



**Federal Aviation  
Administration**

# **Research to Ops Implementation Strategy**

**Presented to: AWT R2O Planning Meeting**

**By: Tom MacPhail**

**Date: November 18, 2009**



# Forecast Ops is not NAS Ops

## Working Definition of “Operational”

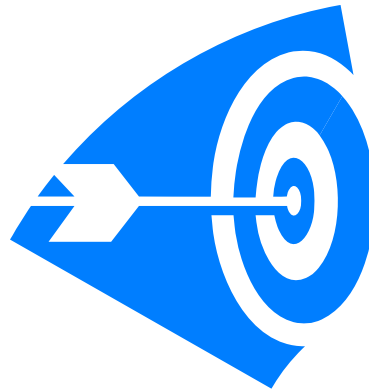
**A sustainable solution** satisfying a user’s mission needs and requirements<sup>1</sup>, produced as required<sup>2</sup>, obtained through appropriate communications channels from an appropriate source, and displayed or integrated in an appropriate manner.

<sup>1</sup>Satisfying user needs and requirements includes human performance factors, safety, and training.

<sup>2</sup>Produced as required includes maintenance and logistics support, reliability, and security.

# Issue

- **AWTT process needed to evolve to meet requirements of the FAA's Acquisition Management System**
- **A clear, unambiguous process needed for transitioning research to operations**

