

National Aeronautics and Space Administration



NASA

Fundamental Aeronautics Program

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**Fundamental Aeronautics
2012 Annual Meeting
March 13, 2012**

Meeting Overview



Fundamental Aeronautics 2012 Annual Conference

- 3-day Conference – an opportunity to share and discuss Fundamental Aeronautics (FA) Program research & technology efforts.
- 4 parallel technical sessions, with over 110 presentations focused on the technical efforts of each of the four projects of the FA Program:
 - Subsonic Fixed Wing (SFW)
 - Subsonic Rotary Wing (SRW)
 - Supersonics (SUP)
 - Hypersonics (HYP)
- “Working Lunch” with Speaker: A Historical Review of Sonic Boom Technology by Domenic Maglieri
- Feedback sessions, one-on-one meetings
 - Projects
 - Program Office

NASA Aeronautics' Priorities



Accelerate implementation and **enhance** the capabilities of NextGen

Innovate to close critical gaps in both ATM and vehicles to achieve the full potential of NextGen

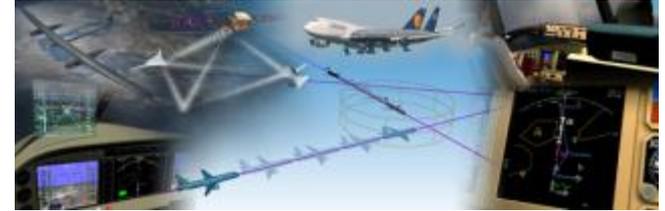
Lead the country with a vision and revolutionary capabilities for the Nation's future aviation system

NASA Aeronautics is making tangible and compelling impact today in all three priorities

NASA Aeronautics Programs



Fundamental Aeronautics Program

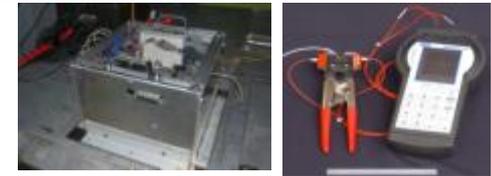


Airspace Systems Program

Integrated Systems Research Program



Aviation Safety Program



Aeronautics Test Program



Current Fundamental Aeronautics Overview



Goal:

To achieve technological capabilities necessary to overcome national challenges in air transportation including reduced noise, emissions, and fuel consumption, increased mobility through a faster means of transportation, and the ability to ascend/descend at very high speeds through atmospheres.

Subsonic Fixed Wing (SFW)

Explore and develop tools, technologies, concepts, and knowledge for improved energy efficiency and environmental compatibility for sustained growth of commercial aviation

Subsonic Rotary Wing (SRW)

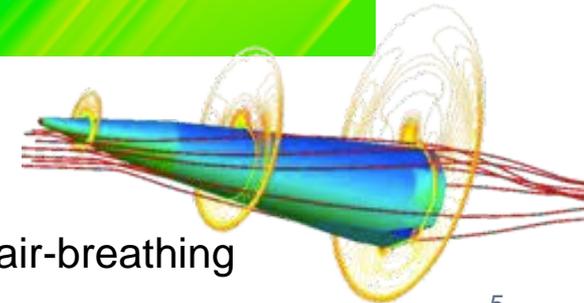
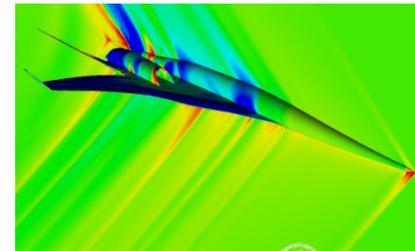
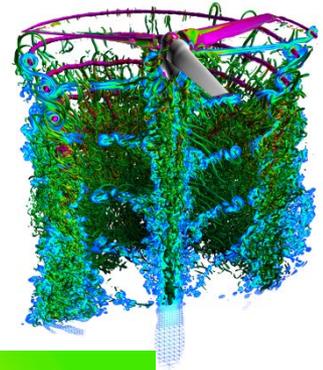
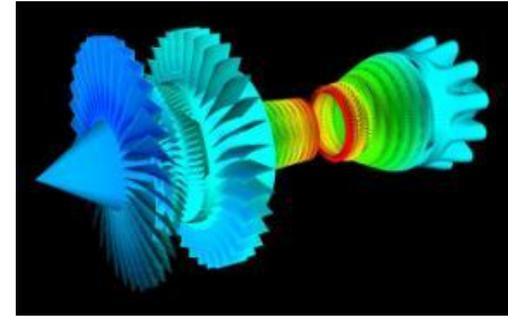
Enable radical changes in the transportation system through advanced concept rotary wing vehicles

