Research to Ops
Conceptual Framework

Presented to: **FPAW**

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Federal Aviation Administration

Issue

- **AWTT process needed to evolve to meet requirements of the FAA's Acquisition Management System**

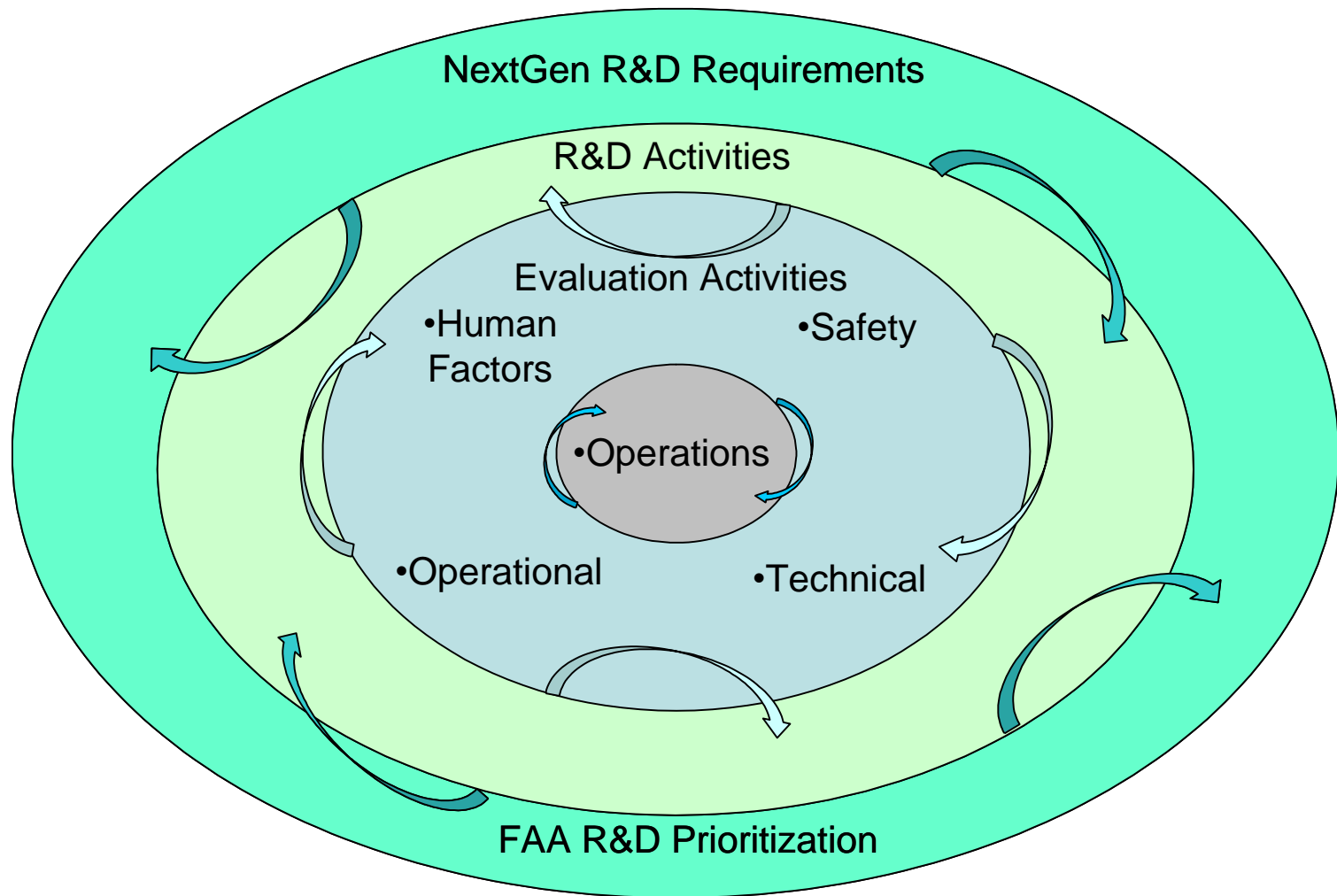- **A clear, unambiguous process needed for transitioning research to operations**
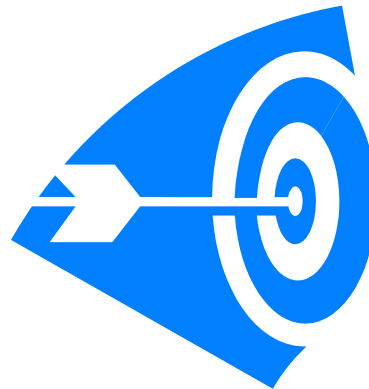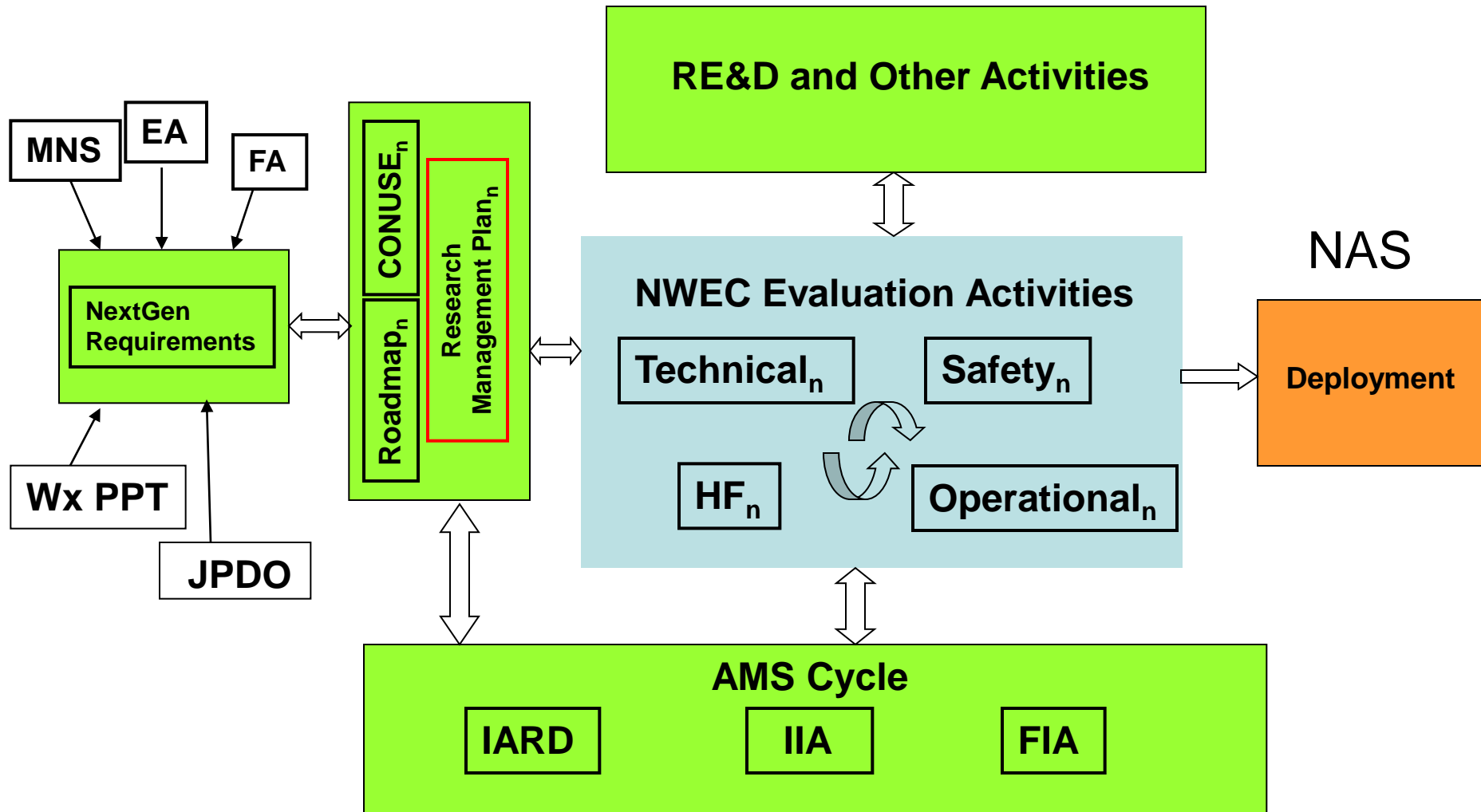
RTO Coordinator Goals