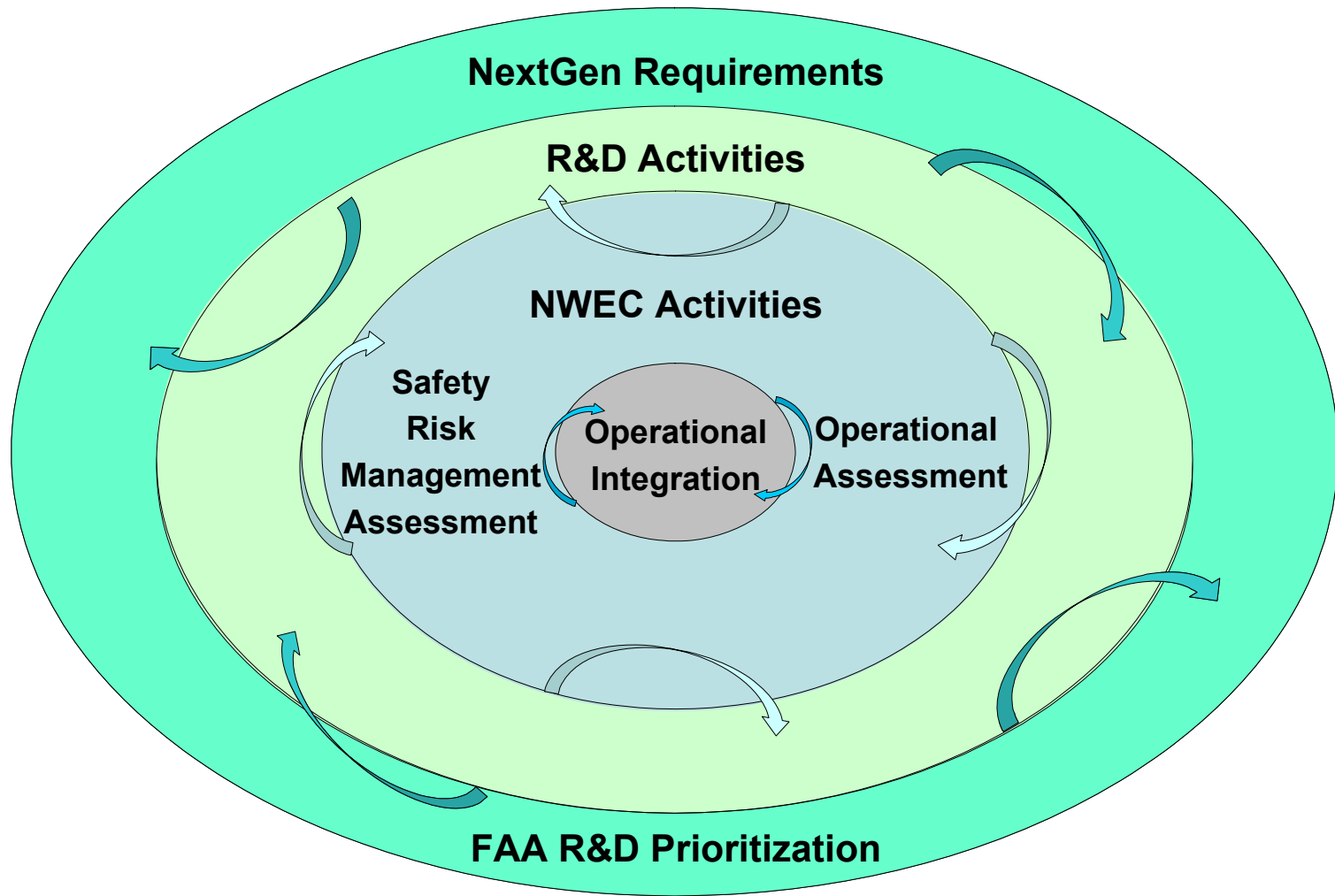


# RTO Coordinator Goals

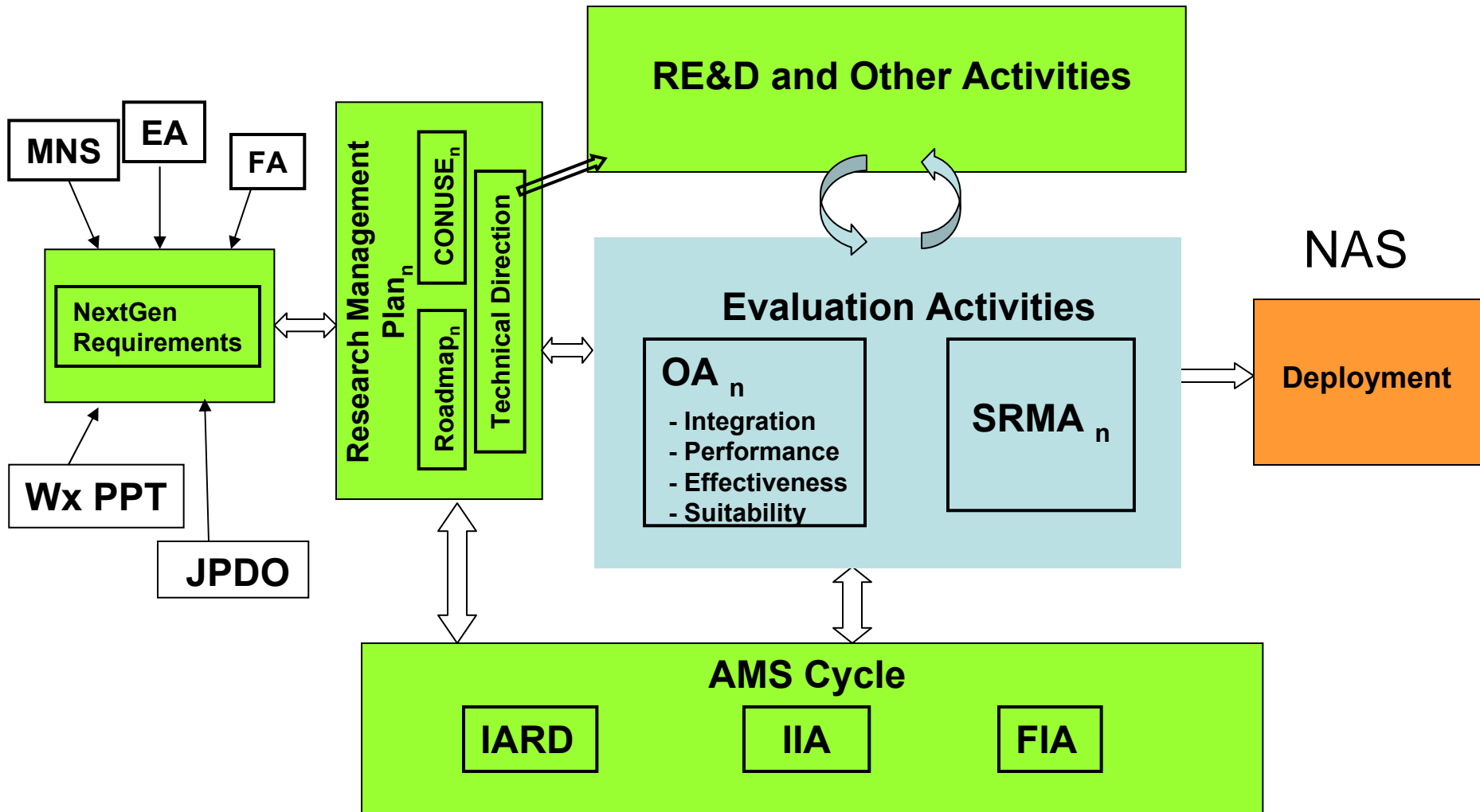
- **Facilitate movement of research into operations efficiently and effectively by creating and managing an RTO process that delivers solutions which:**
  - Have traceability to operational requirements,
  - Provide demonstrable enhancement to aviation safety and traffic flow efficiency
  - And are operationally/technically suitable and sustainable
- **Facilitate programmatic activities for solution entry to, management within, and exit from the NextGen Weather Evaluation Capability (NWEAC)**



