



National Aeronautics and Space Administration

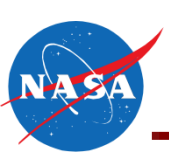
UAS Integration in the NAS Project

UAS Commercialization Industry Conference

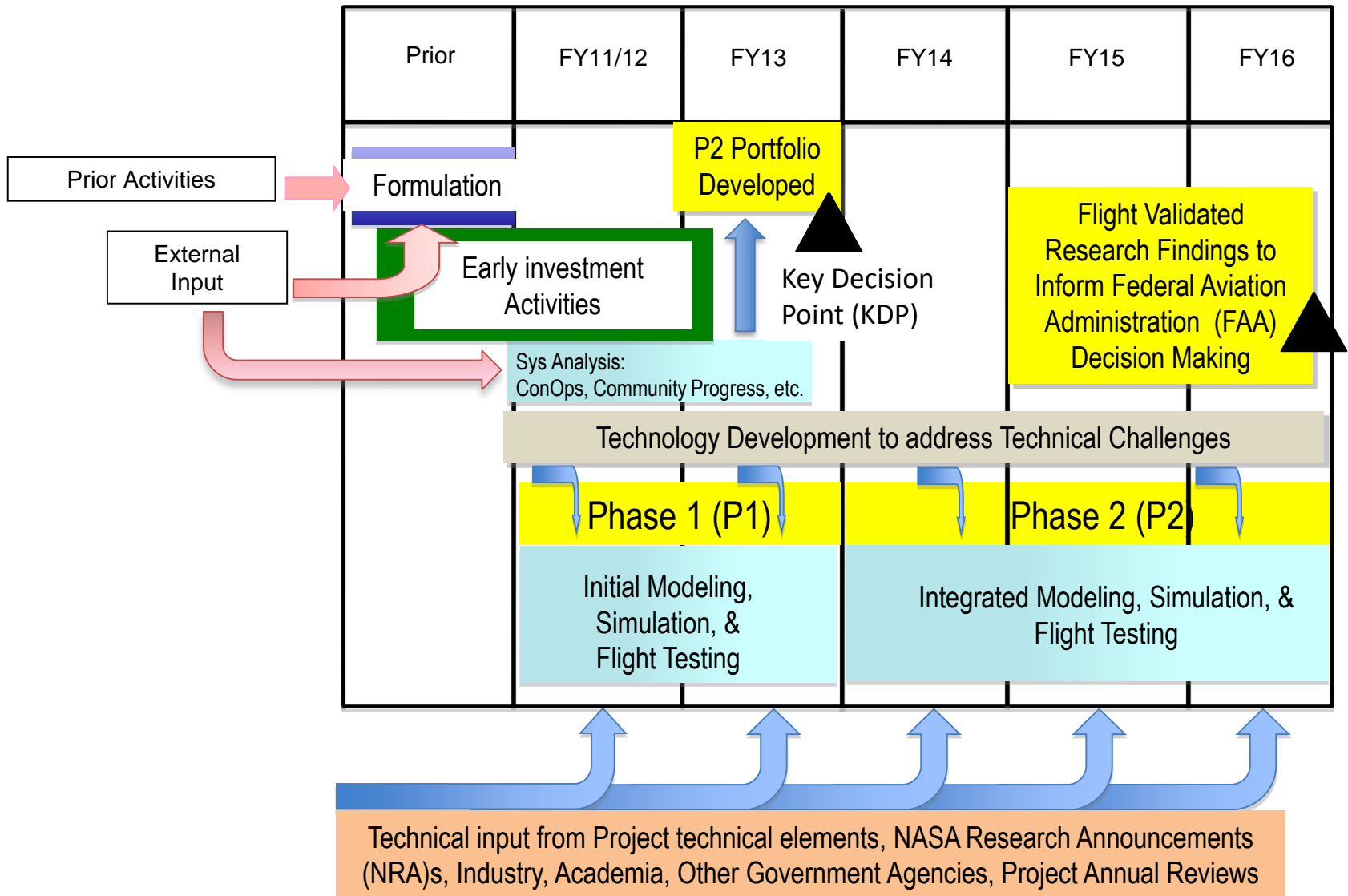
Chuck Johnson
Vice President of Operations, The Padina Group
Former NASA UAS-NAS Project Manager