Supersonics (SUP)

Develop tools, technologies and knowledge to overcome the environmental & performance barriers to practical civil supersonic airliners.

Hypersonics (HYP)

Develop tools, technologies and knowledge to enable hypersonic air-breathing vehicles and high-mass entry into planetary atmospheres.



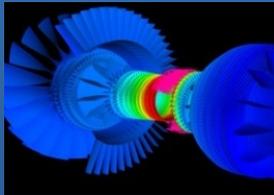
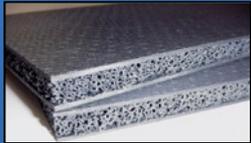
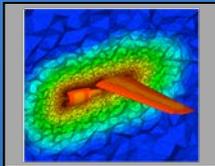
New FA Program Organization Structure



Starting in FY13

Fundamental
Aeronautics
Program Office

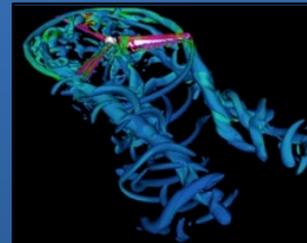
Aeronautical
Sciences Project



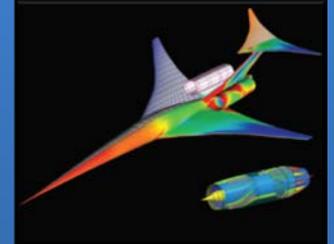
Fixed Wing
Project



Rotary Wing
Project



High Speed
Project



New FA Program Organization Structure



New FAP Org. Structure and Program Direction

- Provide a more sustainable environment to focus research on key vehicle technical challenges
- Facilitate the transition of the skill-mix in some areas and augment with additional personnel where needed
- Aeronautical Sciences Project will serve as an “incubator” for maturing budding ideas and will provide a “home” for some “cross-cutting” research elements

Planning is underway to enable the new structure to be implemented in FY13

- The initial starting point is based on the current portfolio
- Expect some impact to content based on the reality of a projected flat or declining budget during these lean budget times

FY 2013 Budget Request



Program Funding

Budget Authority (\$M)	FY 2011	FY 2012	FY 2013
	Actual	Estimate	
Aeronautics	\$533.5	\$569.4	\$551.5
<u>Aeronautics Research</u>	<u>533.5</u>	<u>569.4</u>	<u>551.5</u>
Aviation Safety	67.3	80.1	81.1
Airspace Systems	87.2	92.7	93.3
Fundamental Aeronautics	206.3	186.3	168.7
Aeronautics Test Program	76.4	79.4	78.1
Integrated Systems Research	75.9	104.2	104.0
Aero Strategy and Management	20.4	26.7	26.4

FY13 President's Budget - FAP



	\$M	FY12	FY13
Fundamental Aeronautics Program		\$186.3	\$168.7
Rotary Wing Project		\$0.0	\$24.1
Fixed Wing Project		\$0.0	\$77.9
High Speed Project		\$0.0	\$34.4
Aeronautical Sciences Project		\$0.0	\$32.3
Subsonic-Rotary Wing		\$27.9	\$0.0
Subsonic-Fixed Wing		\$90.5	\$0.0
Supersonics		\$42.8	\$0.0
Hypersonics		\$25.1	\$0.0

Note that FY13 figures are initial estimates that are likely to be modified

Reduction of Hypersonics Research



- The current research portfolio has two focus areas: air-breathing hypersonics flight systems and Entry, Descent and Landing (EDL)
- The Fundamental Aeronautics Program will do the following:

Realign

- Maintain the testing and research capabilities associated with the LaRC 8-FT High Temperature Tunnel in order to support future needs of NASA and external programs including DoD's hypersonic activities.
- Transfer fundamental research on EDL technologies to Space Technology

Reduce

- Research related to air-breathing hypersonics flight systems including propulsion technologies and structurally integrated thermal protection systems.