- **Facilitate movement of research into operations efficiently and effectively by *creating* and then managing an RTO process that delivers products 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 product entry to, management within, and exit from the NextGen Weather Evaluation Capability (NWEC)**

Research to Operations Process

Research to Operations Process

RE&D and Other Activities

NextGen Requirements

MNS, EA, FA

Wx PPT

JPDO

$CONUSE_n$

$Roadmap_n$

Research Management $Plan_n$

NWEC Evaluation Activities

$Technical_n$

$Safety_n$

HF_n

$Operational_n$

NAS

Deployment

AMS Cycle

IARD

IIA

FIA

Research to Operations Process
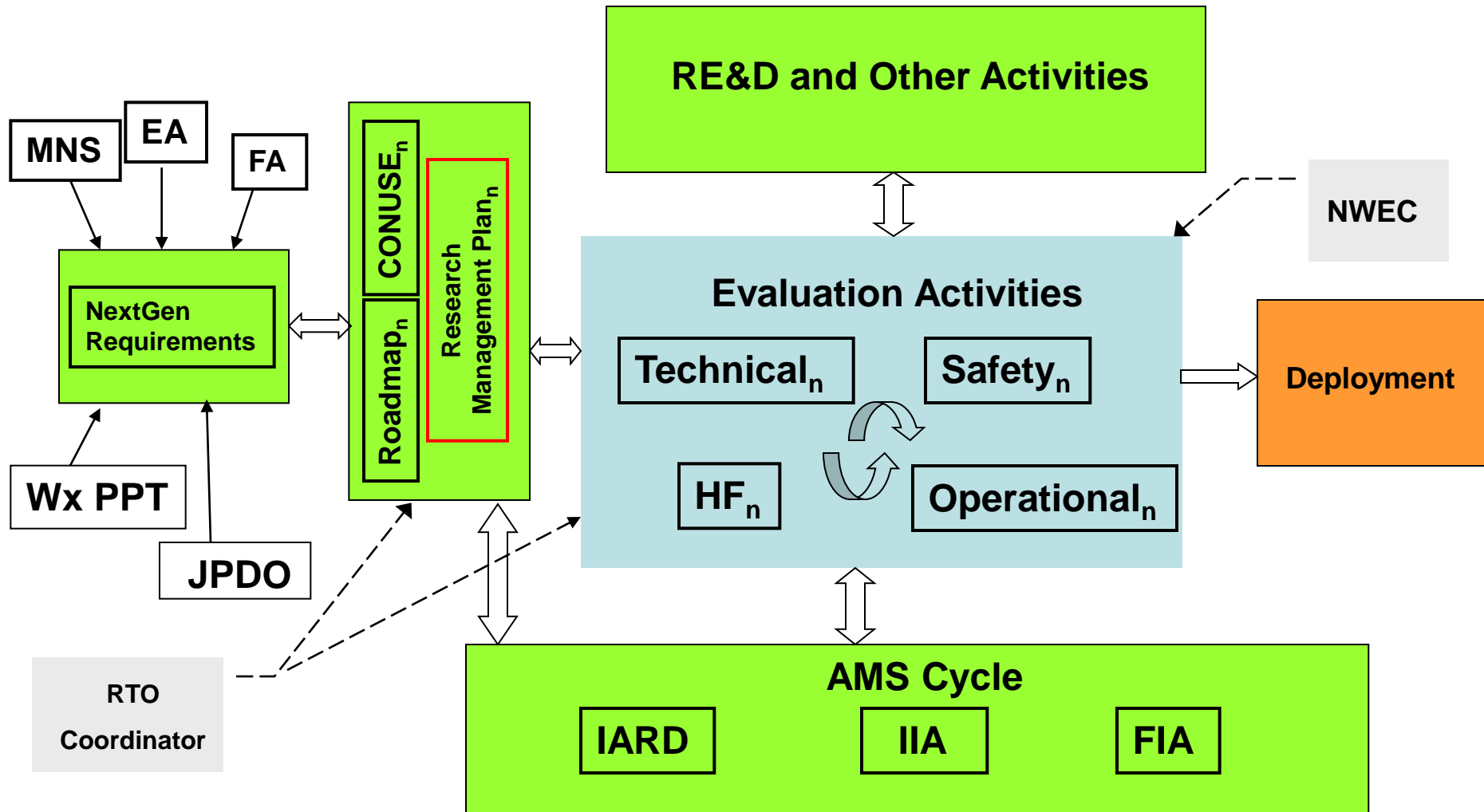
RTO Process: AWRP to NWS Platform