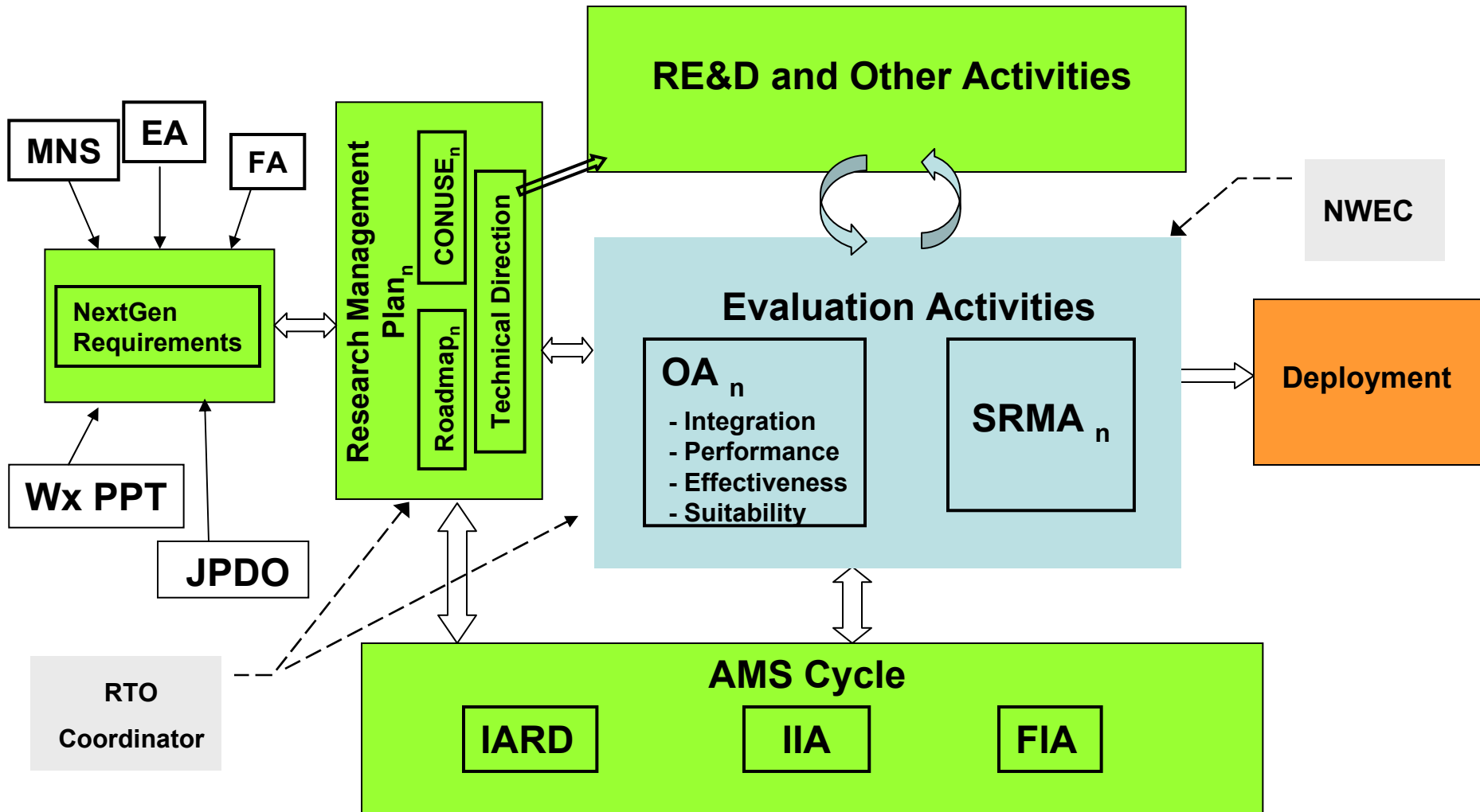
# Research to Operations Process



# Research to Operations Process



# Research to Operations Process



# RTO Implementation Process

- **RTO Coordinator manages movement of research solutions to/within/from NextGen Weather Evaluation Capability (NVEC) according to a *solution-specific* Research Management Plan (RMP)**
- **Each solution's RMP will:**
  - Document status of program activities leading to NVEC
  - Identify each candidate solution's evaluation strategy, goals and specific criteria
  - Form the basis for the recommendation that a solution is ready for entry to or exit from NVEC
  - Be a “living” document that reflects solution status through NVEC to include activities undertaken to correct solution deficiencies
  - Be the source of NVEC evaluation data supporting decisions to move that solution to operational deployment or to investment/procurement

