Aeronautics Committee Membership

- Ms. Marion Blakey, Chair, *Rolls Royce North America*
- Mr. John Borghese, Vice Chair, *Rockwell Collins*
- Mr. Mark Anderson, *Independent Consultant*
- Dr. Michael Francis, *United Technologies*
- Mr. Tommie Wood, *Bell Helicopter*
- **Dr. Missy Cummings, Duke University***
- Dr. John Paul Clarke, *Georgia Institute of Technology*
- Dr. Karen Thole, *Pennsylvania State University*
- **Dr. Lui Sha, University of Illinois***
- Mr. Stephen Morford, *Pratt and Whitney*

* New Members
Areas of Interest Explored at Current Meeting

Topics covered at the Aeronautics Committee Meeting held on July 28, 2015 at the Jet Propulsion Laboratory:

- Aeronautics Partnership Strategy*
- Global Air Traffic Management*
- SMART-NAS for Safe Trajectory Based Operations (TBO)*
- ARMD University Strategy*
- NRC Low Carbon Study

* These topics have related recommendations or findings provided by the Aeronautics Committee
Aeronautics Partnership Strategy

Our partnership objectives are to:

• Ensure NASA’s strategic focus stays relevant to the needs of technology users and facilitate transition of research products to implementation
• Leverage funds and resources
• Inform domestic and international aviation standards and practices
• Provide realistic objectives and environments for technology demonstrations
• Synergistically apply complementary knowledge, skills and facilities to achieve successful results
• Foster advances in U.S. Aerospace industry while leveraging expertise of international partners
**Partnership Strategy:**

**Research Transition Teams (RTTs)**

- **Goal:**
  - Ensure that R&D needed for NextGen implementation is identified, conducted, and effectively transitioned to the implementing agency

- **Objectives:**
  - Provide a structured forum for researchers and implementers to constructively work together on a continual basis
  - Ensure that planned research results can be fully utilized and will be sufficient to enable implementation of NextGen Operational Improvements

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**Convening Authority**

- NASA: Associate Administrator for Aeronautics Research Mission Directorate
- FAA: Assistant Administrator for NextGen

**Coordinating Committee**

Co-chairs:
- Akbar Sultan (NASA)
- Steve Bradford (FAA)

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**Continuing RTTs**
- NASA - Airspace Operations and Safety Program
  - Integrated Arrival/Departure/Surface
  - Efficient Flow into Congested Airspace

**Retired RTTs**
- NASA - NextGen Planning
  - ATO Service Units
  - Aviation Safety
- FAA - Flow Based Trajectory Management
- NASA - Dynamic Airspace Configuration

**New RTTs**
- Autonomy
- Data Management
- Applied TFM and Weather Integration
- System Wide Safety Assurance
Global ATM: International Collaboration and Unique Global Collaboration

AOSP’s international partnership strategy seeks to:

**Lead** the international research community on key mid- and far-term ATM initiatives

**Collaborate** with research organization through complementary research capabilities to address a larger trade space than otherwise accomplished alone

**Leverage** unique partner capabilities, assets, and technologies not available internally to accelerate research and address a larger trade space
### Global ATM: Ratified AOSP Collaboration

Lead group of 13 national research organization initiative on Integrated Arrival, Departure, Surface operations to inform ICAO Aviation System Block Upgrades 2 and 3; capture global challenges and research capabilities; enable bi-lateral collaboration.

