NOAA Unmanned Aircraft Systems and Fiscal Year 2012 Call for Proposal Process

Webinar Hosted by: The NOAA UAS Team

Location: SSMC 11836

11:00-11:10 11:10-11:30	Introduction to UAS and Introduction of UAS Video	Dr. Alexander MacDonald Office of Oceanic and Atmospheric Reasearch, Deputy Assistant Administror for Labs and Cooperative Institute
11:30 -12:00	History and overview of the UAS Program	Robbie Hood NOAA Unmanned Aircraft Systems, Program Manager
12:00-12:15	Request for Proposal Process	RDML Philip M. Kenul, NOAA (Retired) NOAA Unmanned Aircraft, Senior Systems Engineer
12:15-12:30	Platform Capabilities Project Reviews and Programmatic Analyses	CDMR John "JC" Coffey, USN (Retired) NOAA Unmanned Aircraft, Senior System Engineer
12:30 -1:00	Questions/Discussion	Senita M. Hill NOAA Unmanned Aircraft Systems, Project Manager

NOAA Unmanned Aircraft Systems Program Overview

Robbie Hood, UAS Program Director

NOAA Office of Oceanic and Atmospheric Research

13 December 2011

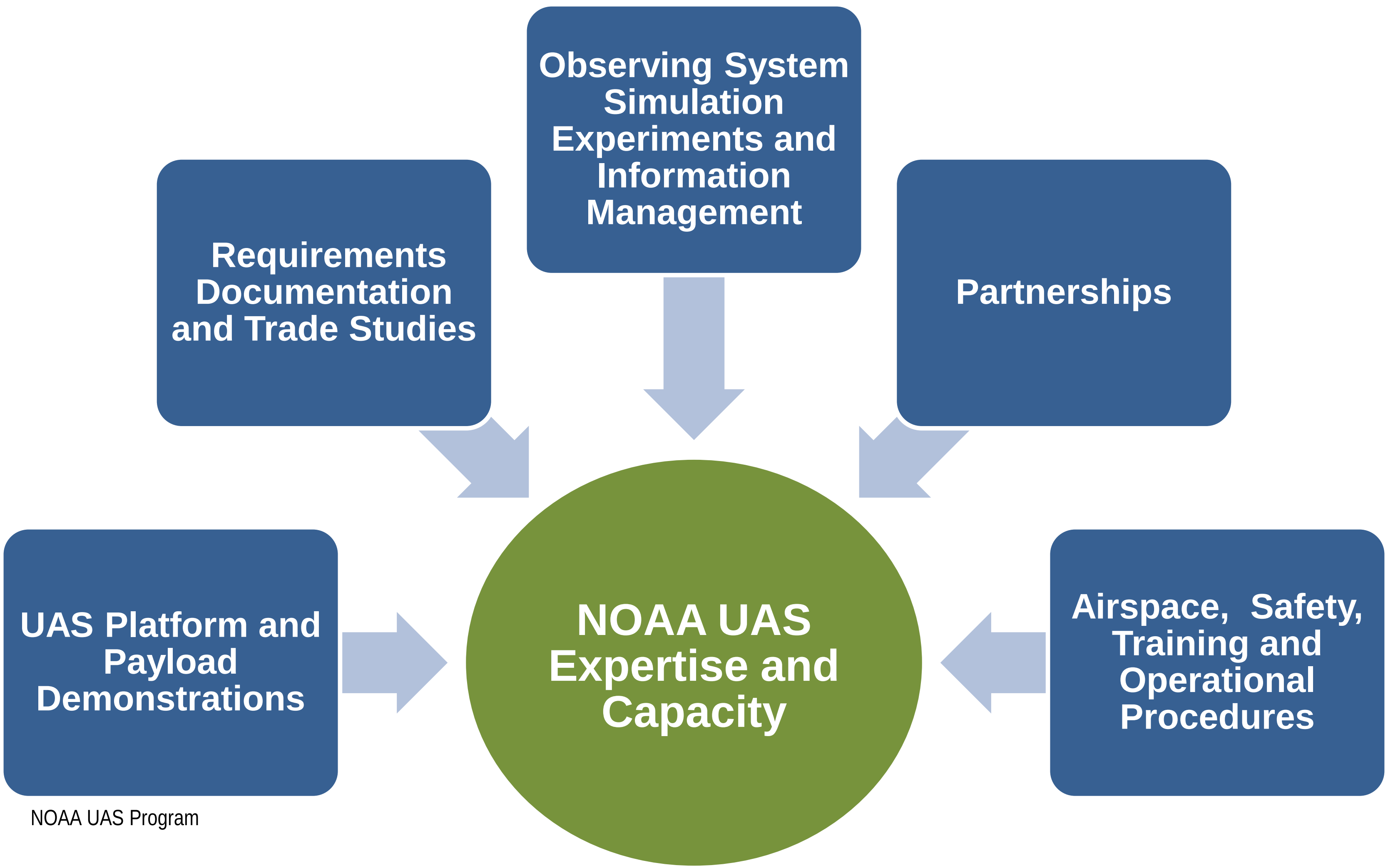
Purpose and Outline

- ***<u>Webinar Purpose – Informational briefing describing:</u>***
  - **Background, accomplishments, and strategic direction of UAS Program**
  - **Request for proposals**
  - **Project review process**
  - **Capabilities of common unmanned systems**
- ***<u>Outline of UAS Program Overview</u>***
  - **Basic definition**
  - **Building UAS Expertise and Capacity**
  - **Strategic Priorities**
  - **Program Vision and Goals**
  - **UAS Transition Process**
  - **UAS Strategic Direction**
  - **Selected Roadmaps**
  - **Initial Business Case**
  - **Contact Information**