# Research Management Plan (RMP)

- **RMP will include:**
  - Introduction
  - Description of proposed capability
  - ConUse
  - Scope of plan
  - Technical Direction
  - Work Breakdown Structure for R&D and NWECC
  - Description of test environment
  - Test requirements
  - Description of the testing
  - Exit Criteria description
  - Risks and risk mitigation strategies
  - Schedule



# Research Management Plan (cont'd)

- **RTO Coordinator will lead RMP development in FY10 for the following IOC products:**
  - NCV, FIP Severity, GTG3 and CoSPA
- **Lessons learned from these RMPs will be used to develop an RTO Implementation Plan. The RTOIP will:**
  - Codify an unambiguous RTO pathway
  - Provide required guidance/templates/procedures
  - Be completed by **1FY11** and begin the decision process for candidate solution entry to NVEC

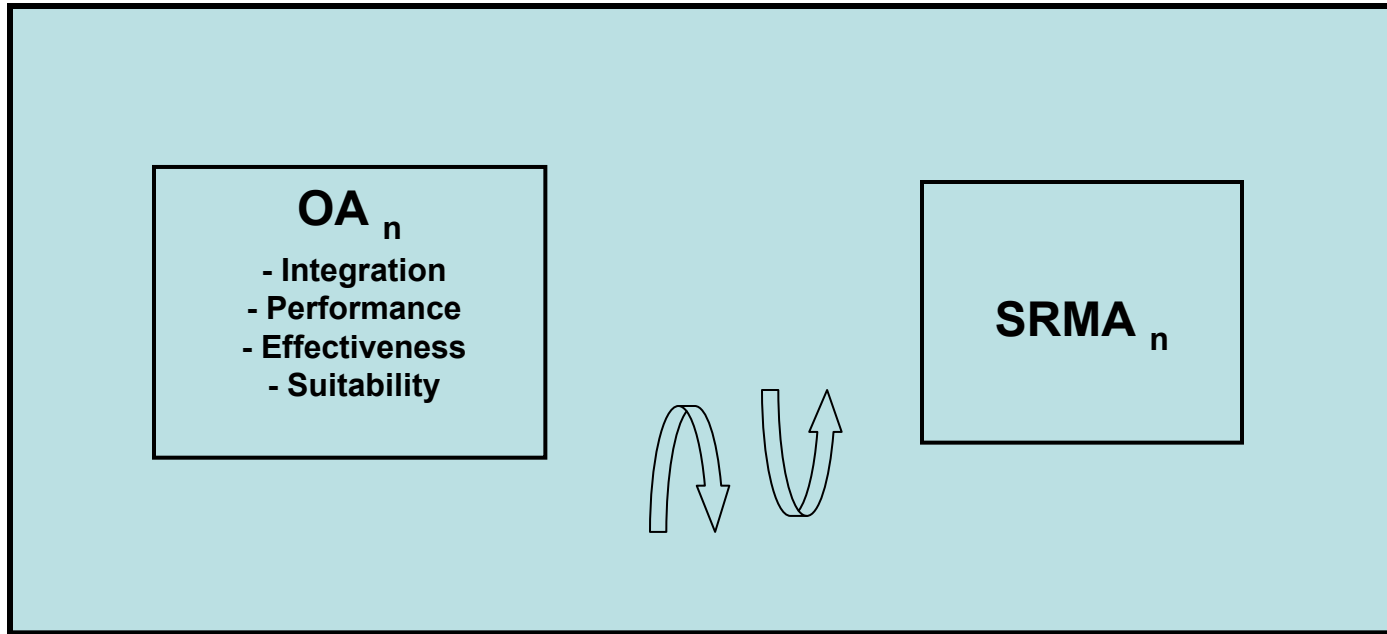
# NextGen Weather Evaluation Capability

- **NWEC evaluates solution suitability for NAS deployment by evaluating that:**
  - Algorithm is technically sound and meets Operational and Safety Risk Management standards
  - Targeted user requirements are met and expected NAS benefits are substantiated
  - Software/system conforms with NAS EA standards
  - Solution will be operationally effective and suitable and that the NAS infrastructure is ready to accept the solution

# Evaluation Activities



# NWEC Activities



## Notes:

- 1)  $n$  = number of evaluations
- 2)  = Spiral Development

# NWEC Activities (cont'd)

- **Operational Assessment:**
  - Demonstrates:
    - Solution is operationally effective for NAS use
    - Solution is operationally suitable for NAS use
    - NAS infrastructure is ready to accept the solution
  - Tests focus on demonstrating all pre-identified requirements have been met
  - Tests conducted at:
    - WJHTC
    - NWS's Aviation Wx Testbed
    - Or a filed site, using field personnel