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<td>![IFAR Logo]</td>
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- **ATD2**: AMAN/DMAN/SMAN integration expertise
- **ATD3**: Flow Management in the presence of volcanic ash, weather, and environmental effects

- **ATD2**: modeling noise, emissions, and fuel consumption in terminal and surface operations
- **SMART-NAS and SASO**: Functional Allocation for Autonomy - Human/Machine and Air/Ground

- **ATD2**: surface traffic management and conflict detection/avoidance
- **ATD1 and ATD2**: ADS-B enabled airborne technology applications

- **ATD2**: noise modeling of terminal operations
- **SASO**: traffic management for UAS and disaster recovery operations

- **ATD2**: efficient terminal operations and access to test bed
Committee Finding for ARMD AA

The Committee recognizes the importance of partnerships for collaboration in research and for transference of technology. The Committee encourages ARMD to continue with their domestic partnerships and with international partnerships where it makes sense, such as in research areas like air traffic management. It is not clear to the committee how partnerships are selected and vetted to ensure who will provide the best partnerships, in particular international partnerships. The Committee feels that international partnerships are important to ensure a consistent global approach to such areas as air traffic management. However, the Committee agrees that ARMD would be better served if it is clearer about whether the partnership is for “best in class” or if it is to understand where the world is with respect to specific technologies and regulatory areas that need to be harmonized globally.
Shadow Mode Assessment using Realistic Technologies in the NAS (SMART-NAS)

Project Scope and Objectives

Explore and Develop Concepts, Technologies and a Test Bed for Safe, Global, Gate-to-Gate Trajectory Based Operations
SMART-NAS Technical Areas

• SMART-NAS Testbed:
  – *Goal*: Develop a collaborative, distributed ATM simulation and test environment to enable accelerated acceptance of ATM concepts and technologies for use by ATM and safety communities

• Functional Allocation:
  – *Goal*: Evaluate allocation of separation assurance functions to humans and automated systems to inform future air transportation policy and technology decisions

• Regional TBO:
  – *Goal*: Develop an integrated concept for well managed traffic flows to improve system predictability in the face of weather constraints and other types of delays without compromising safety.

• Networked ATM:
  – *Goal*: Develop technologies for networked-enabled decision support tools for the flight deck, AOC, and ATC facilities

• Safe Avionics and ATM Future Evolution (SAAFE):
  – *Goal*: Reduce the cost of certification and V&V of complex safety critical and ATMF systems.
SMART-NAS Top Project Risks

Overview

- **High**
- **Med**
- **Low**

**Criticality**

Decreasing (Improving)

Increasing (Worsening)

Unchanged

New since last Period

**LxC Trend**

M - Mitigate
W - Watch
A - Accept
R - Research

**Approach**

**Risk Status – 7/1/2015**

- 9 risks shown
- Risk Manager conducts Monthly Risk Meetings with Project
- Current risk status
  - 9 Open risks
  - 0 New risks this period
  - 0 Closed this period

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<th>Rank &amp; Trend</th>
<th>ID</th>
<th>Sub-Proj.</th>
<th>Risk Title</th>
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<tr>
<td>1</td>
<td>86</td>
<td>SAT</td>
<td>Industry fails to adopt developed SAFE tools, techniques and architecture patterns</td>
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<tr>
<td>2</td>
<td>116</td>
<td>SAT</td>
<td>FAA fails to adopt developed SAAFE tools, techniques and architecture patterns</td>
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<td>3</td>
<td>115</td>
<td>PM</td>
<td>Unrealistic expectations for SMART-NAS Test Bed</td>
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<tr>
<td>4</td>
<td>52</td>
<td>Test-bed</td>
<td>Risk to development from requirement to integrate multiple complex formats</td>
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<td>5</td>
<td>57</td>
<td>Networked ATM</td>
<td>Lack of Data to Support New Networked Winter Ground Ops</td>
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<tr>
<td>6</td>
<td>54</td>
<td>Function Allocation</td>
<td>Function Allocation Recommendations not Adopted</td>
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<td>7</td>
<td>69</td>
<td>TBO</td>
<td>Difficulty of Modeling Technical Complexity of Integrated Gate-to-Gate Operations</td>
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<tr>
<td>8</td>
<td>58</td>
<td>SAT</td>
<td>Difficulty of Tool development without access to FAA Ground Systems</td>
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<tr>
<td>9</td>
<td>11</td>
<td>Test Bed</td>
<td>Uncertainty of Accurate SMART-NAS Contractor Cost and Benefit Estimates</td>
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Committee Finding for ARMD AA