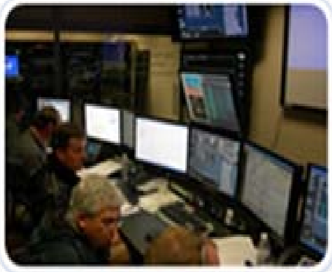
Reality of Unmanned Aircraft Systems

- **Proven platforms and payloads**
  - **Many classified at Technology Readiness Level – 9**
  - **Air Force and Navy Global Hawk - 20,000 flight hours over 10 years**
  - **Air Force and CBP Predator – 1M flight hours over 15 years**
  - **Army PM UAS – 1 M flight hours among 5 operational UAS models**
- **Airspace Access improving**
  - **FAA Certificate of Authorization (COA) to flight - Approved for NASA and NOAA science missions**
  - **FAA flight rules for small low altitude UAS – Expected by 2013**
  - **Advancing DOD sense and avoid technologies – Army/FAA pilot study underway for 2010 - 2015**
- **New capabilities on the horizon**
  - **High altitude Zephyr - flown for 2 weeks**
  - **DARPA technology investments – flight times of months to years**
  - **UAS - launched from balloons or other aircraft**

Tools for Building UAS Expertise and Capacity



Strategic Priorities



NOAA Next Generation Strategic Plan

- *Success indicated by enhanced horizontal coverage, time, and vertical profile of the Earth*

National Ocean Policy

- *Call for the use of unmanned vehicles to gather data on the health and productivity of the ocean, our coasts, and the Great Lakes*

NOAA NWS Strategic Plan

- *Future focus on maintaining continuous situational awareness, interpreting information and providing decision for high-impact events*