# NWEC Activities (cont'd)

- **Operational Assessment:**

- Major Components:

- Integration Tests
      - Verifies solution interfaces with existing elements of NAS
    - Performance Tests
      - Verifies NAS can operation with the solution, at the required performance levels
    - Effectiveness Tests
      - Evaluates degree to which a solution accomplishes its mission when used by personnel in the operational environment
        - » Includes: capacity and NAS loading, degraded mode operations, safety, security, and transition switchover
    - Suitability Tests
      - Evaluated degree to which a solution satisfies its availability, compatibility, interoperability, reliability, maintainability, safety, and human factors requirements
      - Supportability, documentation, certification criteria, installation, operating procedures, and transition/training are also validated

# NWEC Activities (cont'd)

- **Safety Risk Management Assessment:**
  - Safety – systematically assesses safety risk of a product in the NAS (e.g., Preliminary Hazard Analysis)
  - IAW FAA Safety Management System Manual, v2.1 as established by ATO Order 1000.37
    - Solutions will be assessed to ensure the change is documented, hazards are identified, the hazards are assessed and analyzed, the unacceptable safety risk is reduced to the lowest acceptable level and mitigations are tracked and monitored.



# NWEC Activities (cont'd)

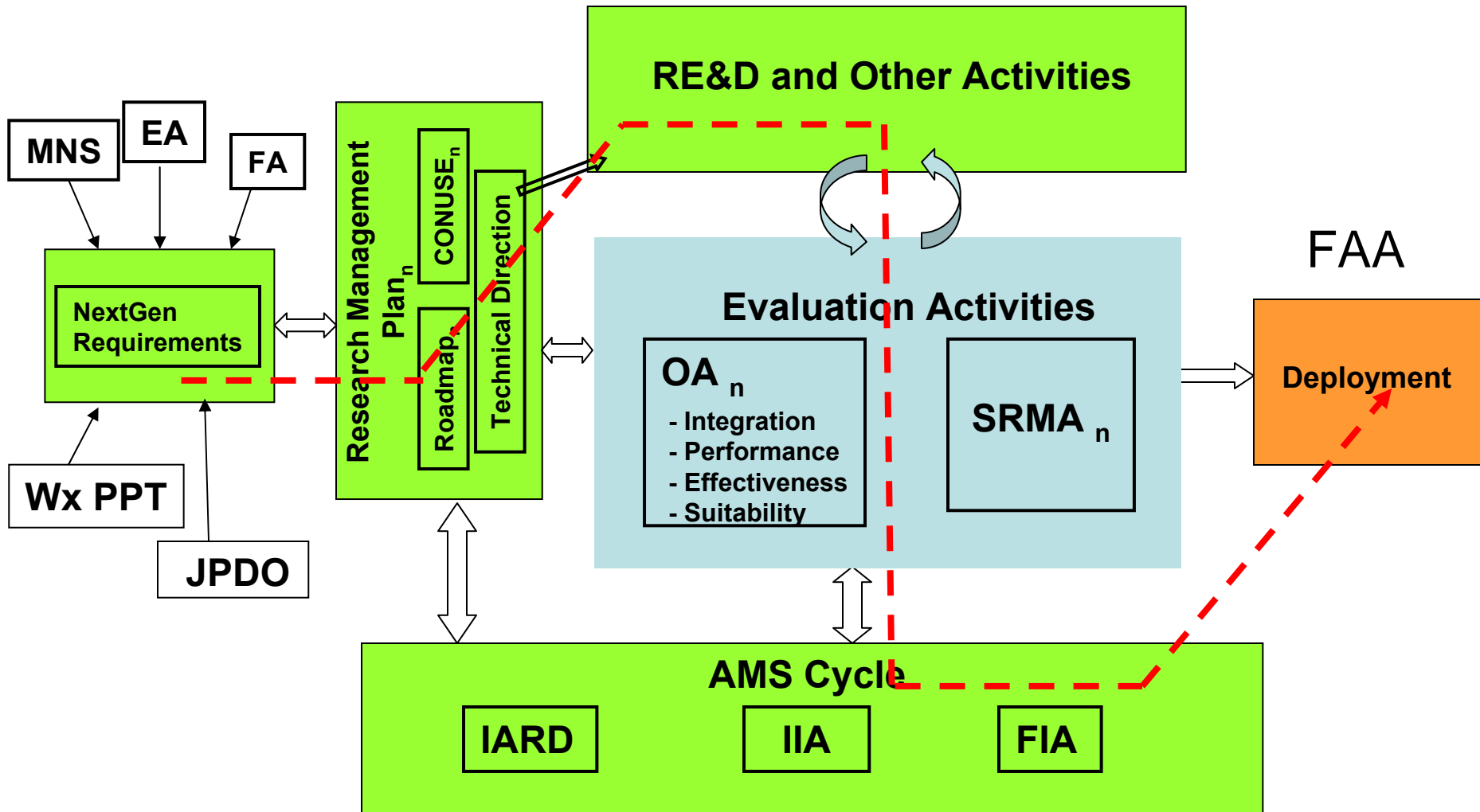
- **NWEC results form the basis for technical and performance reporting to the AMS**
  - Basis for financial and costing calculations
  - And business case/investment analysis
- **NWEC results also provide validation for operational deployment decisions**
- **All products destined for NAS deployment will undergo NWEC (or NWEC-sanctioned) evaluation**



