National Aeronautics and Space Administration

UAS Integration in the NAS Project
UAS Commercialization Conference

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Briefing Outline

- UAS Integration in the NAS Project Alignment within NASA
- Project Overview
- Project Technical Challenges and Technology Development Approach

NASA Aeronautics Portfolio



Fundamental Aeronautics Program

Conduct cutting-edge research that will produce innovative concepts, tools, and technologies to enable revolutionary changes for vehicles that fly in all speed regimes.

Integrated Systems Research Program

Conduct research at an integrated system-level on promising concepts and technologies and explore/assess/demonstrate the benefits in a relevant environment

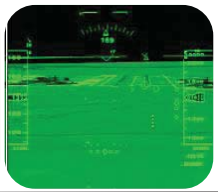



Airspace Systems Program

Directly address the fundamental ATM research needs for NextGen by developing revolutionary concepts, capabilities, and technologies that will enable significant increases in the capacity, efficiency and flexibility of the NAS.


Aviation Safety Program

Conduct cutting-edge research that will produce innovative concepts, tools, and technologies to improve the intrinsic safety attributes of current and future aircraft.



Aeronautics Test Program

Preserve and promote the testing capabilities of one of the United States' largest, most versatile and comprehensive set of flight and ground-based research facilities.

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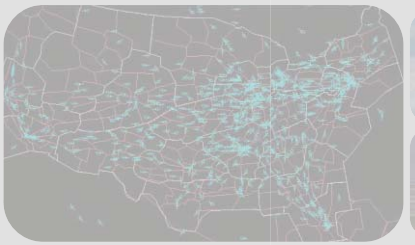

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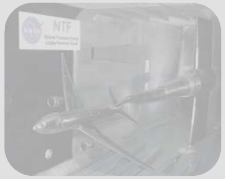


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NASA Strategic Plan Flow Down to UAS-NAS Project

STRATEGIC GOAL

2: Advance understanding of Earth and develop technologies to improve the quality of life on our home planet

OBJECTIVE

2.1: Enable a revolutionary transformation for safe and sustainable U.S. and global aviation by advancing aeronautics research

PERFORMANCE GOAL
UAS-NAS

2.1.6: Support transformation of civil aircraft operations and air traffic management through the development, application, and validation of advanced autonomy and automation technologies, including addressing critical barriers to future routine access of Unmanned Aircraft Systems (UAS) in the National Airspace System, through the development and maturation of technologies and validation of data.

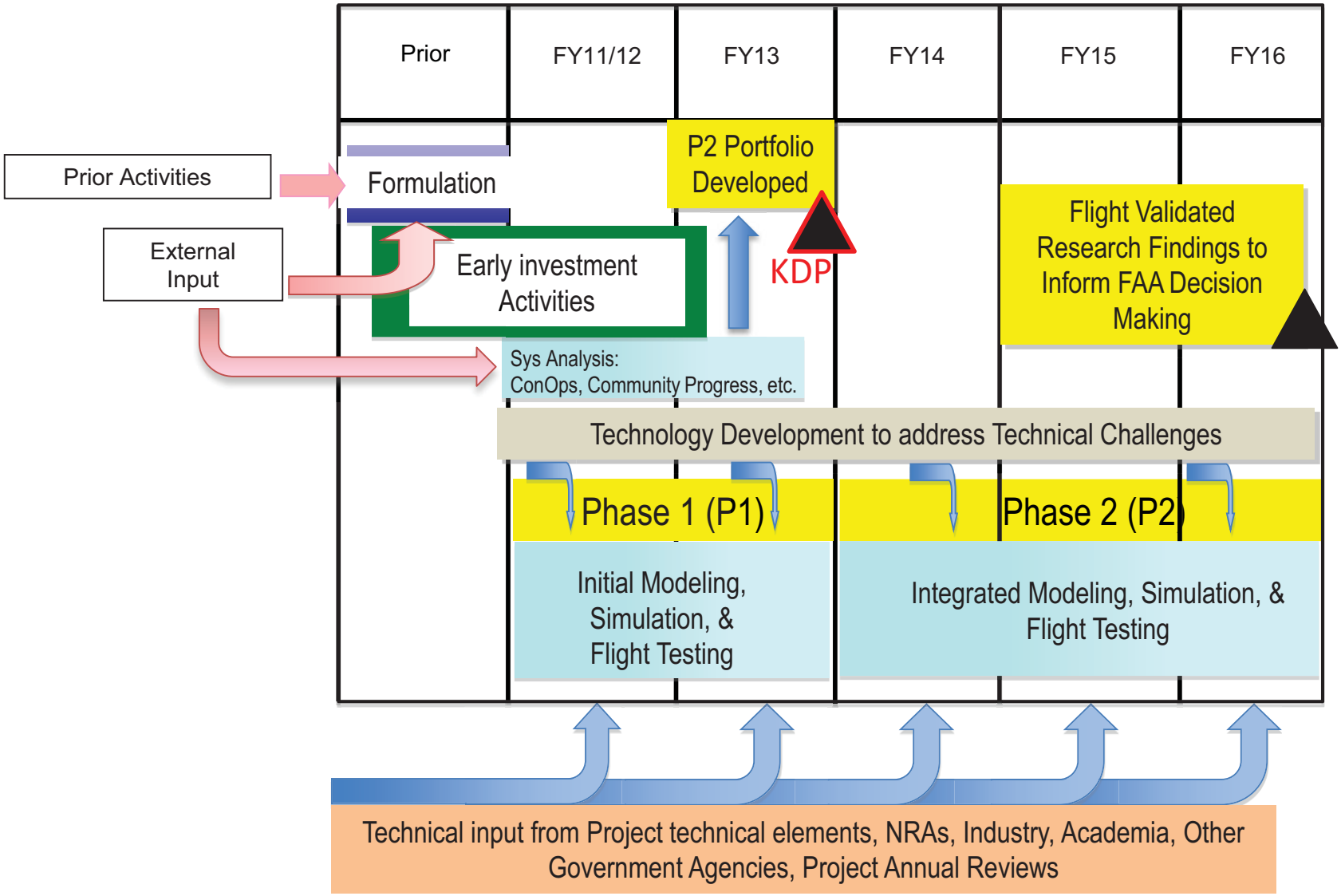
Annual Performance Indicators (APIs)
UAS-NAS