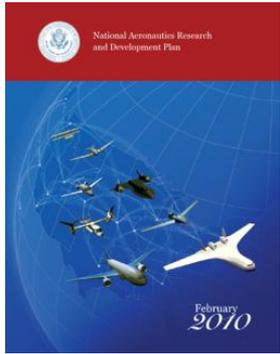


Key Questions to Address

- What are you trying to do? Articulate your objectives.
- How is it done today, and what are the limits of current practice?
- What's new in your approach and why do you think it will be successful?
- **Who cares? If you're successful, what difference will it make?**
- What are the risks and the payoffs?
- How much will it cost? How long will it take?
- What are the midterm and final "exams" to check for success?

Answers to these questions help effectively communicate what we are doing, why it is important, and how we ensure appropriate progress.

National Goals and “Technical Challenges”



Mobility is Vital

Goal 5: Expanded Capabilities

Energy & Environment

Goal 1: Alternative Fuels

Goal 2: Increased Energy Efficiency

Goal 3: Reduced Environmental Impact

National Defense

Goal 1: Increase Cruise Lift to Drag

Goal 2: Improved Rotorcraft

Goal 3: Reduced Engine SFC

Goal 5: Sustained Hypersonic Flight

Safety

Goal 1: Enhanced Vehicle Design

Goal 3: Improved Crashworthiness

15 related Technical Challenges including:

- Reduced drag, weight, noise, emissions, specific energy consumption (SFW)
- Supersonic aircraft in NexGen (SUP)
- NexGen rotorcraft (SRW)
- Multi-disciplinary tools and system design

18 related Technical Challenges including:

- Reduced drag, weight, noise, emissions, specific energy consumption (SFW)
- Supersonic boom & supersonic cruise (SUP)
- Light weight engines/airframes (SUP)
- Actively-controlled, efficient rotorcraft (SRW)
- Multi-disciplinary tools and system design

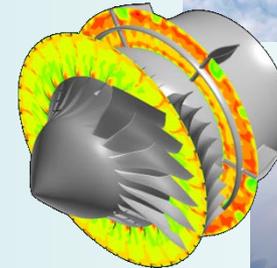
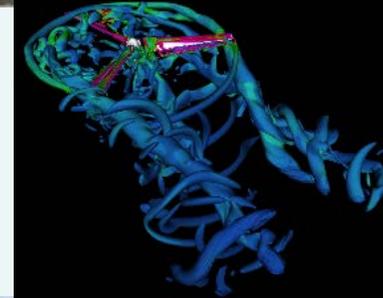
19 related Technical Challenges including:

- Reduced drag, weight, specific energy consumption (SFW)
- Light weight engines/airframes (SUP)
- Integrated Aero/Propulsion System (SRW)
- Airbreathing propulsion (HYP)
- Multi-disciplinary tools and system design

1 related Technical Challenge:

- NextGen Rotorcraft (SRW)