# RTO Coordinator and NWEC

- **RTO Coordinator manages solution entrance, movement, and exit from NWEC**
  - RMP will document NWEC activities and results to support solution status and movement recommendation
- **RTO Coordinator facilitates NWEC spiral development and feedback looping**
  - Conduit for feedback between requirements development, RE&D, evaluation and deployment
  - Conduit for RE&D involvement in response to evaluation when product adjustment is needed

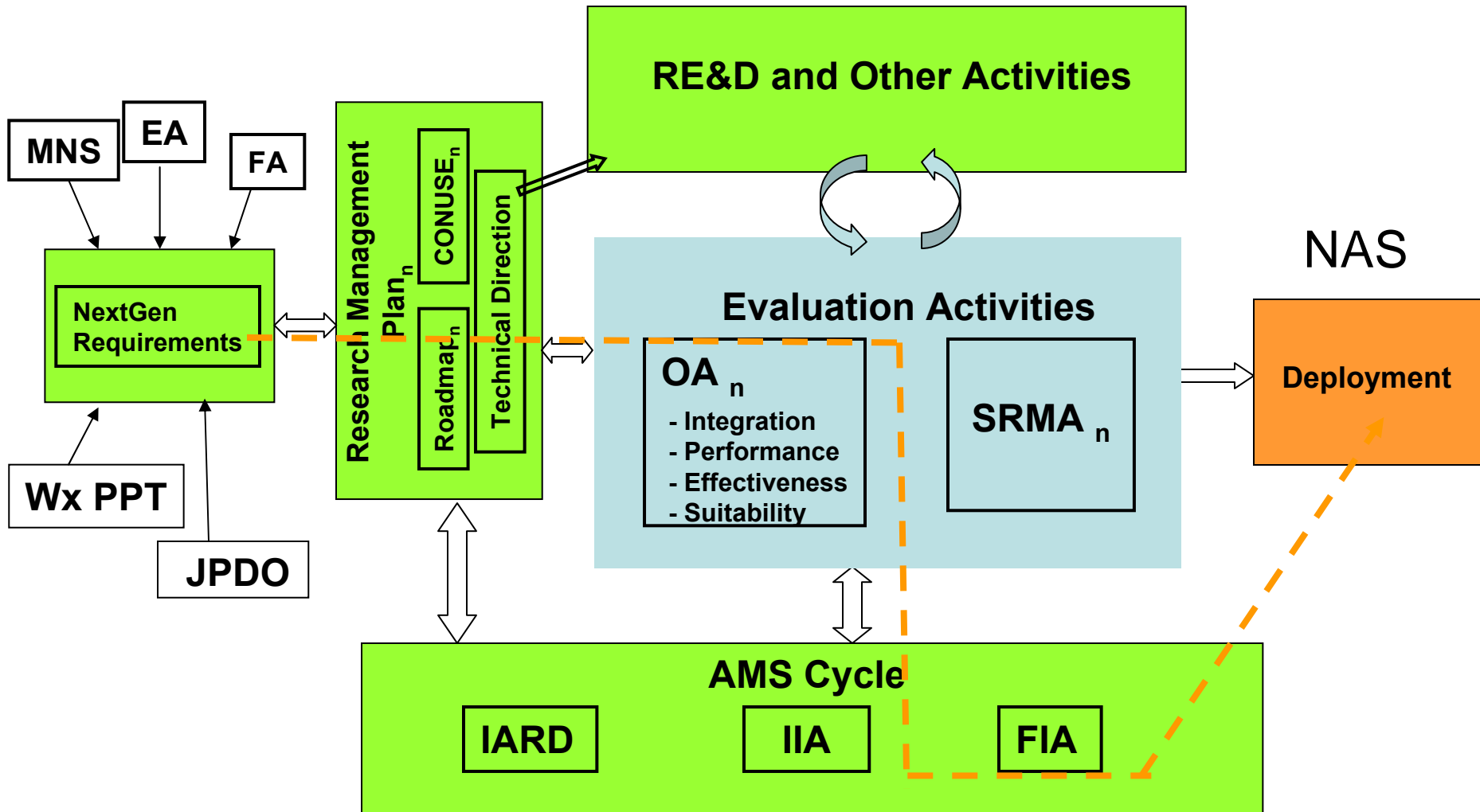