MNS

EA

FA

NextGen Requirements

Wx PPT

JPDO

$CONUSE_n$

$Roadmap_n$

Research Management Plan$_n$

RE&D and Other Activities

Evaluation Activities

Technical$_n$

Safety$_n$

HF$_n$

Operational$_n$

NOAA Acquisition Process

OSIP

PPBES

NWS
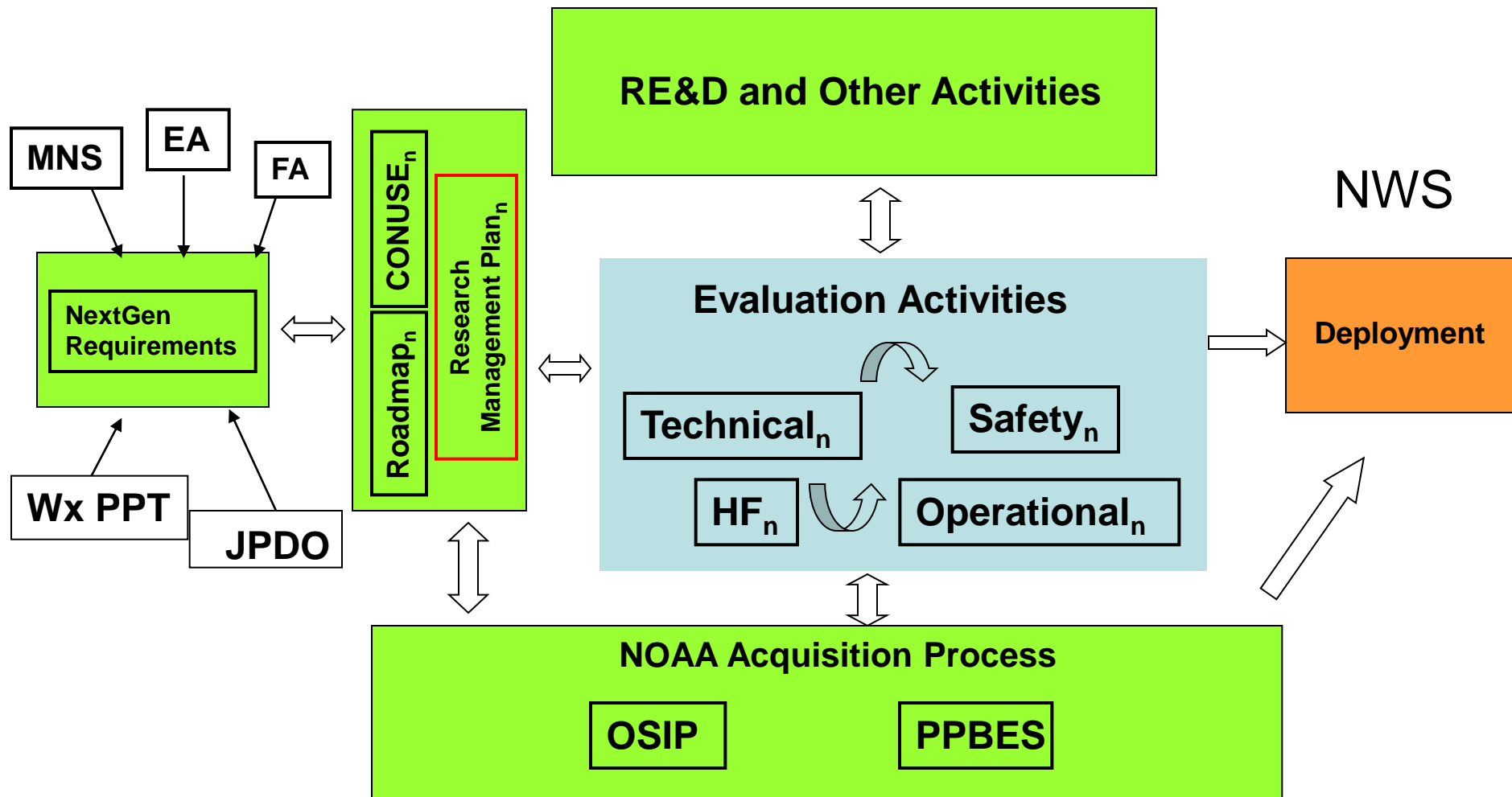
Deployment

NextGen Weather Evaluation Capability

- **NWEC evaluates product suitability for NAS deployment by evaluating that:**
  - Algorithm is technically sound and meets HF, safety and operational suitability standards
  - Targeted user requirements are met and expected NAS benefits are substantiated
  - Software/system conforms with NAS EA standards
  - Product will be operable and maintainable over its life cycle