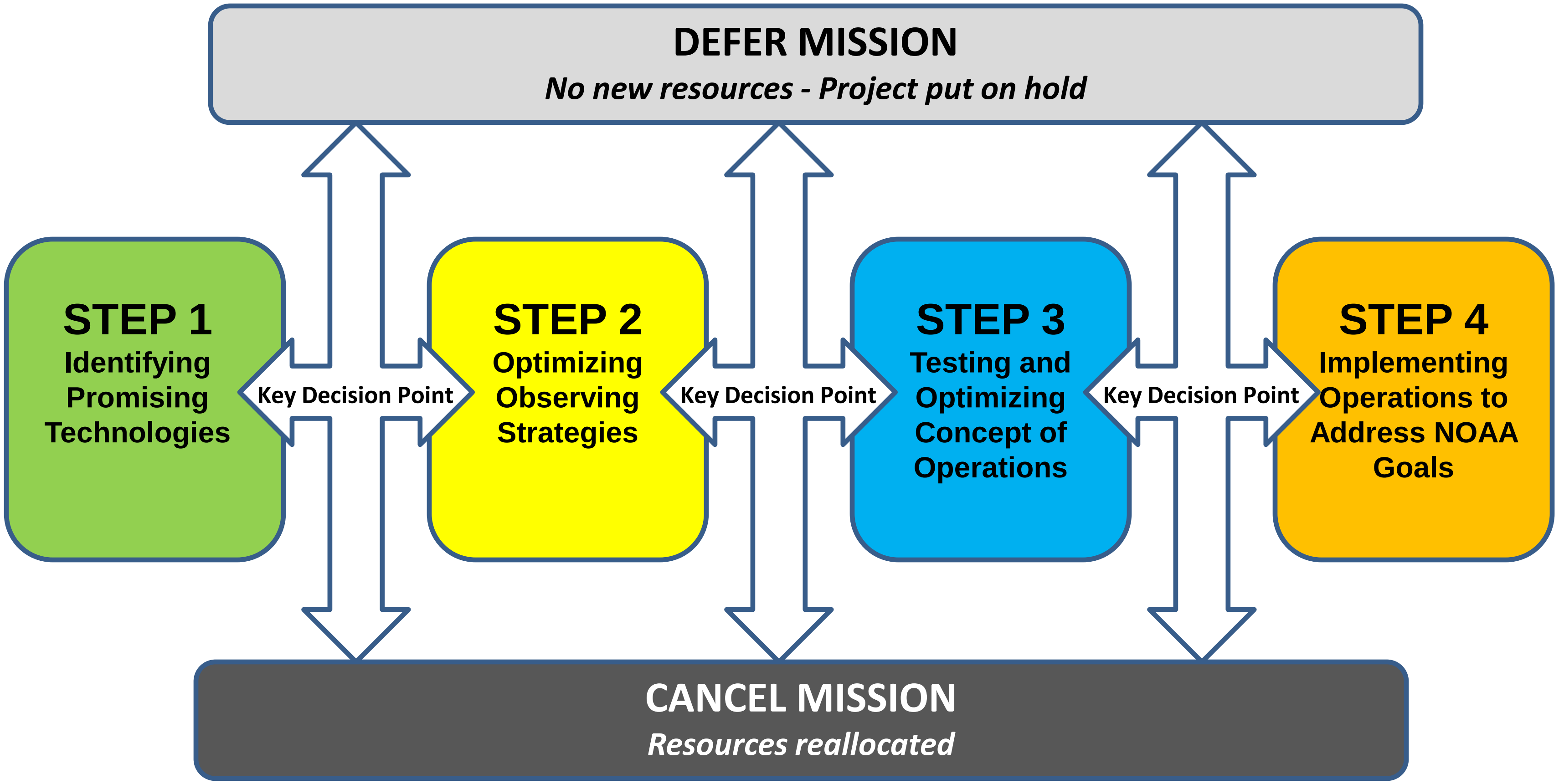
NOAA Arctic Plan

- *Improved observations to better forecast sea ice, understand climate and ecosystem changes, and improve weather and water warnings*

Metrics for UAS Technology Assessment

Technology Readiness Level	Description
TRL 1	Basic or fundamental research
TRL 2	Technology concept and/or application
TRL 3	Proof-of-concept
TRL 4	Concept validated in laboratory
TRL 5	Concept validated in relevant environment
TRL 6	Prototype demonstration in relevant environment
TRL 7	Prototype demonstration in operational environment
TRL 8	System demonstration in an operational environment
TRL 9	System totally operational

UAS Transition Process



NOAA UAS Strategic Vision and Goals

- ***Vision***
  - **UAS will revolutionize NOAA observing strategies by 2014 comparable to the introduction of satellite and radar assets decades earlier**

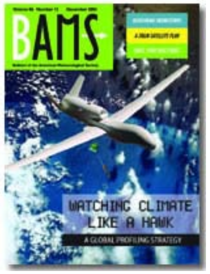
- ***Goals***
  - **Goal 1: Increase UAS observing capacity**
  - **Goal 2: Develop high science-return UAS missions**
    - ***High impact weather monitoring,***
    - ***Polar monitoring***
    - ***Marine monitoring***
  - **Goal 3: Transition cost-effective, operationally feasible UAS solutions into routine operations**

NOAA UAS Program Strategic Direction

	Innovate	*Incubate*		*Integrate*
	STEP 1 Identifying Promising Technologies	**STEP 2** Optimizing Observing Strategies	**STEP 3** Testing and Optimizing Concept of Operations	**STEP 4** Implementing Operations to Address NOAA Goals
High Impact Wx	Long Endurance High and Low Altitude Transportable	High Resolution Imaging Vertical Meteorological Profiles Ocean Surface Meteorology	Tropical Storms Winter Storms Atmospheric River Storms Flooding Fire Weather	Weather-Ready Nation Sustainable Coastal Communities Climate Adaptation and Mitigation
Polar Monitoring	Long Endurance High and Low Altitude Transportable Quiet	High Resolution Imaging Vertical Meteorological Profiles Air Chemistry	Sea Ice Conditions Storm Forecasting Wildlife Assessment Air Chemistry Disaster Response	Climate Adaption and Mitigation Sustainable Ocean Ecosystems Arctic Strategy National Ocean Policy
Marine Monitoring	Long Endurance High, Medium, and Low Altitude Transportable Quiet	High Resolution Imaging Ocean Color Air Chemistry	Wildlife Assessment Fisheries Law Enforcement Marine Debris Coastal Ecosystems Disaster Response	Sustainable Ocean Ecosystems Sustainable Coastal Communities Arctic Strategy National Ocean Policy

Roadmap for Global Capabilities UAS

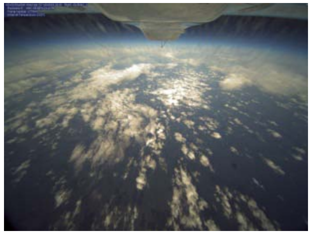
Vision of Global Profiling System



NASA-NOAA Global Hawks and payloads feasible for dedicated operational high impact weather and polar monitoring

2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015

Proven Global Hawk flight capabilities
- **Arctic, Pacific, Gulf of Mexico, Atlantic**
- **Tropical and winter storms**
- **Dropsonde and remote sensing profiling**
- **Aircraft *in situ* profiling**



Roadmap for Polar Ice Monitoring

NOAA low altitude melting glacier study in Greenland

NASA-NOAA low and medium altitude marginal ice zone study in Bering Sea

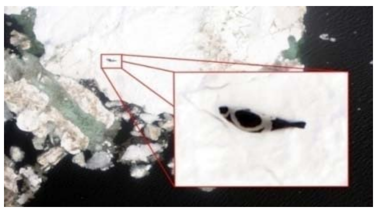
2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018