# RTO Process: AWRP to FAA Platform



## Notes:

- 1)  $n$  = number of evaluations
- 2) diagram does not imply time

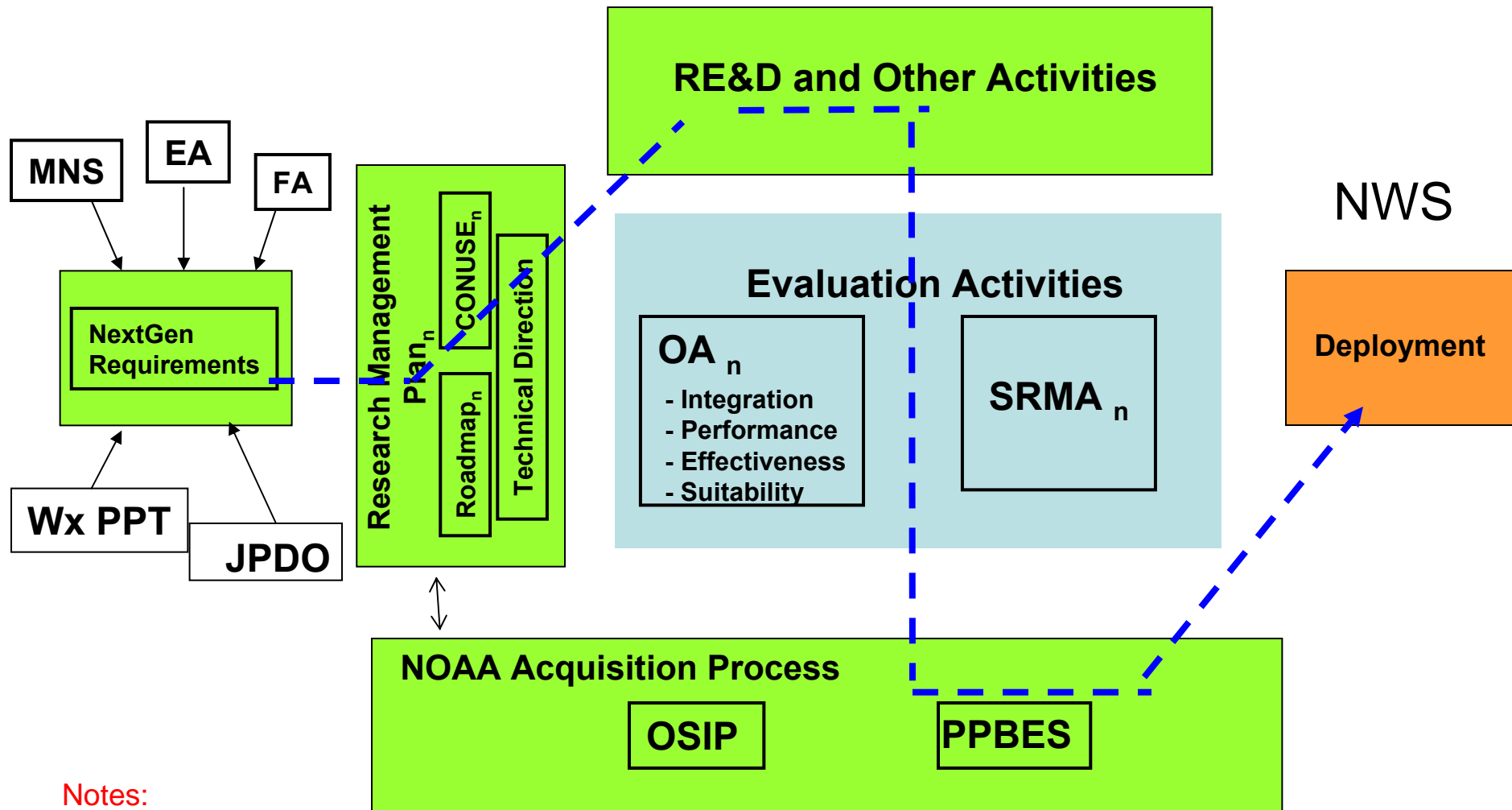
# RTO Process: Non-AWRP to FAA Platform



## Notes:

- 1)  $n$  = number of evaluations
- 2) diagram does not imply time

# RTO Process: AWRP to NWS Platform



## Notes:

- 1)  $n$  = number of evaluations
- 2) diagram does not imply time
- 3) FAA and NWS have not agreed to standard configuration management and QA practices