AR-14-8: Conduct a human-in-the-loop (HITL) simulation where unmanned aircraft are mixed with manned aircraft and subjected to a range of test conditions

AR-15-7: Deliver data, analysis, and recommendations based on integrated simulations and flight tests to the RTCA Special Committee on Minimum Operational Performance Standards (MOPS) for UAS to support preliminary MOPS development.

AR-16-6: Deliver data, analysis, and recommendations based on two integrated flight test series with simulated traffic and live vehicles to the RTCA Special Committee on MOPS for UAS to support final MOPS development.

UAS-NAS Project Lifecycle



Project Goal, Research Themes, & Technical Challenges

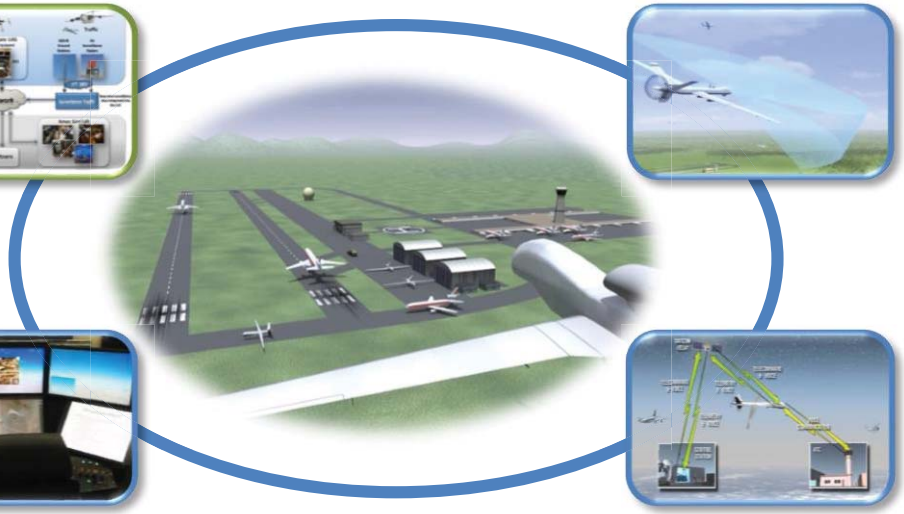
Goal: Provide research findings to reduce technical barriers associated with integrating Unmanned Aircraft Systems into the National Airspace System utilizing integrated system level tests in a relevant environment

