NASA
Fundamental Aeronautics Program

Jay Dryer
Director
Fundamental Aeronautics Program

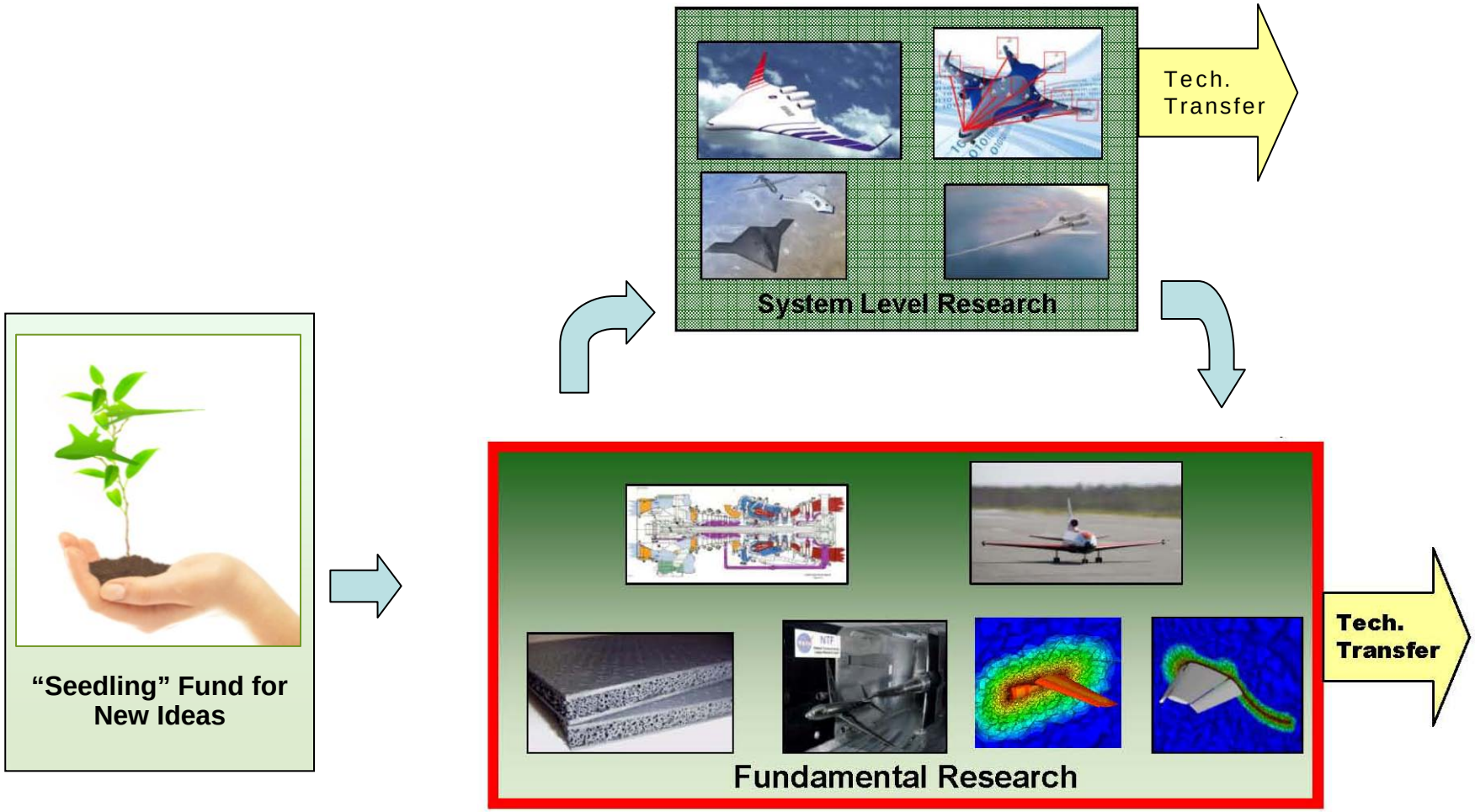
2009 Annual Meeting
September 29-October 1, 2009