NOAA low altitude black carbon study in Norway

Optimized UAS ice observing strategy

Roadmap for Low Altitude Marine and Wildlife Monitoring

NOAA UAS ship-deployed study of ice seals in Bering Sea



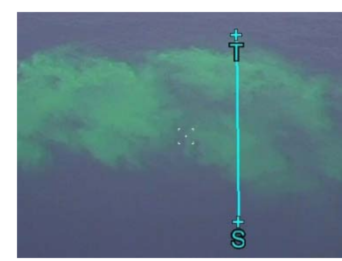
University of Alaska - Fairbanks UAS partnership study of seals at Dutch Harbor

Optimized UAS marine and wildlife observing strategy

2009 2010 2011 2012 2013 2014 2015

NOAA UAS penguin study in Antarctica

Coast Guard UAS partnership study of oil spill monitoring in Santa Barbara channel



Initial Business Case

Summary Recommendations

<table>
<tr><th></th><th></th><th>FY11</th><th>FY12</th><th>FY13</th><th>FY14</th><th>FY15</th><th>FY16</th><th>FY17</th></tr>
<tr><td rowspan="2">HALE</td><td>ACQ</td><td colspan="2">Negotiate MOA with NASA</td><td>Stand up GH1, GCS1</td><td>Stand up GH2</td><td>Stand up GH3, GCS2</td><td></td><td></td></tr>
<tr><td>OPS</td><td></td><td></td><td colspan="5">Training, Demos, Payload optimization, CONOPs</td></tr>
<tr><td rowspan="2">MALE</td><td>ACQ</td><td></td><td colspan="2">Negotiate MOAs with NASA, CBP</td><td></td><td></td><td></td><td></td></tr>
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<tr><td rowspan="2">LASE</td><td>ACQ</td><td>Acquire Puma-AEs</td><td></td><td>Acquire TBD</td><td></td><td>Acquire TBD</td><td></td><td></td></tr>
<tr><td>OPS</td><td></td><td colspan="6">Training, Demos, Payload optimization, CONOPs</td></tr>
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NOAA Unmanned Aircraft Systems (UAS) Program

Administrative Procedures for Competitive Award for Project Proposals
Overview

Philip Kenul

Office of Oceanic and Atmospheric Research

Earth System Research Laboratory

UAS Program

December 2011

Outline

- Announcement-Call for Proposals
- Pre-Proposal Letter
- Full Proposal Format
- Evaluation Criteria
- Project Review Team Panel
- Pre-Award Procedures
- Post-Award Procedures
- Progress Reports/Monitoring and Evaluations

UAS Call for Proposals Process

- Request for proposals (RFP) are developed from the research priorities established by the UASP
- The UAS Director will identify critical science and management needs.
- The PM will provide the project description, priorities and objectives, evaluation criteria to be used, closing date, projected start date, and the funding availability to the UAS Project Review Team (PRT) Panel.
- The PRT will review all proposals and rank them according to the evaluation criteria established by the UAS Program Director. The evaluation criteria are also posted on the UAS Sharepoint and UAS Website.

Pre-Proposal Letter

- Contact information for the principal investigator
- Max 3-page synopsis of research, including a rationale, questions and/or hypotheses, the methodology, and anticipated results.
- Focus on new, groundbreaking or transformative research to investigate UAS technology for potential NOAA application.
- Relevance to NOAA's science priorities, goals, and objectives.

Pre-Proposal Letter

- Statement of relevance to NOAA and a linkage to NOAA's mission.
- One page describing estimated budget, with approx cost per year up to a maximum of three years. Major equipment procurements or unusual costs, e.g., ship, aircraft, computers should be identified.
- Up to one additional page of relevant references to the literature.
- Biography of principal and primary co-investigators, with a focus on research activities and publications relevant to the proposed research.

Full Proposal Format

- **Project Abstract -500 words**
  - Objectives and benefits
  - Outline of proposed work and methodology
  - Period of performance
- **Project Objective**
  - Project operating plans for performance period
  - Long term plan for research to operations transition
  - Describe each task or milestone
  - Define success criteria for each task or milestone
- **Expected Significance to:**
  - NOAA Strategic Plan
  - OAR or relevant Line Office Strategic Plan

Full Proposal Format

- **Technical Plan to describe:**
  - Lab/field demonstration of UAS payloads, platforms, or concept of operations in relevant and/or operational environments,
  - Instrument development /mod for UAS application
  - UAS observation impact studies, data assimilation experiments or decision support experiments.
  - Sample mission scenarios
- **Management Plan**
  - overall project coordination, logistics, decision-making, comms, data collection/management.

Full Proposal Format

- **Deliverables**
  - Safety and Operations Plan, Summary of Field Operations, Summary of Scientific Results, and Technology Assessment of UAS Concept of Operations.
- **Key Personnel**
  - Roles of personnel and funding source
- **Comparative Technology Assessment**
  - Identify the entrance technology readiness level the expected exit technology readiness level

Full Proposal Format

- **Project Risk Mitigation**
  - Identify risks and mitigations
- **Budget Breakdown**
  - By quarter-personnel, hours, sensors, hardware, travel
- **Supervisor Letter of Commitment**
  - Principal Investigator's supervisor stating the organization's commitment to the scope, schedule, budget, and deliverables of the proposed activities.