NWEC Activities

- **Spiral Evaluation Approach – Iterative, incremental development and testing which allows for:**
  - Product refinement and re-evaluation
  - Movement between evaluation and RE&D / AMS

- **Evaluations tailored to candidate product**
  - Research Evaluation Plan ensures requirements traceability, defines test methodology and validates completion of entrance criteria

NWEC Activities (cont'd)

- **Technical Evaluation:**
  - Verifies that the product performs within established performance requirements
  - Ensures software code is functionally equivalent – the code works as expected when transferred from the Lab to an operational platform (i.e., burn-in-time)
  - Ensures software is reliable and maintainable and is delivered with documentation and standard interfaces

NWEC Activities (cont'd)

- **Safety / Human Factors Evaluation:**
  - Safety – systematically assesses safety risk of a product in the NAS (e.g., Preliminary Hazard Analysis) in accordance with the FAA Safety Management System (SMS)
  - Human Factors – ensures product is consistent with human capabilities and limitations – will perform safely and effectively
    - HF analysis considers the implications for the specific user group(s) identified in the ConUse in the context of all relevant factors
    - HF considerations include, but are not limited to, workload, computer-human interface, information presentation, documentation, functional design, error potential and recovery, information requirements, procedures, situation awareness

NWEC Activities (cont'd)

- **Operational Evaluation:**
  - Systematically assesses the product in an operational or near operational (simulated) environment
    - Assess operational suitability and feasibility
    - Assess impact of product on users' decisions/performance
    - Collect technical data and obtain user feedback
  - Operational analysis is linked to the ConUse

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 will provide decision support to a management board for product entrance, movement, and exit from NWEC**
  - RMP will document NWEC activities and results to support product status and movement recommendation

- **RTO Coordinator will facilitate 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

NWEC Entrance Criteria

NWEC Entrance Criteria

- **Candidate product must have a ConUse traceable to requirements with:**
  - Scientific, technical and operational description
  - Identification of target users
  - Decisions users are expected to make using product
  - Expectation for product use for decision-making
  - Description of how users will access product (display and/or interface method)
    - Include operational use cases with narrative scenarios

Entrance Criteria (con't)

- **Candidate product must:**
  - Be consistent with weather roadmaps and NAS architecture
  - Fit NAS infrastructure and capabilities evolution
  - Be considered ready to meet functional and performance requirements

Entrance Criteria (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 Entrance Criteria (con't)

- **Assess evaluation candidate against investment analysis/management criteria**
  - Potential budget, resource and life cycle cost implications of continuing 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 risks; viability against NextGen Master Plan and Roadmaps

- **Identify shortfalls in meeting requirements**

Other Entrance Criteria (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

Roles and Responsibilities

Responsibilities:
New Weather Capabilities Manager

- **Leads NWEC process:**
    - Formal acceptance that NWEC entrance criteria met
    - Formal approval of the initial Research Management Plan
    - Formal approval of NWEC outputs after subject matter expert review of evaluation results
    - Formal approval for product to move into AMS

Responsibilities: RTO Coordinator

- **Develops Research Management Plans and coordinates RTO process**
  - Assesses candidate product's readiness to proceed to formal evaluation
  - Recommends to the New Weather Capabilities Manager that candidate products meet NWEC entrance/exit criteria
  - Identifies/coordinates with subject matter experts for review of product evaluations
  - Ensures consistency and traceability of products to ConUse, roadmaps, and requirements
  - Ensures configuration management
  - Ensures preparation of meeting minutes

Responsibilities: Subject Matter Experts

- **Subject Matter Experts:**
  - Maintain independence (not responsible for managing product through the NWEC process)
  - Provide inputs for requirements, ConUse and Research Management Plan and review as appropriate
  - Review weather product evaluations and provide recommendations

Responsibilities: Weather Product Approval Board

- **Approval of weather products 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
  - RTO Coordinator (Sec'y, non-voting)

Responsibilities: Weather Product Approval Board (cont'd)

- **Operating Processes**
  - Members responsible for coordination with their respective organizations
  - Meet semi-annually or as needed
  - Decisions made by consensus