Meeting Overview

Fundamental Aeronautics 2009 Annual Meeting

- 3-day meeting to communicate details of work pursued by the Fundamental Aeronautics Program. Interaction.
- 4 parallel technical sessions focused on the technical content of each Fundamental Aeronautics Project:
  - Subsonic Rotary Wing
  - Subsonic Fixed Wing
  - Supersonics
  - Hypersonics
- 2 Plenary talks:
  - “X-15 Program: its Legacy and History”, Major General Joe Engle United States Air Force, retired
  - “Opportunities for Aeronautics for an Energy-Conscious World”, Dr. Mark J. Lewis Willis Young Professor, Department of Aerospace Engineering, University of Maryland Former Chief Scientist, Air Force Research Laboratory
- NRA Final Briefing: Advanced Vehicle Concepts and Implications for NextGen
- Student Session with participation by the 2009 college/university division contest winners and 2009 contest summer interns
- Student awards presented at the luncheon
- Feedback sessions, one-on-one meetings

NASA Aeronautics Investment Strategy



Enabling "Game Changing" concepts and technologies from advancing fundamental research ultimately to understand the feasibility of advanced systems

Fundamental Aeronautics Program Overview

Goal: Develop capabilities necessary to address national challenges in air transportation including noise, emissions, fuel consumption, acceptable supersonic flight over land, mobility, and the ability to ascend/descend through planetary atmospheres. These technological capabilities will enable feasible design solutions to performance and environmental challenges of future air vehicles – vehicles that fly through any atmosphere at any speed.

Subsonic Fixed Wing (SFW)

Develop improved prediction methods and technologies that enable dramatic improvements in noise and emissions reduction, and increased performance (fuel burn and reduced field length) characteristics of subsonic/transonic aircraft.

Subsonic Rotary Wing (SRW)

Radically improve the transportation system using rotary wing vehicles by increasing speed, range, and paylod while decreasing noise and emissions.

Supersonics

Eliminate environmental and performance barriers that prevent practical supersonic vehicles (cruise efficiency, noise and emissions, performance, boom acceptability).

Hypersonics

Enable airbreathing access to space and high mass entry into planetary atmospheres.

Fundamental Aeronautics Program: Organizational Chart

Program Office, NASA HQ, Washington, DC

- Director: Jay Dryer
- Deputy Director: Barbara Esker (Acting)
- Technical Integration Manager: Vacant
- Program Integration Manager: Irma Cortes Rodriguez

LaRC - NASA Langley
GRC - NASA Glenn
ARC - NASA Ames
DFRC - NASA Dryden

Hypersonics Project

- Principal Investigator: James Pittman, LaRC
- Project Scientist: Neil Cheatwood, LaRC
- Project Manager: John Koudelka, GRC

Supersonics Project

- Principal Investigator: Peter G. Coen, LaRC
- Project Scientist: Louis Povinelli, GRC
- Project Manager: Kestutis Civinskas, GRC