The FA Program Big Picture



Fundamental Aeronautics Program

Fundamental Aeronautics Projects

NASA Centers
ARC GRC
DFRC LaRC

Utilize Core Competencies

Fundamental Research

Enabling Future Technologies and Capabilities



Building on NACA/NASA Legacy

Program-to-Program Collaborations

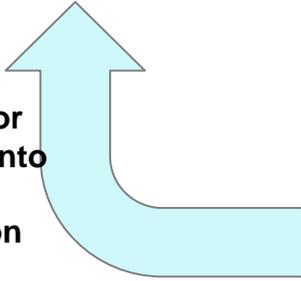


Integrated Systems Research Program



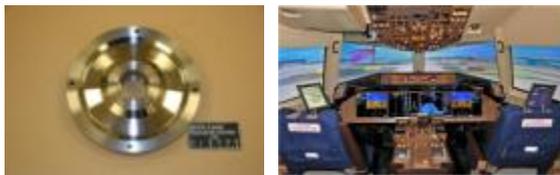
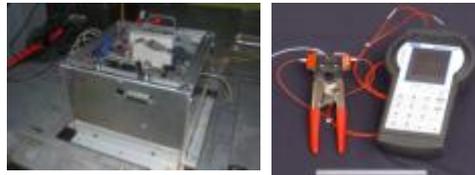
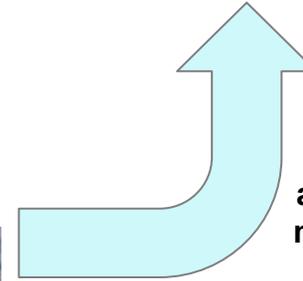
Airspace Systems Program

Advanced technologies for "graduation" into system-level experimentation (SFW-ERA)



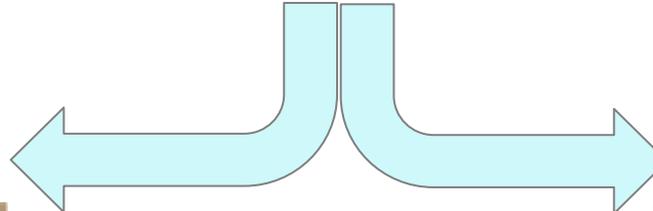
Fundamental Aeronautics Program

Advanced vehicle capabilities for airspace system models; LCTR in airspace study results provided



Aviation Safety Program

Collaboration on external vision systems (SUP)