Research Theme 1: UAS Integration - Airspace integration procedures and performance standards to enable UAS integration in the air transportation system

Research Theme 2: Test Infrastructure - Test infrastructure to enable development and validation of airspace integration procedures and performance standards

TC-ITE: Integrated Test & Evaluation

TC-SAA: Sense and Avoid (SAA) Performance Standards



TC-HSI: Human Systems Integration

TC-C2: Command & Control (C2) Performance Standards

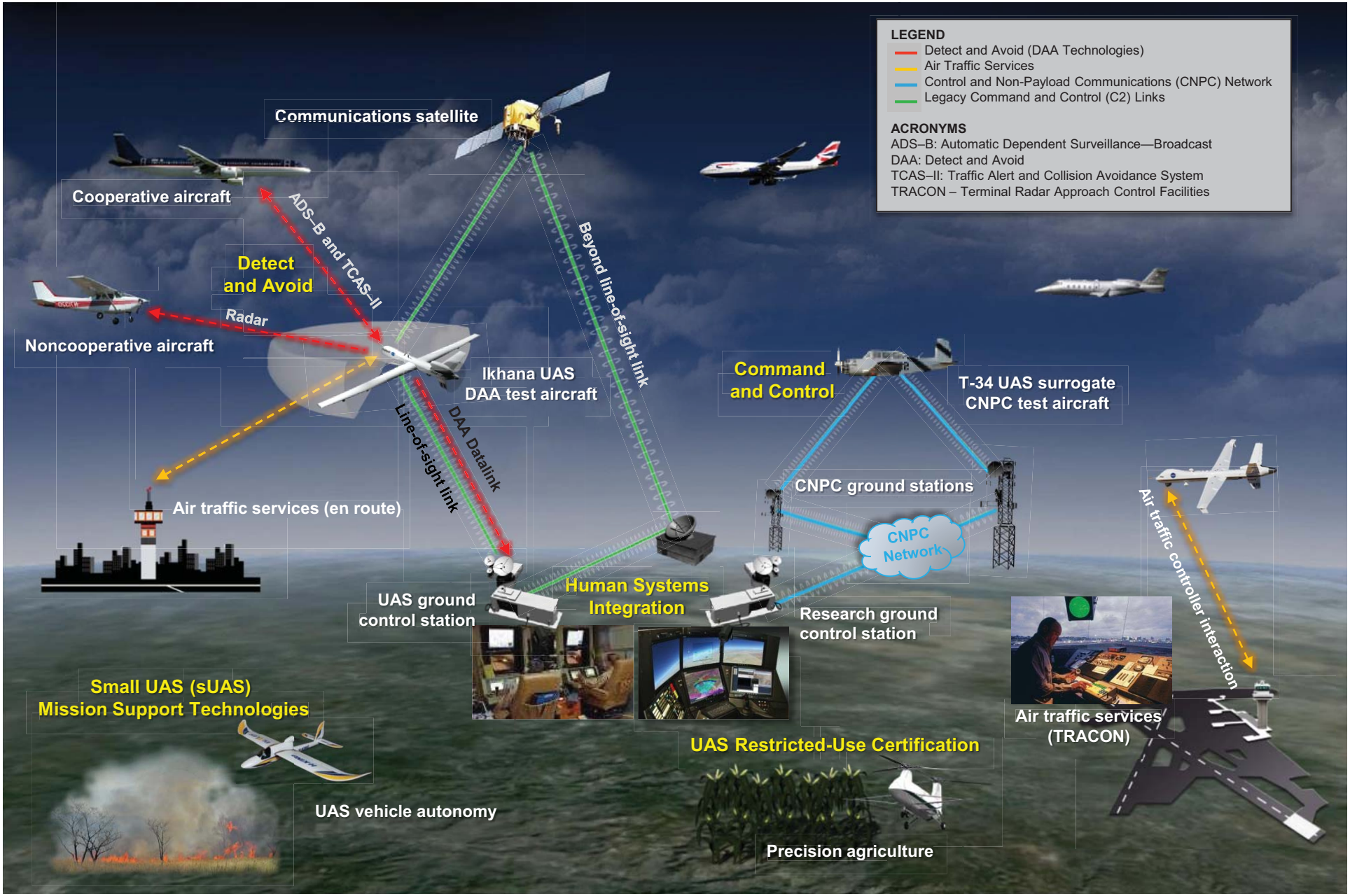
Non-TC: UAS Restricted Use Certification