# NWEC Prerequisites

- **Candidate solution must have all of the following:**
  - Mission Needs Statement
  - Enterprise Architecture
  - Functional Analysis
  - Functional and Performance Goals (requirements)
  - ConUse
  - Technical Direction
  - Roadmaps
  - Verification Reports
  - Solution Documentation
  - Research Management Plan

# NWEC Prerequisites (con't)

- **Preliminary Scientific Testing (from AWRP)**
  - Does candidate algorithm accurately depict the current or forecast state of the atmosphere
- **Verification report that includes:**
  - Goal of the evaluation
  - Linkage to requirements/ConUse
  - Participants and methodology
  - Detailed scientific results and issues
  - Conclusions/Recommendations



## Other Prerequisites (con't)

- **Assess evaluation candidate against investment analysis/management criteria**
  - Potential budget, resource and life cycle cost implications of continuing forward to implementation
  - Benefits in terms of Flight Plan and SMP Goals
  - Risks assessed and mitigation plans available for medium or high risks
  - Schedule impact and realism; viability against NextGen Master Plan and Roadmaps
- **Identify shortfalls in meeting requirements**

# Other Prerequisites (con't)

- **Algorithm documentation**
  - Algorithm Description - theory of the science, limitations, dependencies
  - Computations and subroutines
  - Outputs
- **Software Documentation**
  - Software requirements and performance
  - Software Structure
  - Outputs
  - Testing requirements and methods

# Exit Reports



# Exit Reports / Outputs from NWEAC

Approved (√)	Criteria
	Revised ConUse
	Revised Functional Analysis (FA) Report
	Revised Functional and Performance Goals (requirements)
	Final Research Management Plan
	Completed Evaluations <ul style="list-style-type: none"><li>• Operational Assessment</li><li>• Safety Risk Management Assessment</li></ul>

# NWEC Outputs

- **ConUse**

- Solution description includes both scientific (technical) and operational details
- Identification of the user(s)
- Description of how users access the solution
- Description of the type of decisions users will make and how they use the solution to make those decisions
- Description of how and on what platform the solution will be displayed and/or accessed

# NWEC Outputs (cont'd)

- **Functional Analysis (FA) Report**
  - Functional Flow Block Diagrams
  - N2 Diagrams
  - Lexicons
- **Functional and performance goals (requirements)**
  - Completed functional and performance requirements based on Functional Analysis and performance analyses
- **Baselined document complete in accordance with AMS pPR or fPR**

# NWEC Output (con't)

- **Research Management Plan with:**
  - Completed WBS
  - Completed test requirements and verification
- **Safety Evaluation**
  - Preliminary Hazards Analysis (PHA), as outlined by the Safety Management System (SMS) process
    - Accepted & approved SRMD or SRMDM



# NWEC Output (con't)

- **Operational and Safety Risk Management Assessments**
  - Completed reports including, at a minimum:
    - Evaluation Goal
    - Participants
    - Methodology
    - Issues
    - Assumptions
    - Alternatives
    - Results
    - Conclusions / Recommendations



# Roles and Responsibilities



# Responsibilities: New Weather Capabilities Manager

- **Leads NWEC process:**
  - Formal acceptance that NWEC prerequisites are met
  - Formal approval of the Research Management Plan
  - Formal approval of NWEC reports after Subject Matter Expert review of evaluation results
  - Formal approval for solution to move to acquisition

\*AFS, operational  
service units, &  
NWS provide input



# Responsibilities: RTO Coordinator

- **Provides guidance on Research Management Plans and manages RTO process**
  - Assesses candidate solution's readiness to proceed to formal evaluation
  - Recommends to the New Weather Capabilities Manager that candidate solutions meet NVEC prerequisites / completion
  - Identifies/coordinates with Subject Matter Experts for review of solution evaluations
  - Ensures consistency and traceability of solutions to ConUse, roadmaps, and requirements
  - Ensures configuration management
  - Ensures preparation of meeting minutes



# Responsibilities:

- **Research Transition Team Lead**
  - Manages solution for transition to operational use per their Research Management Plan
- **Subject Matter Experts:**
  - Maintain independence (not responsible for managing solution through the NWECC process)
  - Provide inputs for requirements, ConUse, TD and Research Management Plan as appropriate
  - Review weather solution evaluations and provide recommendations



# Responsibilities: Weather Solution Approval Board

- **Approval of weather solutions to send to NWS for investment decision and subsequent implementation on NWS platform**
- **Structure:**
  - Director, Aviation Weather Group (Chair)
  - ATO service unit representative
  - AVS
  - NWS (OST Director or designated representative)
  - RTO Coordinator (Secretary, non-voting member)