Evaluation Criteria

- The Program Director will provide the project description, priorities and objectives, evaluation criteria to be used, closing date, projected start date, and the funding availability to the UAS Project Review Team (PRT) Panel.
- The PRT will review all proposals and rank them according to the evaluation criteria established by the UAS PM.
  - Importance and/or Relevance and applicability of proposed project to the program goals
  - Technical/scientific merit
  - Overall qualifications of applicant
  - Project costs
  - Other

Project Review Team Panel (PRT)

- UAS Program adheres to a panel review process to review proposals.
- Panel selected by Program Director
  - Technical experts from UAS Program and SME as required
- PRT reviews proposals and ranks them according to evaluation criteria.
- Assess and evaluate proposals within context of research needs

Pre-Award Procedures

- Based on PRT evaluations UAS Program Director will :
  - place the proposals in rank order and make recommendations using the rank order, the evaluation, and selection
  - submit the recommendation to the Office of Oceanic and Atmospheric Administration's, Deputy Assistant Administrator of Laboratory and Cooperative Institutes (DAA/LCI), for review and comment.

POST-AWARD PROCEDURES

- Proposal awards are bilateral agreements.
- By signing the award, the recipient agrees to abide by the terms and conditions of the award
- Monitoring may take the form of site visits, written and/or oral reports, meetings, or any other form of communication deemed appropriate for keeping apprised of project progress.

PROGRESS REPORTS

- UAS Program will perform a series of project review
- Use financial reports to measure the progress
- Keep abreast of any situations that may prevent the project from being accomplished Mission Concept Reviews, Preliminary Design Reviews, Critical Design Reviews, Airworthiness and Flight Safety Reviews, Flight Readiness Reviews, Mission Readiness Reviews, and Post Mission Review and Report

Project Monitoring Plan for UAS Program

- UAS Program Director is responsible monitoring official
  - will develop a monitoring plan for each project before the project begins.
  - will determine the type and frequency of monitoring activities based on the risk assessment of the project and the available resources. Monitoring plan templates can be found in on the in RFP manual.

NOAA Unmanned Aircraft Systems (UAS) Program
Call For Proposals
FY2012

Philip Kenul

Office of Oceanic and Atmospheric Research

Earth System Research Laboratory

UAS Program

December 2011

FY 12 UAS Call for Proposals Schedule

- 13 Dec 2011 – Call for FY12
- 11 Jan 2011 – Deadline for pre-proposals
- 13 Feb 2011 – Request for full proposals
- 26 Mar 2011 – Deadline for full proposals
- 24 Apr 2011 – Proposal selection

Scope of the Solicitation

- Low Altitude Marine and Wildlife Assessments, High Impact Oceanic Weather, Arctic Sea Ice and Climate Change, and Marine Monitoring
- UAS selection at the discretion of PI
- Consideration to NOAA owned
  - md4-1000 quadrocopter (1),
  - APQ-16 (1),
  - Manta UAS (2),
  - SkyWisp balloon launched glider (2),
  - Puma UAS (2 systems),
  - EMILY (Surface Vessel).

Scope

- Proposals are expected to:
  - Meet objectives through measurements to prove/disprove a scientific hypothesis
  - Utilize currently available sensors and instrumentation
- Deliver the following:
  - Analysis of data, report on science objectives, and draft publication of science results;
  - Analysis of UAS performance /improvements

Scope

- Investigations requested by this solicitation shall include provision for:
  - any required upgrades to platforms to enable the science mission
  - required instrument adaption and integration of instrument(s) onto the UAS platforms,
  - operations,
  - data analysis, distribution and archiving in a NOAA-assigned data center within 6 months
  - publication of science results,
  - Logistics/project management

Excess Capacity in Selected Investigations

- UAS Program reserves the right to utilize excess capacity in selected projects.
  - measurements, flight hours, sampling locations and/or times, etc. may be added to any project
  - additions coordinated with the PI, and negative impacts will be minimized.
  - costs associated with these additions will be covered by NOAA outside of the funding of any project selected as part of this solicitation.

Funding

- Obligated by September 30, 2012, with performance complete by September 30, 2013.
- $600K allocated for proposals (3-5 projects)
  - $300K maximum
  - 1-2 micro-awards of less than $50K each.