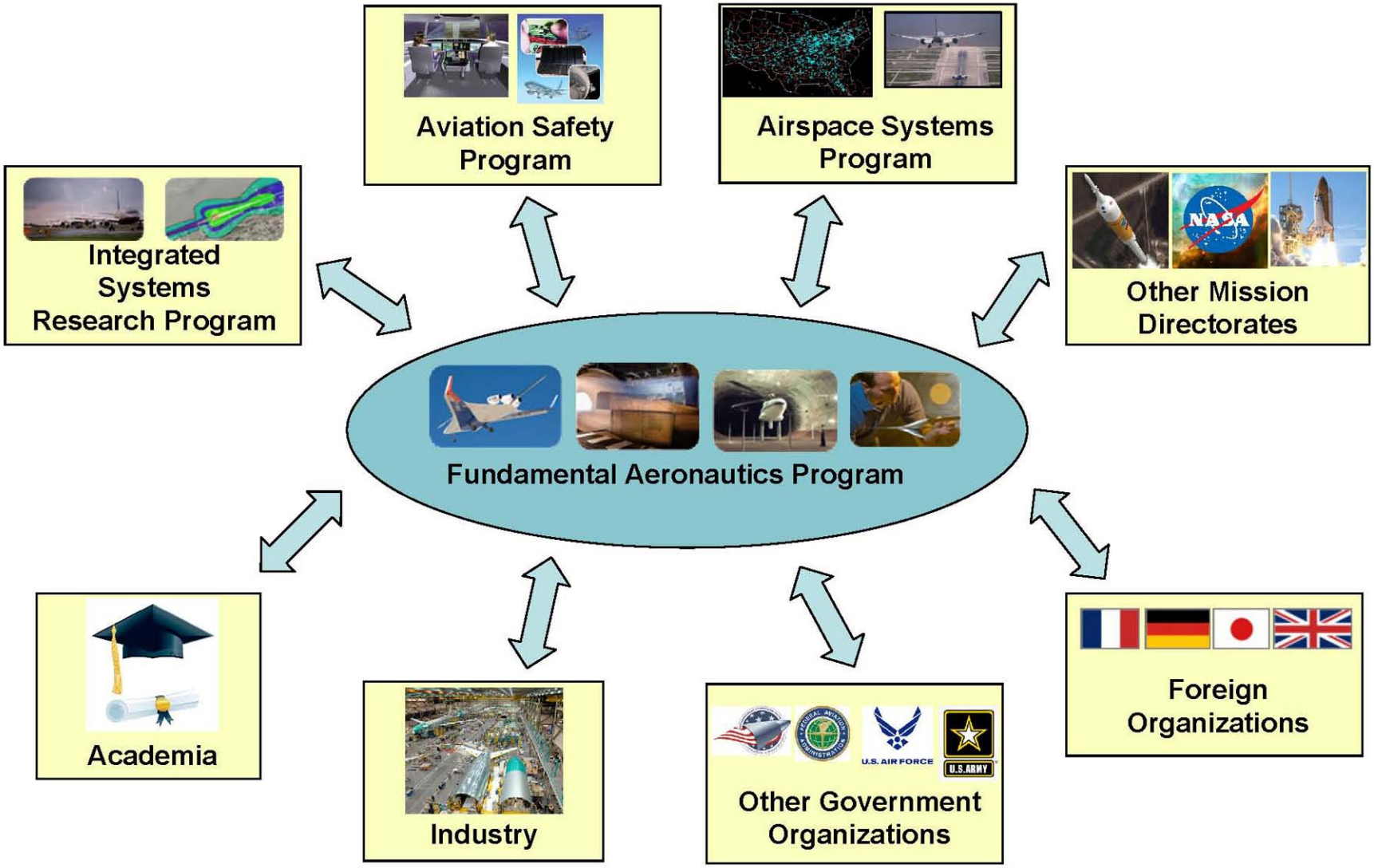
Subsonic Fixed Wing Project

- Principal Investigator: Rubén del Rosario, GRC
- Project Scientist: Rich Wahls, LaRC
- Project Manager: Greg Follen, GRC

Subsonic Rotary Wing Project

- Principal Investigator: Susan Gorton, LaRC
- Project Scientist: Isaac Lopez, GRC
- Project Manager: Vacant

Collaboration and Partnerships



ARMD's Aeronautics Test Program

ATP's vision for the future is a National portfolio of ground and flight test capabilities that advance U.S. leadership in aeronautics.

ATP Goals for FAP Meeting:

- Identify FAP program and technology requirements
  - Specifically, flight test aircraft requirements for the next five years
- Increase awareness of ATP testing and investment activities
- Connect FAP representatives and requirements with ATP representatives and capabilities

Aeronautics Test Program Office
Mike George, Director
Tim Marshall, Deputy Director
Steve Helland, Test Technology Project Manager
George Sydnor, Capital Investment Project Manager
Brian Barr, Flight Ops Project Manager
Dina Weiss, Program Integration Manager
Courtney Henson, Program Analyst
Mike Mastaler, HQ Liaison

NASA's Aeronautics Test Program

Look for the ATP shirts!

The National and NASA Contexts

- National Aeronautics R&D Policy (Dec 2006) and Plan (Dec 2007)
  - “Mobility through the air is vital…”
  - “Aviation is vital to national security and homeland defense”
  - “Assuring energy availability and efficiency …” and “The environment must be protected…”
- NextGen: The Next Generation Air Transportation System
  - Joint Planning Development Office (JPDO), Vision 100 (2003)
  - Revolutionary transformation of the airspace, the vehicles that fly in it, and their operations, safety, and environmental impact
- NASA Strategic Plan
  - Sub-Goal 3E: “Advance knowledge in the fundamental disciplines of aeronautics, and develop technologies for safer aircraft and higher capacity airspace systems.”