Advanced experimental techniques & facility capability investments

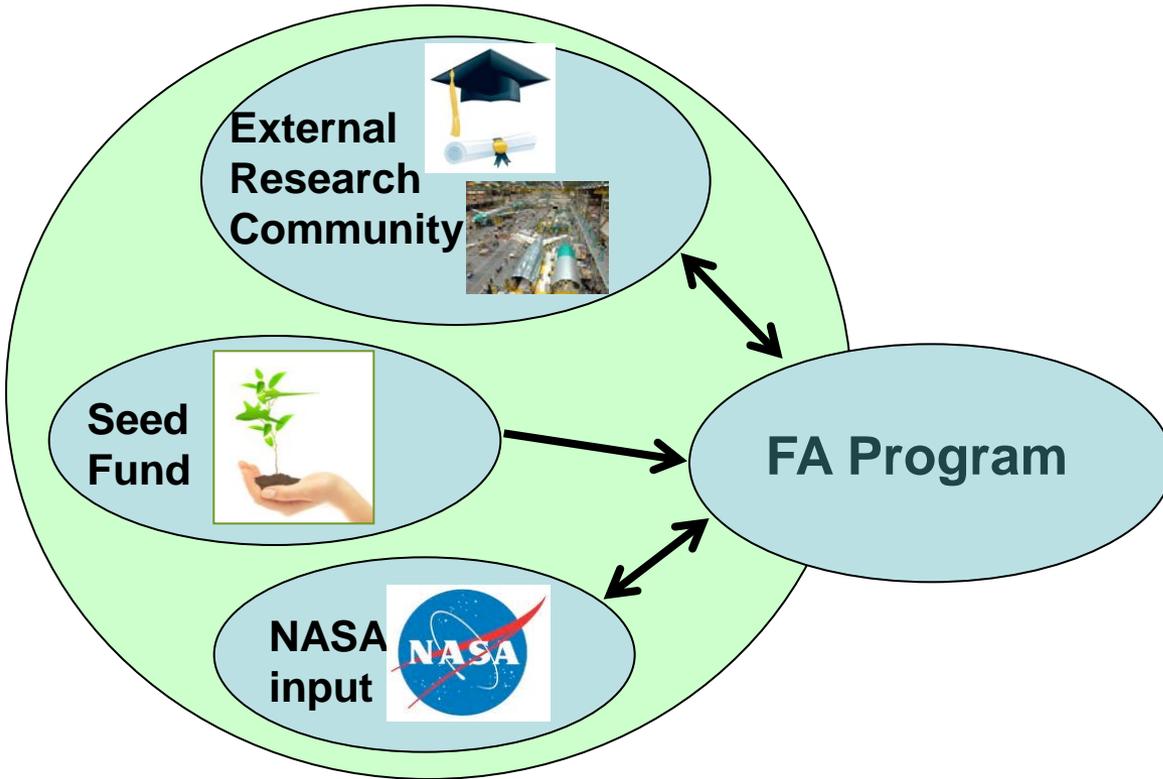


Aeronautics Test Program

