increase enablers for new aviation concepts <ul style="list-style-type: none"> <li>• Connections to mission programs and aeronautics community is critical</li> </ul>	Utilize TCs and “emerging” TCs to overcome barriers
<b>Convergent Aeronautical Solutions (CAS):</b> Rapid feasibility exploration	Encourages game-changing, convergent concepts <ul style="list-style-type: none"> <li>• Makes assessment of feasibility</li> <li>• Three phases: incubation, execution, transition</li> </ul>	Value in knowledge gained: <ul style="list-style-type: none"> <li>• Some concepts may prove feasible, many will not</li> <li>• Some may get into mission programs, many will not</li> </ul>	Big Questions are used to: <ul style="list-style-type: none"> <li>• challenge approaches;</li> <li>• create alternate paths;</li> <li>• enable new outcomes</li> </ul>
<b>Prizes:</b> Challenge me!	Fill-in the difficult gaps	Breakthroughs are needed	External prizes
<b>University Leadership Initiative (ULI):</b> Tap-into and align unique capabilities	Universities independently plan, propose, and execute SIP-relevant “projects”	Provide opportunity to take multi-disciplinary leadership	“New” ROA solicitation

# The CAS Vision

Transformative Concepts that are –

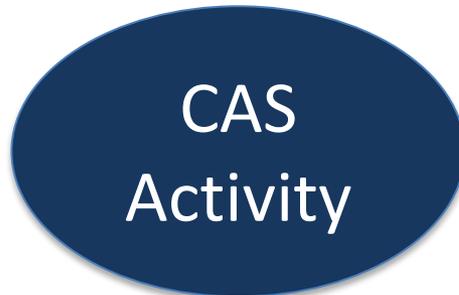


## Convergent

– Cross-Discipline, Cross-Center, Diverse Sources



Targeted



Transformative



## Feasibility Assessment Focused

... Technology Evaluation

Rapidly Executed

- Competitively-selected
- Light project management



# Aeronautics Prizes & Challenges – Under Construction



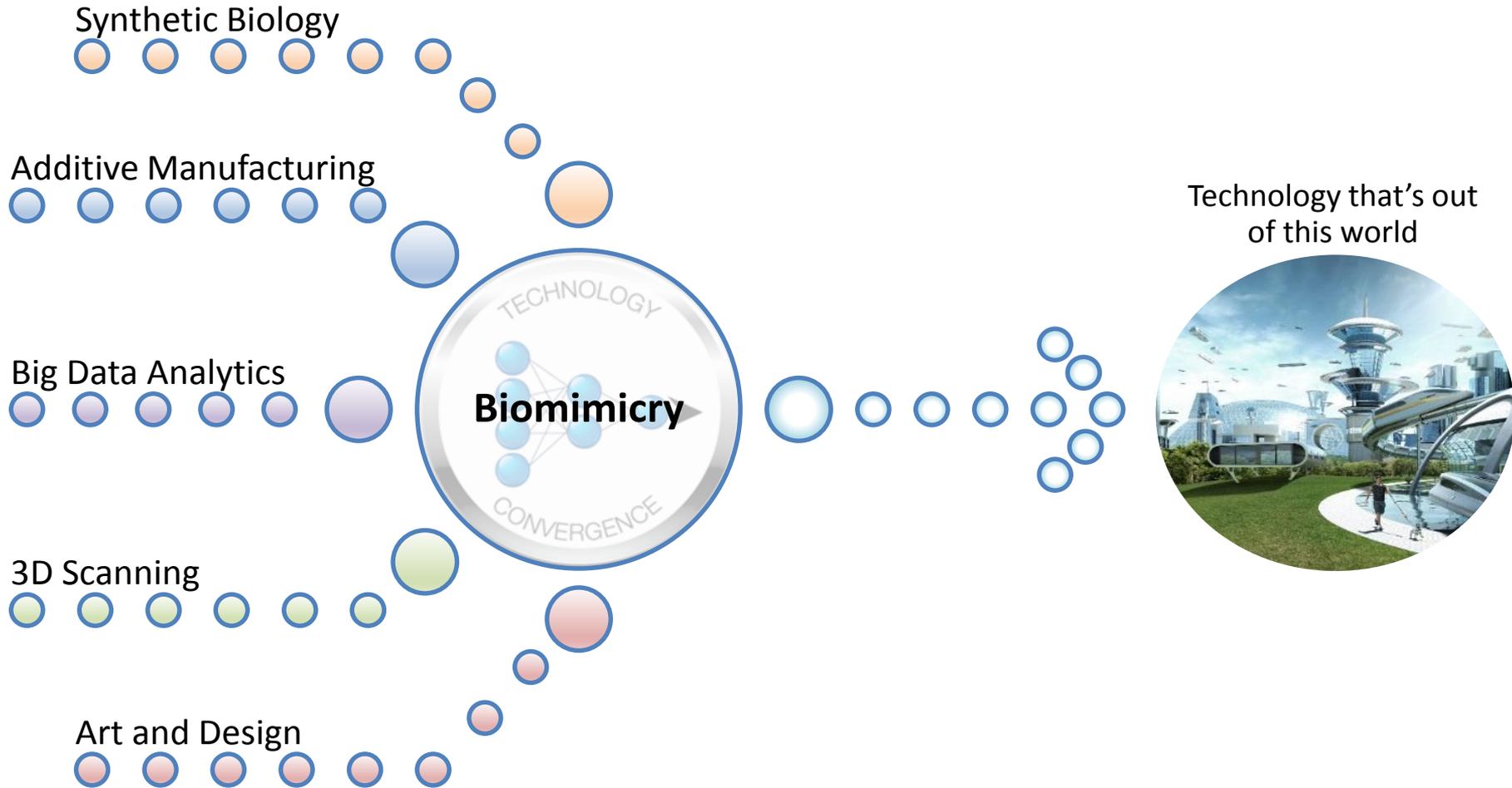
We hope to shorten Research & Development (R&D) time and efforts, to advance & enhance aerospace Technology Readiness Levels (TRL) to enter into market.

# University Leadership Initiative (ULI) Objectives



- Promote transformative, innovative research that can help advance six Aeronautics Strategic Thrusts.
- Develop parallel research paths that contribute to the same strategic outcomes as those pursued by internal NASA research (near-term, mid-term, or far-term timeframe).
- Create new ideas involving interaction across a wide range of disciplines, including traditional and non-traditional aeronautics (“technology convergence”).
- Invest in the next generation of engineers to enable continued U.S. leadership in aviation.
- Promote broader participation across the university community.

# Biomimicry – A New Consideration in Technology Convergence



# A Vision for the Future of Civil Aviation



- There will be a radical increase in new and cost-effective uses of aviation
- The skies will accommodate thousands of times the number of vehicles flying today
- Travelers will have the flexibility to fly when and where they want in a fraction of the time that it takes today.
- All forms of air travel will be as safe as commercial air transport is today
- Subsonic transports will remain the backbone of long-haul global and domestic travel
- Significantly reduced carbon and noise footprints from aviation