National Challenges: Energy and Environment

Fuel Efficiency

- In 2008, U.S. major commercial carriers burned 19.6B gallons of jet fuel. DoD burned 4.6B gallons
- At an average price of $3.00/gallon, fuel cost was $73B

Emissions

- 40 of the top 50 U.S. airports are in non-attainment areas that do not meet EPA local air quality standards for particulate matter and ozone
- The fuel consumed by U.S. commercial carriers and DoD releases more than 250 million tons of CO_2 into the atmosphere each year

Noise

- Aircraft noise continues to be regarded as the most significant hindrance to NAS capacity growth.
- FAA's attempt to reconfigure New York airspace resulted in 14 lawsuits.
- Since 1980 FAA has invested over $5B in airport noise reduction programs

National Challenges: Mobility, Security, and Space

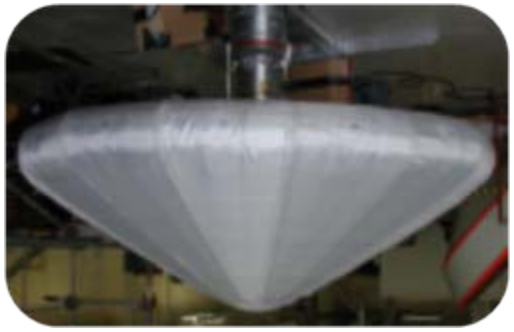
Enhance Mobility through the Air

- Overland supersonic flight can dramatically reduce travel times, but is currently prohibited.
- Increased utilization of vertical lift systems, creating new travel opportunities, are significantly limited by barriers in noise and efficiency.
- Performance and efficiency improvements of all classes of aircraft are needed to take advantage of improvements in National Airspace Operations.

Support National Security

- The capability of critical defense systems, including rotorcraft and fixed wing vehicles, is limited by performance barriers.
- Enabling practical hypersonic systems still requires significant advances.

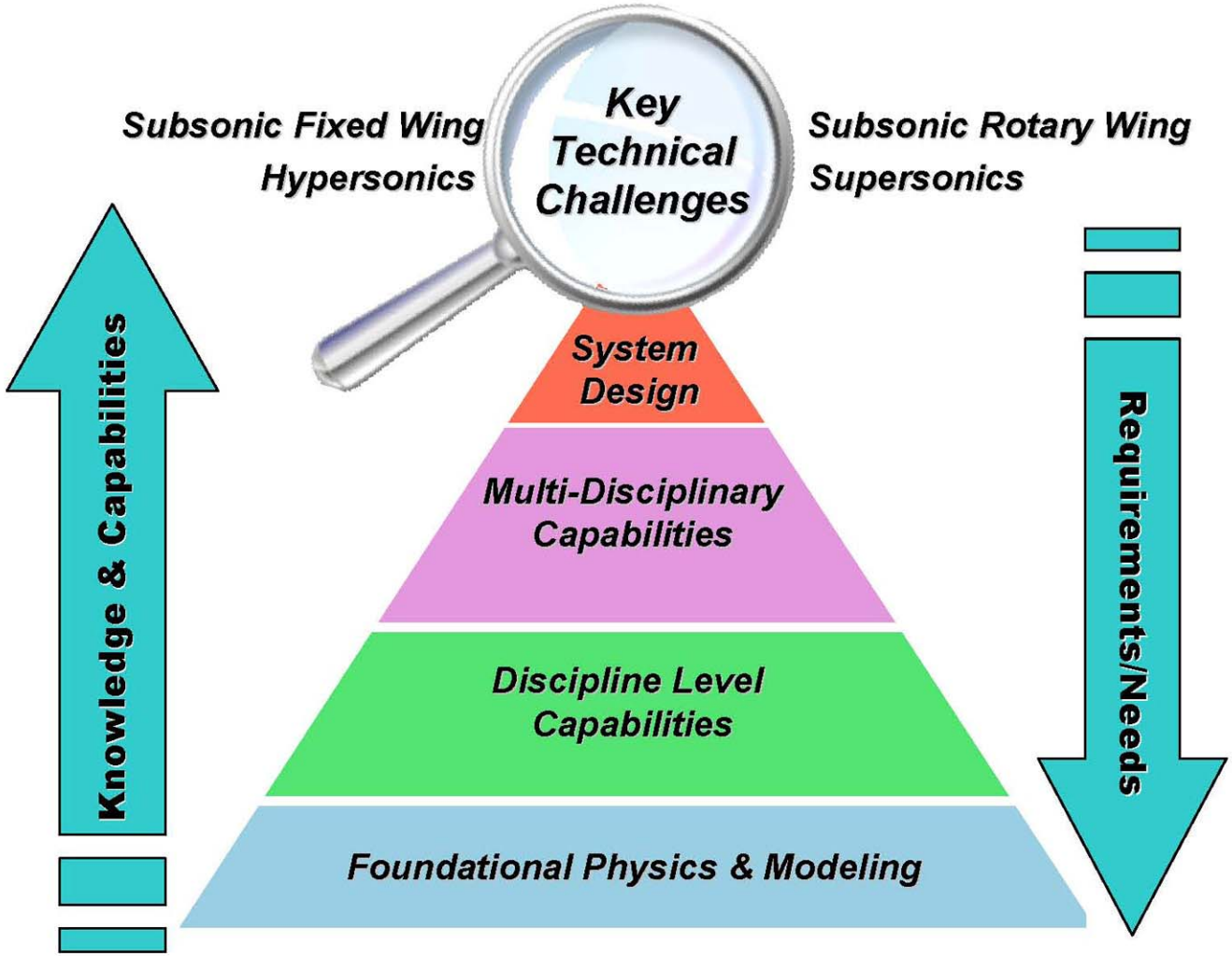
Enable new capabilities to support other NASA missions