Non-TC: Small UAS Mission Support Technologies

TC = Technical Challenge

UAS-NAS Project OV-1

IT&E Technical Challenge: Backbone for Integrated Testing



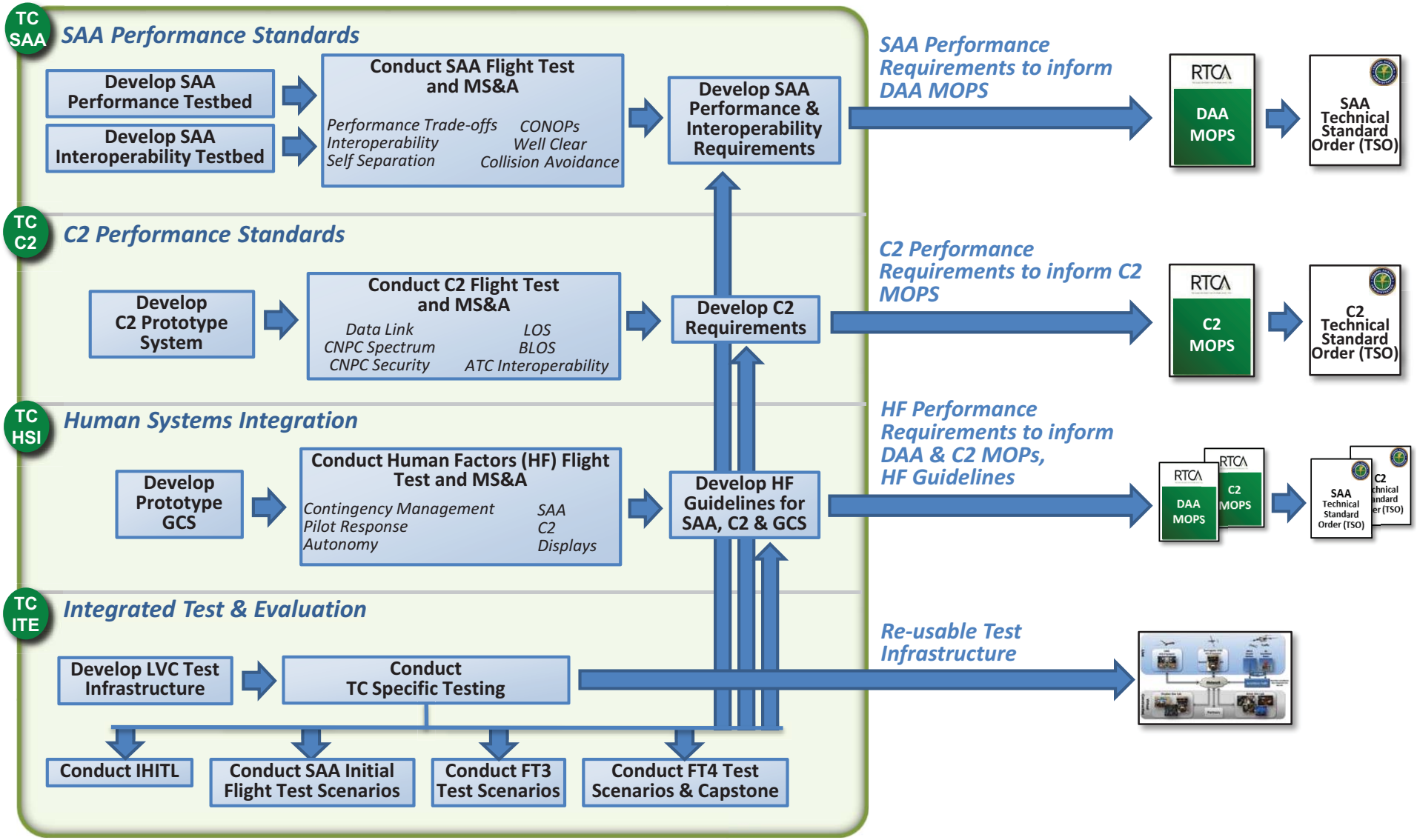
UAS Integration in the NAS Project

Technical Challenge Value Proposition

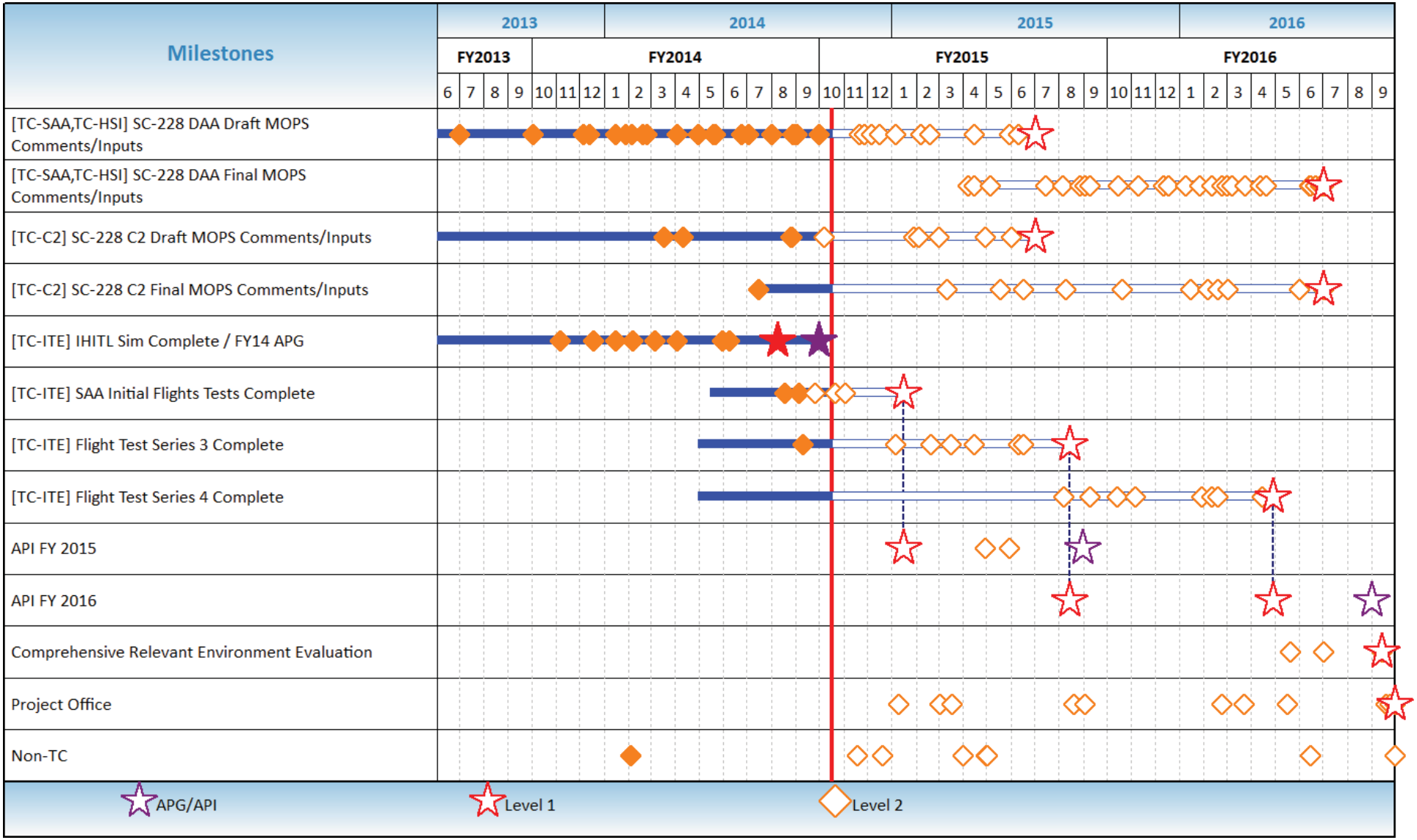
NASA UAS-NAS TC Project Activities

Key Products

Resultant Outcomes



UAS-NAS Milestone Summary



Backup Slides

What is ISRP?

ISRP is an interim step between fundamental research and full systems integration

- ISRP takes promising technologies from fundamental research and matures them to mid-Technology Readiness Levels, validating their feasibility within integrated systems and relevant environments
- Technologies are tested as part of a larger integrated system where multiple technologies interact/interface with one another rather than being tested in isolation
- ISRP defines and develops ConOps of integrated systems while identifying critical technologies required to enable those systems

Success is defined by successful completion of the testing and obtaining information, not by a technology effort meeting its technical performance goals