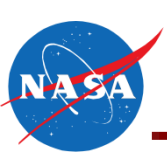
June 25, 2015





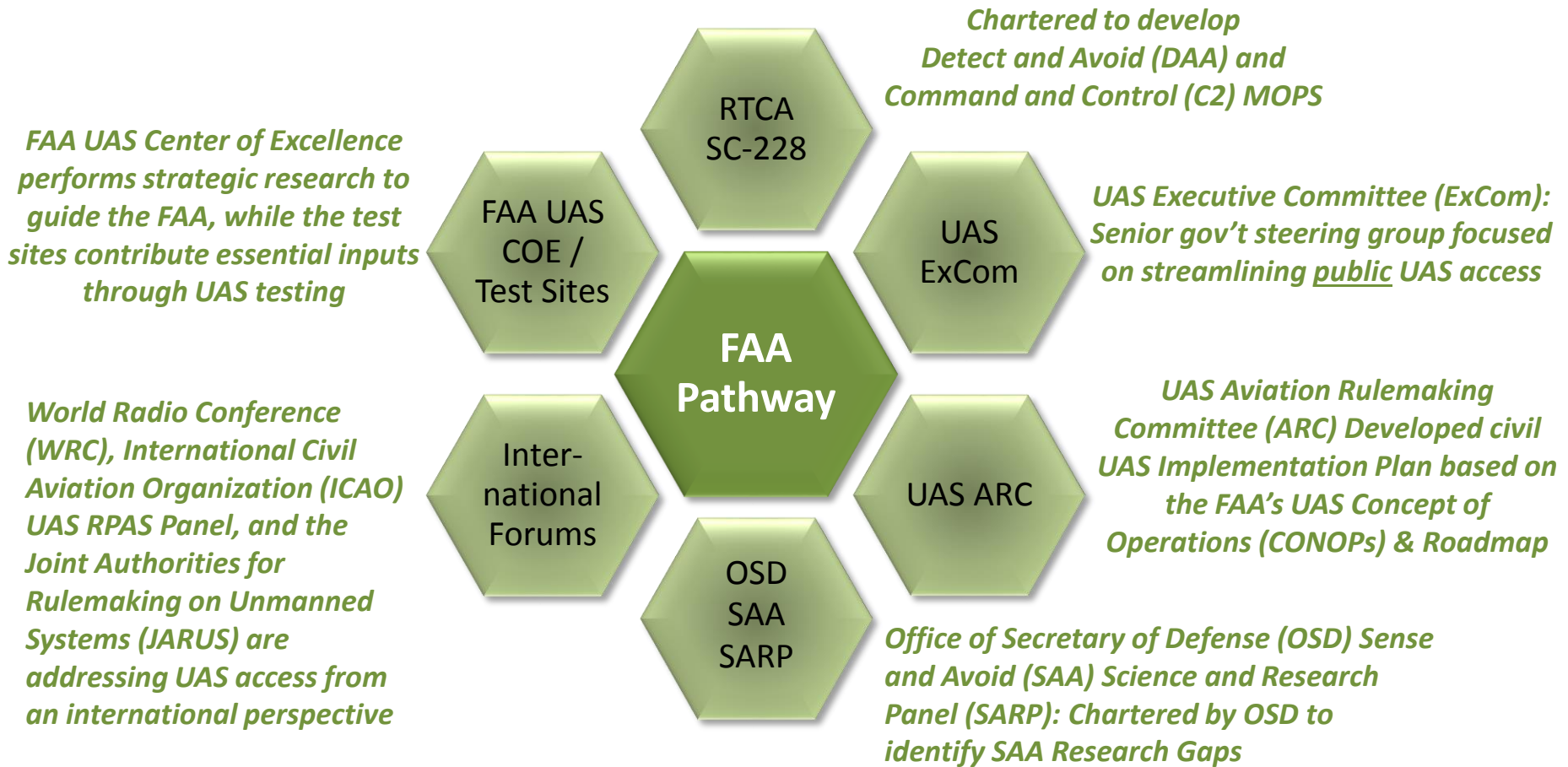
UAS-NAS Project Lifecycle



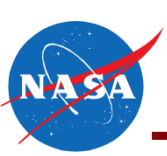


FAA Pathway to UAS Access

- The FAA uses several domestic and international forums to lay out the pathway for their priorities and investments.