FA Partnership Examples



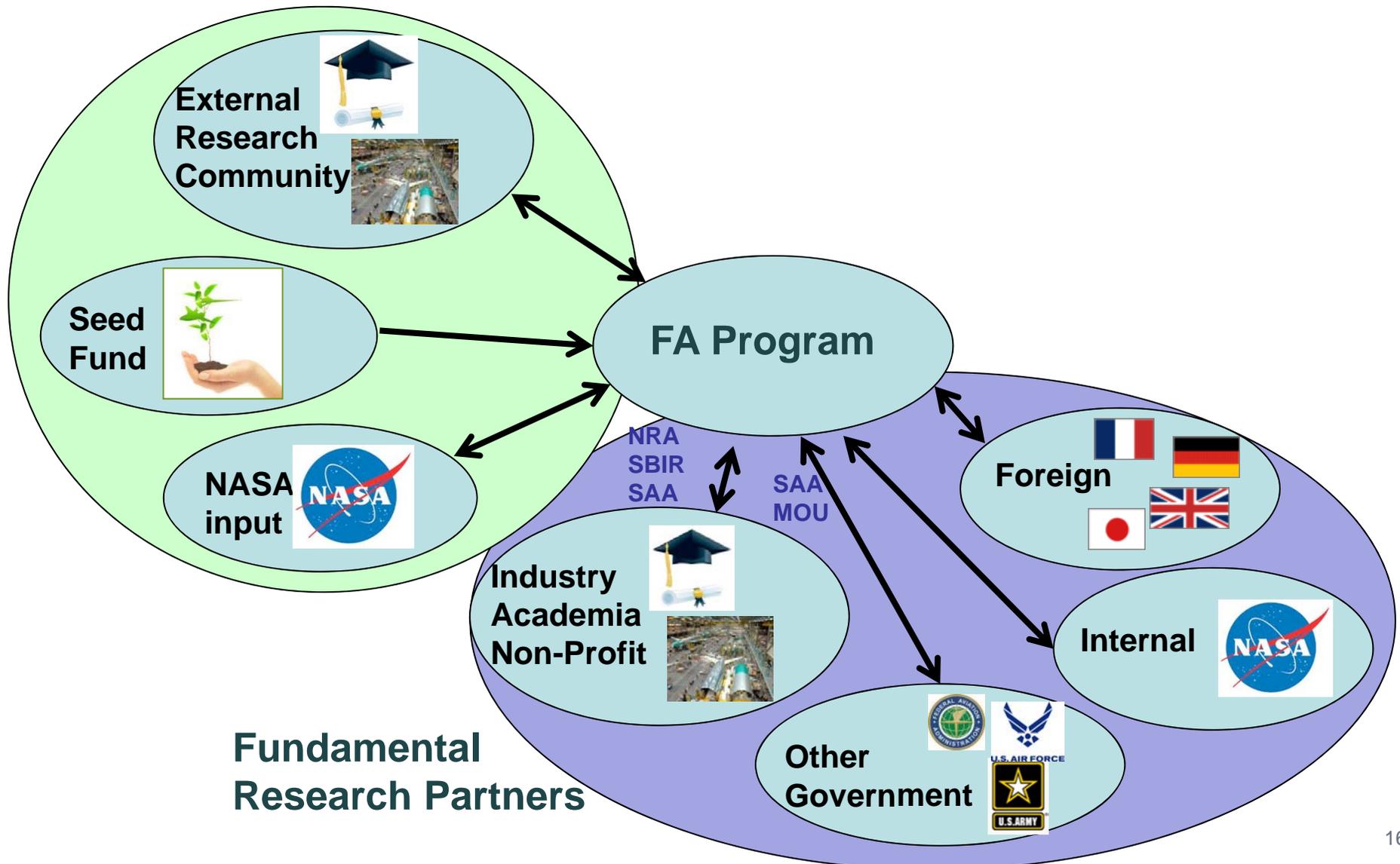
Idea Generation



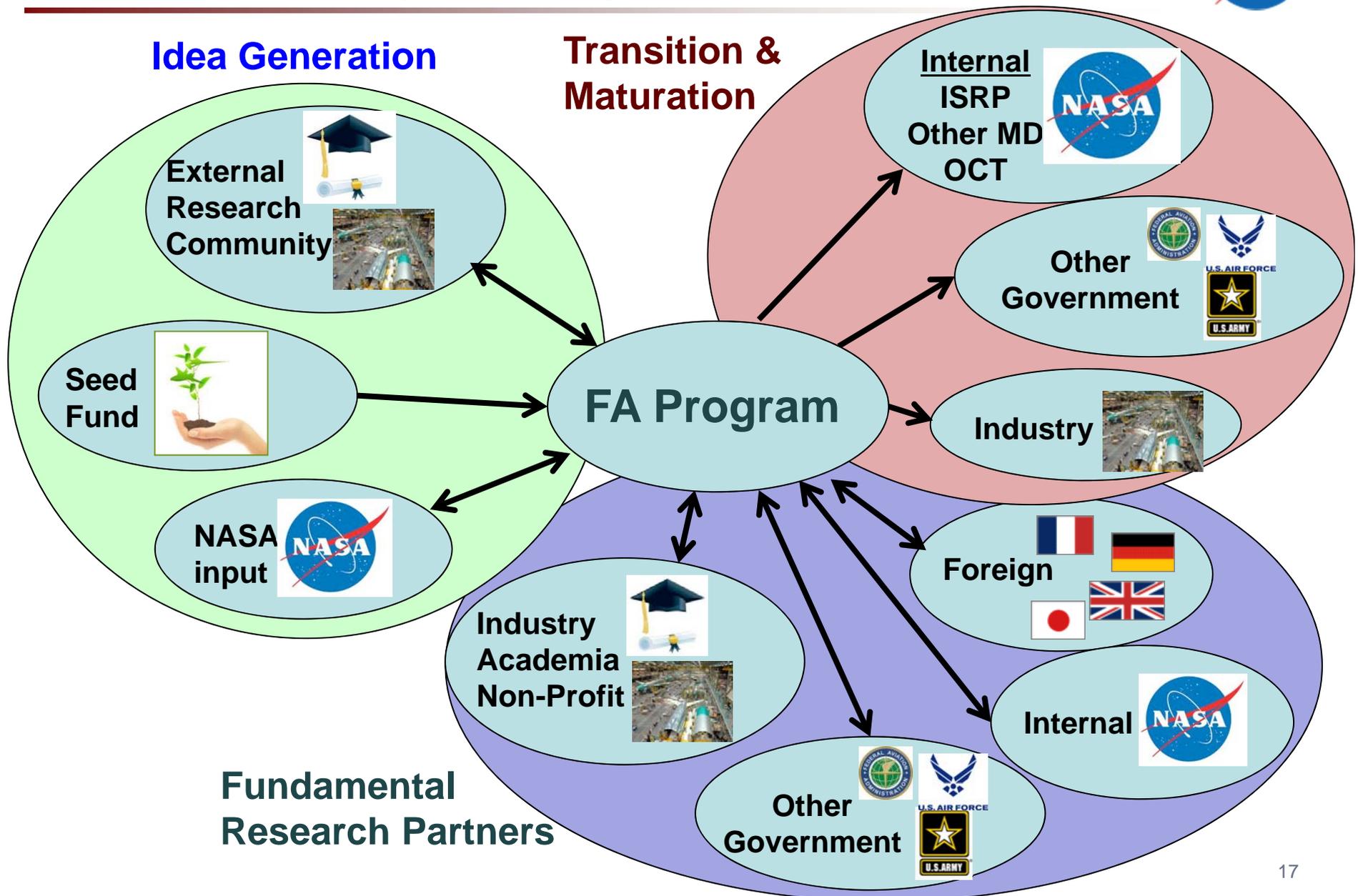
FA Partnership Examples – Cont.