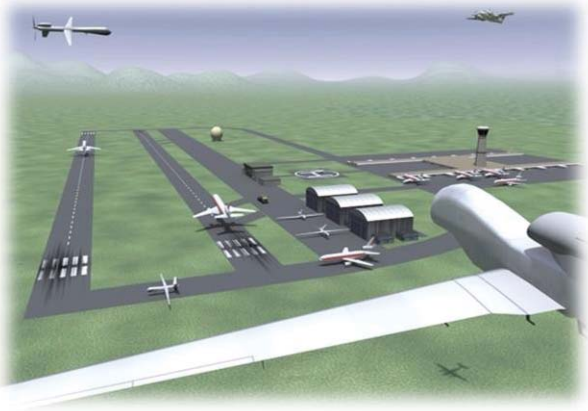
Key Elements	Integrated Systems Research Program
TRL	TRL 3-7 Uses TRL to track progress
Project Life Cycle	Finite life with defined project termination date
Governance	NPR 7120.8 Research and Technology Program and Project Management Requirements NPR 7120.5 Program and Project Management Processes and Requirements
Infusion Timeline	N+1 / N+2 or 2015 – 2025
Partnerships	Strategically utilizes partnerships to ensure integrated system functionality, effective transition to industry, and cost sharing across industry and government agencies
Pedigree of Technology	Promising technologies with demonstrated pedigree through fundamental research
Risk & Risk Reduction	Integrated systems research is to reduce risk of application of technology

UAS-NAS Project Formulation

Key Stakeholders and Influencing Factors

Project Focus:

Unencumbered NAS Access for Civil / Commercial UAS



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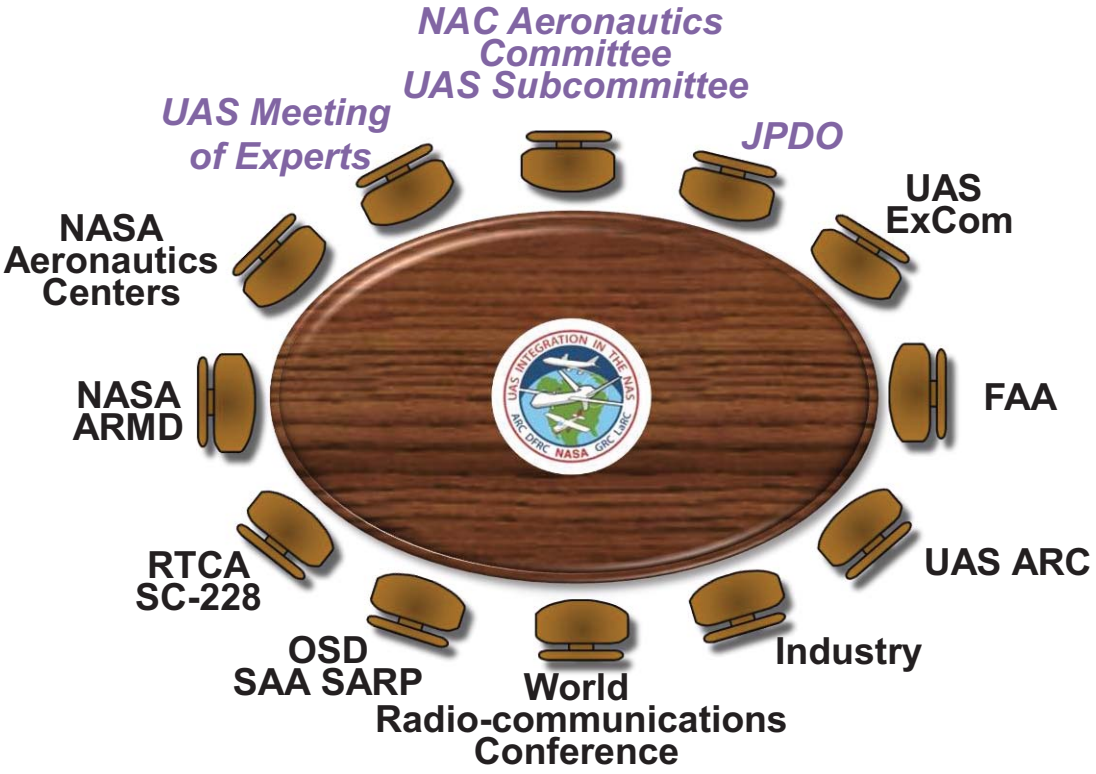

The NASA UAS-NAS Project is influenced by several key stakeholders within the UAS Community which helped guide it's formulation

Phase 1 Influences