NOAA Unmanned Aircraft Systems Resources/Capabilities

John "JC" Coffey

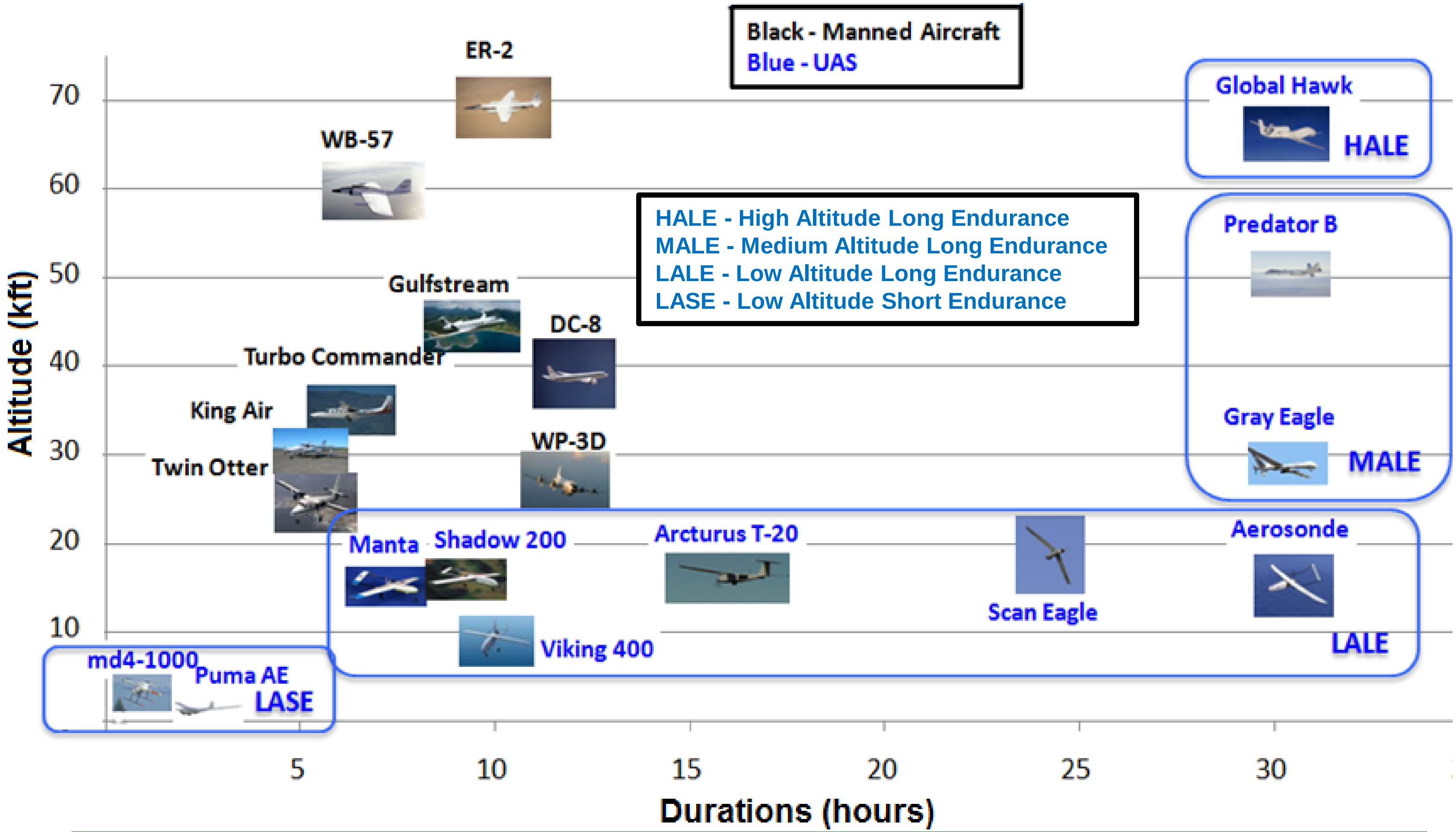
December 2011

Purpose and Outline

- **Purpose – Provide Overview of Unmanned Aircraft Systems available to NOAA Researchers**
- **Outline**
  - Manned and Unmanned Aircraft Capabilities/Fuel Usage
  - Global Hawk (NASA)
  - Ikhana (NASA)
  - Manta
  - Puma AE
  - md4-1000
  - APQ-16
  - SkyWisp
  - Emily