- Efficient and safe transition of large payloads through planetary atmospheres requires new technologies.
- Airbreathing propulsion systems offer potential for significant improvements in access to space, but understanding of key physical characteristics and development of new systems are still in early phases.

Research Focus

Fundamental Aeronautics Program



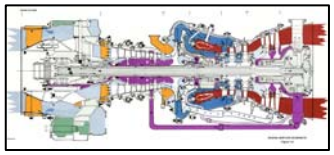
Key Questions to Address

- 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?

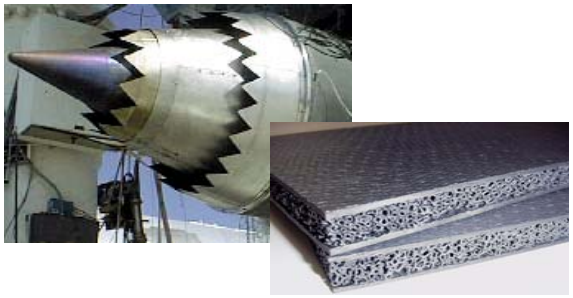
The answers to these questions help effectively communicate what we are doing, why it is important and how we ensure that it is progressing appropriately.

Technology and Knowledge Transition

Support to System Development

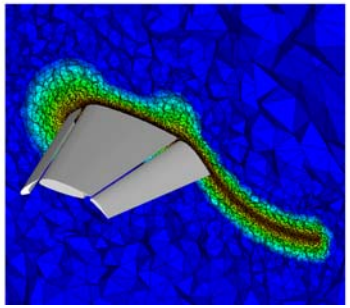


Computational Tools/ Models



Novel Technologies and Materials

Experimental Data



Foundational Research

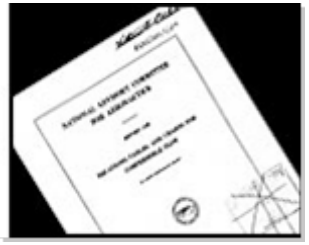
Operational Concepts

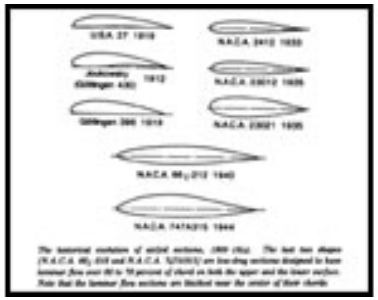
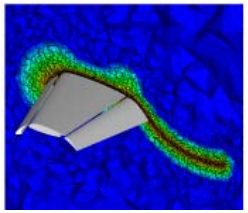
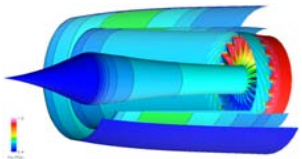
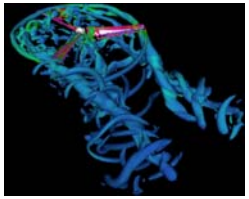
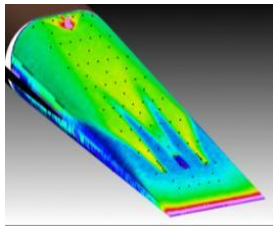
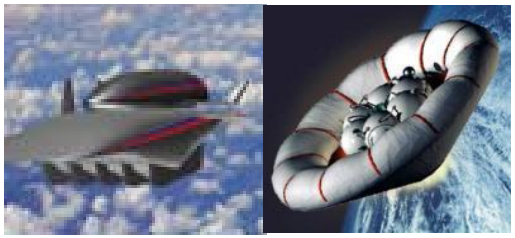
Future Concepts

Experimental Vehicles

Publications and Databases

Build Upon Rich Traditions and Experience…





…to Advance the State of the Art and Enable New Capabilities.