NASA has a leadership role within many domestic forums and participates in the international forums



ARMD Strategic Plan Flow Down to UAS-NAS Project



**AERONAUTICS
STRATEGIC THRUST**

Thrust 6: Assured Autonomy for Aviation Transformation

**AERONAUTICS
OUTCOME**

Outcome (2015 – 2025): Initial Autonomy Applications with Integration of UAS into the NAS

**UAS-NAS
Project Goal**

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

**UAS-NAS
Research Themes**

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

**UAS-NAS
Technical Challenges**



TC-SAA:
*Sense and Avoid
Performance Standards*



TC-C2:
*Command & Control
Performance Standards*



TC-HSI:
*Human Systems
Integration*



TC-ITE:
*Integrated
Test & Evaluation*



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

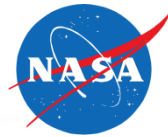
Research Theme 2: Test Infrastructure - Test infrastructure to enable development and validation of airspace integration procedures and performance standards



TC = Technical Challenge

UAS Integration in the NAS Project

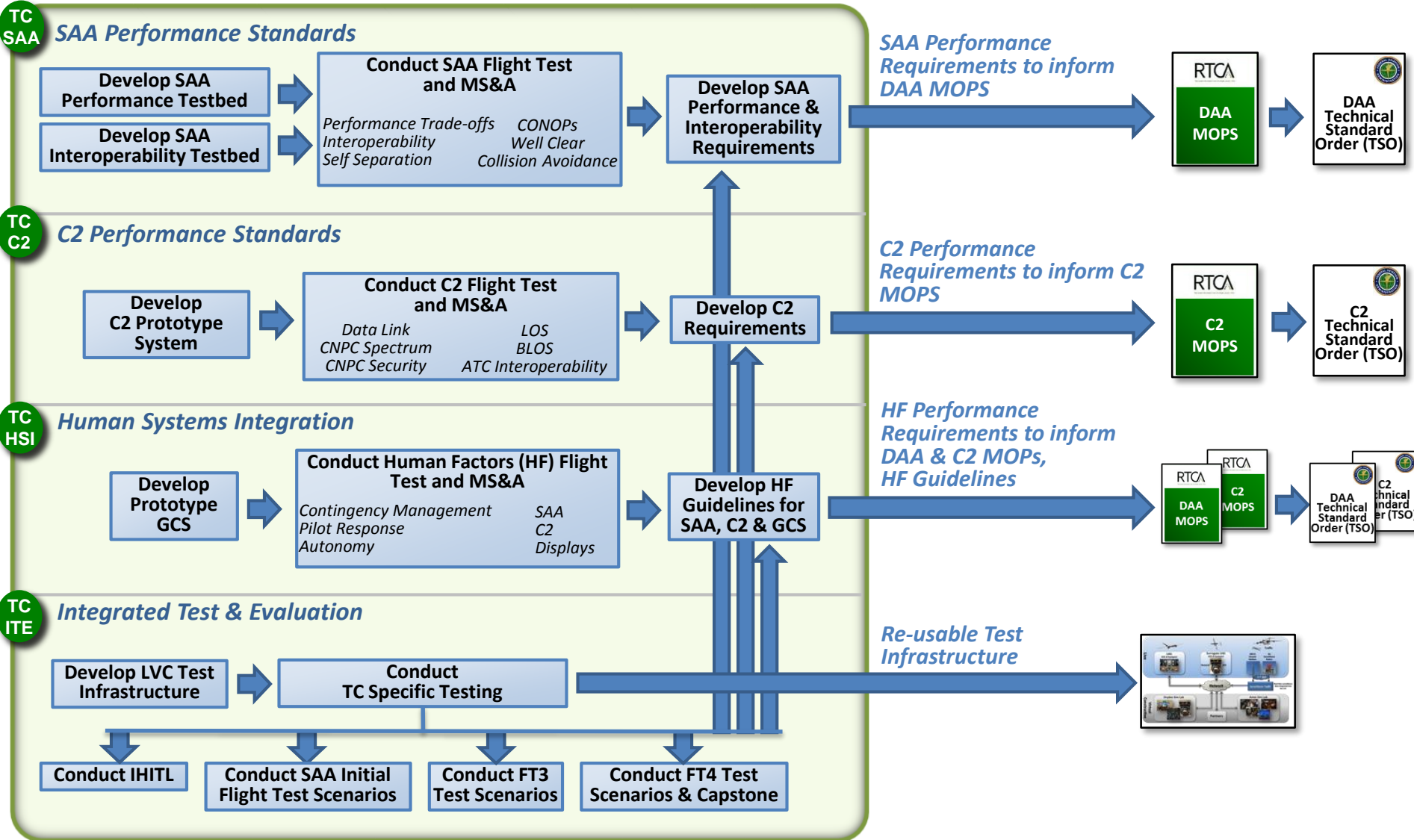
Technical Challenge Value Proposition



NASA UAS-NAS TC Project Activities

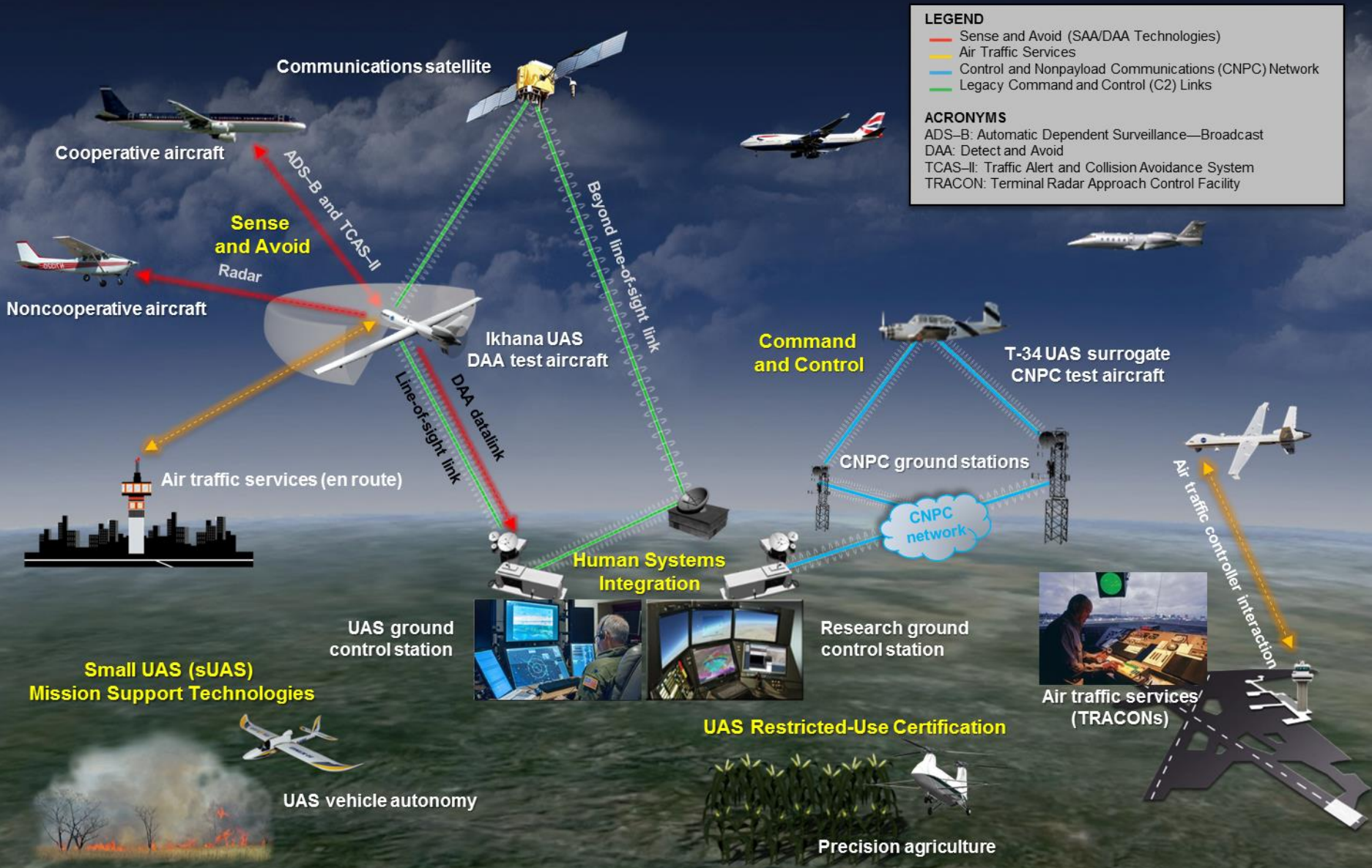
Key Products

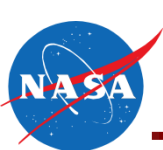
Resultant Outcomes



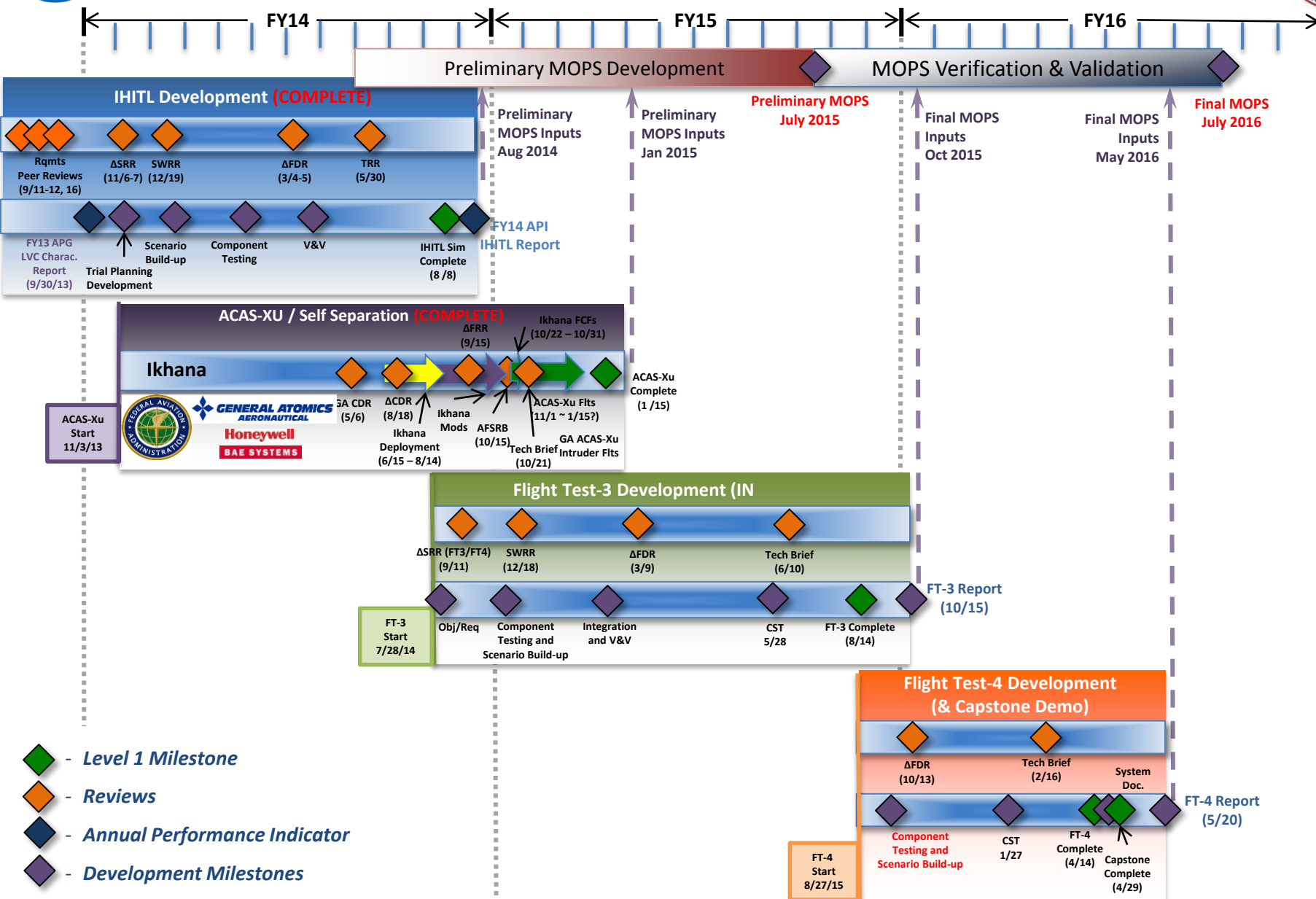


UAS-NAS Project OV-1

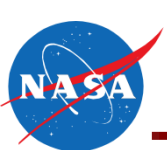




Integrated Test Flow and MOPS Development



Timeline Not To Scale



Other NASA UAS Access Efforts



Phase 2 MOPS ~FY17-20

- DAA MOPS for aircraft interoperating in Classes E and D Airspace
 - May require a suite of options including GBSAA, EO, cell technology, etc
- SATCOM MOPS for C2
- Necessary human systems integration guidelines

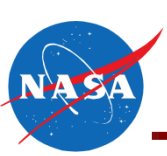
Early Implementation Program (through UAS ARC) ~FY17-20

- Research findings to enable routine operations above FL180 with required equipage

UAS Traffic Management (UTM) ~FY16-26

- Low altitude volume of airspace (e.g. 400 AGL and below)
- Enable operations including goods delivery, infrastructure surveillance, agricultural support, and medical services delivery
- Upcoming UTM Convention July 28-30 at NASA Ames Research Center

NASA will continue to pursue efforts to enable UAS access over the next decade



Benefits to the Commercial Industry



Overall NASA goal - Open airspace in safe/efficient manner for civil/commercial activities

UAS-NAS Project:

- Enable flights to/from Class A Airspace through Classes E and D Airspace

EIP:

- Enable routine operations above FL180 (Classes A and Upper E)

Phase 2 MOPS:

- Enable routine operations in Classes E and D Airspace

UTM

- Enable routine operations in low altitude volume of airspace

NASA efforts, in collaboration with the entire UAS Community of Interest, will maximize commercialization opportunities