Idea Generation



FA Partnership Examples – Cont.



NASA Research Announcement Partnerships



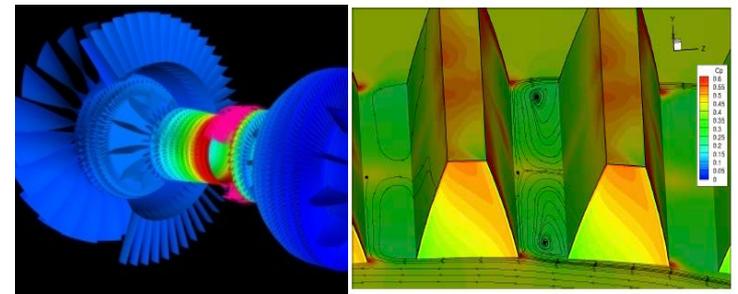
The Research Opportunities in Aeronautics (ROA) NRA - an extremely successful component of the ARMD research portfolio.

- Open to academic institutions, industrial and non-profit organizations.
- Full and open competition encourages participation from a broad range of organizations.
- Thorough annual review process for on-going technical quality and relevance to the project, program, and Mission Directorate goals.
- Efforts complement NASA in-house expertise and provide a collaborative mechanism between NASA and non-NASA researchers.
- Research solicitation topics are generated by project leadership based on input from sub-project leaders, and technical line organizations and are based on identified technology gaps.



N+3 Future Systems Study

SYSTEM FOCUSED



Computational Analyses

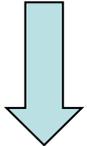
FOUNDATIONAL



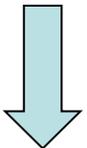
FA Program - Making an Impact



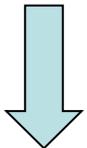
Producing world-class data



Creating the next generation of tools and capabilities to process information

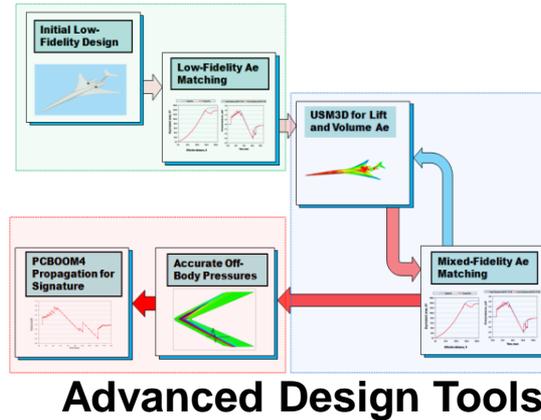


Generating knowledge to advance the field of aeronautics



Developing advanced technologies that make a difference

Analytical/ Computational



N+3 Studies

Ground Test



UH-60 Airloads

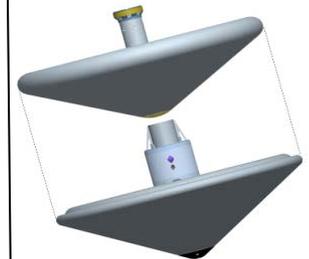


FAST-MAC

Flight Test



SCAMP



Inflatable Re-Entry Systems