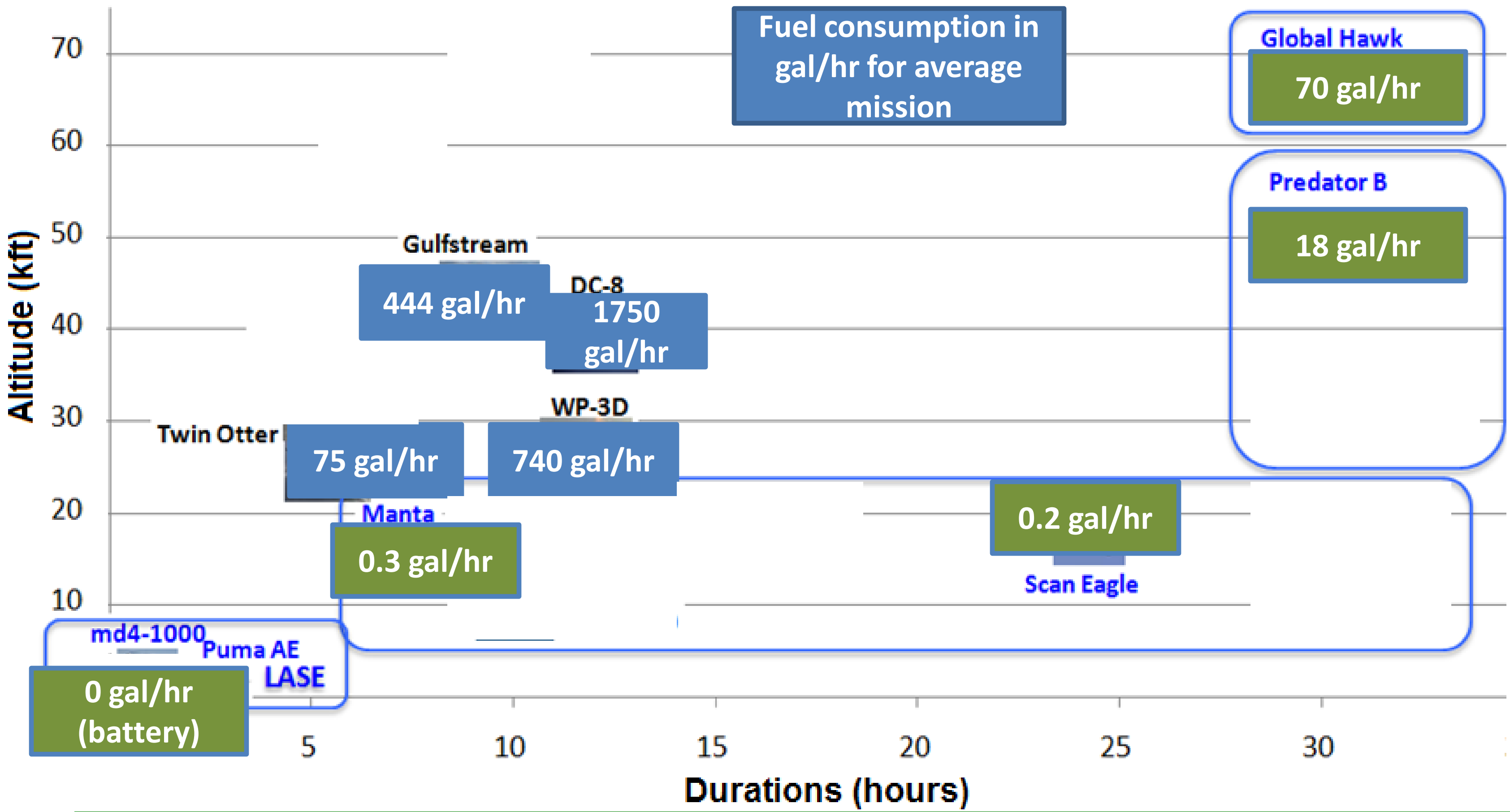
This solicitation will focus on the NOAA platforms

NOAA and NASA Manned and Unmanned Flight Capabilities



Dirty, Dull, Dangerous, Denied Missions… Cheaper & Greener

NOAA and NASA Manned and Unmanned Aircraft Fuel Consumption



Cheaper & Greener… Unmanned systems typically use 10% of the fuel

Global Hawk

- NOAA has partnered with NASA for joint use of the NASA Global Hawk (GH) UAS.
- The GH is built by Northrop Grumman. The NASA GH are initial production (Block 10) aircraft modified for high altitude long endurance (HALE) research missions.
- Currently, NASA has two operational GH with plans to stand up a third aircraft.
- The NASA GH capabilities are summarized in the Table below:

Parameter	Value
Payload	1,500 lb
Endurance	31 hours
Cruise Speed	335 knots
Range	11,000 nm
Ceiling	65,000 ft
Launch/Recovery	Conventional

Ikhana

- The NOAA /NASA partnership includes joint use of the NASA Ikhana UAS.
- The Ikhana was built by General Atomics and is an early version of the military Predator B. It has been modified for medium altitude long endurance (MALE) research missions.
- Currently, NASA has one operational aircraft.
- The NASA Ikhana capabilities are summarized in the Table below:

Parameter	Value
Payload	2,000 lb
Endurance	24 hours
Cruise Speed	200 knots
Range	4800 nm
Ceiling	40,000 ft
Launch/Recovery	Conventional

Manta

• The NOAA currently owns one Manta UAS that includes two aircraft.
• The Manta is built by BAE Systems.
• Currently has observation and carbon sampling sensors integrated.
•The NOAA Manta capabilities are summarized in the Table below:

Parameter	Value
Payload	15 lb
Endurance	8 hours
Cruise Speed	40 knots
Range	352 nm
Ceiling	16,000 ft
Launch/Recovery	Rail/Conventional

Puma AE

•The NOAA is currently in the process of procuring two Puma AE UAS through the Army PM UAS. Each UAS will include 3 aircraft and 2 GCS.

• The Puma AE is built by AeroVironment.

•The Puma AE is waterproof and can land in water making it compatible with ship launch and recovery.

• Gimbaled payload, 360 degree continuous pan, +10 to -90 degrees tilt, stabilized EO, IR camera, and IR Illuminator all in one modular payload.