The Committee applauds ARMD for establishing a project that addresses this very important challenge related to air traffic management, and appreciates the project providing the Committee with enough detail to assess the project goals and approach. The Committee endorses the approach laid out by the project and feels that it provides tremendous benefit to the air traffic management community. The Committee would like to encourage the project to review its top risks and address these risks as part of its further development of the project technical areas. The Committee further encourages the project to carefully assess the impact of the risks if it is determined that these risks remain red, and how the project might change its scope to ensure positive benefit is achieved despite the risks.
ARMD University Strategy

STRATEGY:
- Create “University Aeronautics Leadership” research initiative
- Rationale:
  - Universities are uniquely positioned to bring together the best and brightest minds from many disciplines and from a broad range of institutions and perspectives to help solve the most complex technical challenges associated with the Strategic Thrusts.
  - By providing the nation’s leading universities the opportunity to strategically align its research, NASA will accelerate progress toward the achievement of high impact outcomes that will support continued US aviation leadership.
- Goal
  - Ensure future U.S. aviation leadership through strategic U.S. University Research and Education
- Objective
  - Opportunity for universities to establish global leadership in the pursuit of the most difficult challenges in achieving the ARMD Strategic Implementation Plan

APPROACH:
- NASA ARMD plans to release a competitive solicitation
  - Proposals expected from individual universities or partnerships
  - Awards aligned with each ARMD Strategic Thrust (as funding allows)
  - Provide technical independence to universities with NASA strategic oversight
The Committee applauds ARMD for developing a strategy to encourage Universities to move into a position of leadership to tackle core technical challenges. The Committee suggests that ARMD uses a Broad Area Assessment (BAA) white paper approach in addition to its use of the RFI and NRA solicitation process. The Committee feels that the BAA would provide an opportunity for ARMD to give greater technical guidance for a given thrust area.
Motivation for NRC Low-Carbon Study

S. Csonka, Commercial Aviation Alternative Fuels Initiative, June 2015
NRC Low-Carbon Study Statement of Task

• **Outline a potential national research agenda for propulsion and energy systems to reduce life-cycle carbon emissions from commercial aviation**
  - Define a broad vision for an aviation system powered by low-carbon propulsion and energy systems
  - Define a range of the most promising propulsion and energy system options to achieve the vision
  - Recommend a prioritized set of research projects that, if successful, could enable promising options

• **Study should focus on new or more highly efficient propulsion (i.e. hybrid-electric) and energy systems (i.e. biofuels, batteries, and fuel cells)**

• **Study should consider:**
  - Opportunities and challenges that changes in propulsion and energy technologies have for aircraft.
  - Current state of the art in lower-carbon propulsion and energy systems and related research efforts.
  - Economic and other policy opportunities and challenges that would be associated with a potential major change in propulsion and/or energy systems
  - Timeframe of interest is 10 to 30 years (TRL 6 within 25 years)

  – **Outside of the scope of the study:**
    - Airframe designs; air traffic management systems;
    - Greenhouse gases are not a concern except in context of LNG/methane
    - Non-technology approaches such as carbon taxes; usage of carbon offsets; or legislative limits
NRC Low-Carbon Study Plan

• Interviews and presentations to study team
  – Challenges of low Carbon aviation
  – Combustion engines (gas turbines)
  – Electric and fuel cell systems
  – Drop-in fuels (biofuels)
  – Infrastructure issues (considered but not a driver)

• Schedule … 4 meetings
  ✓ June 2-3, 2015 Washington, DC
  – September 1-3 Washington, D.C. (Open sessions Sept 1-2)
  – November 10-11 Washington, D.C.
  – TBD TBD

• Deliberate, discuss, integrate, adjudicate, achieve consensus …

• Prepare study report for NRC release NLT 5/15/2016