•The Puma AE capabilities are summarized in the Table below:

Parameter	Value
Payload	2 lb
Endurance	2 hours
Cruise Speed	20-45 knots
LOS Range	8 nm
Ceiling	500 ft
Launch/Recovery	Hand/Deep Stall

md4-1000

- NOAA currently owns one md4-1000 UAS that consists of one aircraft and one GCS.
- The md4-1000 is built by Microdrones GmbH in Germany.
- The aircraft is a VTOL quadracopter.
- The NOAA md4-1000 capabilities are summarized in the Table below:

Parameter	Value
Payload	1.7 lb
Endurance	1.16 hours
Cruise Speed	29 knots
LOS Range	0.54 nm
Ceiling	3,280 ft
Launch/Recovery	Vertical/Vertical

APQ-16

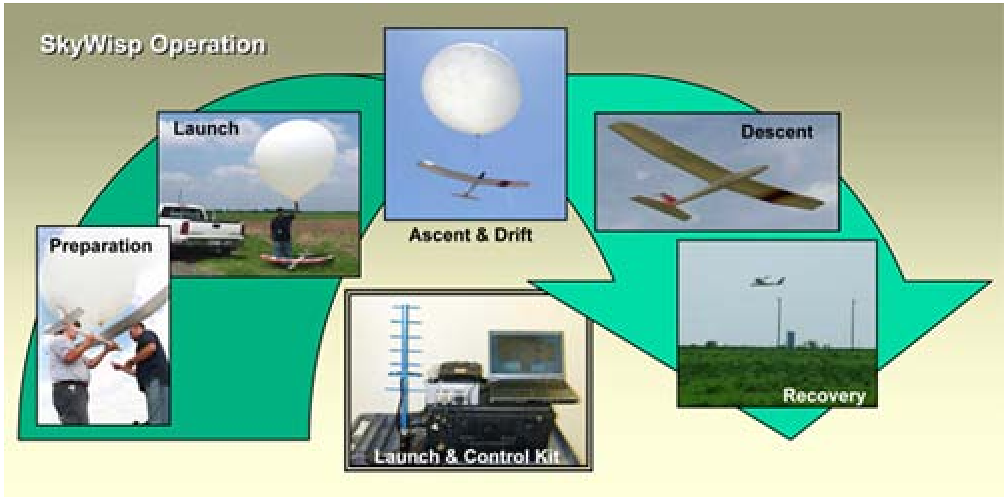
- NOAA currently owns one APQ-16 UAS that includes one aircraft and one GCS.
- The APQ-16 is built by Aerial Imaging Systems.
- The NOAA APQ-16 capabilities are summarized in the Table below:

Parameter	Value
Payload	1.1 lb
Endurance	0.5 hours
Cruise Speed	25 knots
LOS Range	6.3 nm
Ceiling	4,000 ft
Launch/Recovery	Vertical/Vertical

SkyWisp

• NOAA currently owns this system.
• The SkyWisp System was developed and built by Southwest Research Institute (SwRI).
•The NOAA SkyWisp capabilities are summarized as the listed below:

- ❖Operation to 100,000-feet altitude
- ❖Very low-cost balloon-assisted glider
- ❖Autonomous operation and recovery
- ❖1- or 2-person launch and forget
- ❖Continuous option for positive human control
- ❖Quick reaction capability
- ❖Low observables

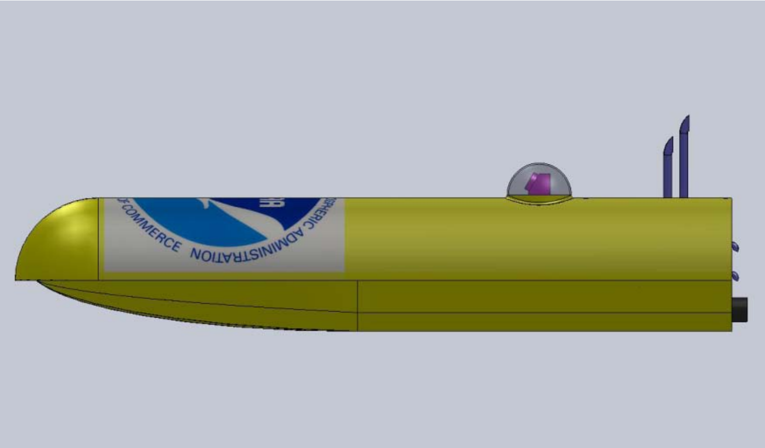


E.M.I.L.Y

• NOAA currently owns TBD Emergency Integrated Lifesaving Lanyard (E.M.I.L.Y) USVs.
• The Emily was developed and built by Hydronalix. Technology sub-systems will be demonstrated through a series of 3 missions:

1. Marine sanctuaries testing - Channel Islands
2. Coral mapping - Florida Keys
3. Tropical cyclone testing -Florida keys region

• Gas engine will increase endurance to 5 days at 2-3 knots.
•The NOAA Emily capabilities are summarized in the Table below:



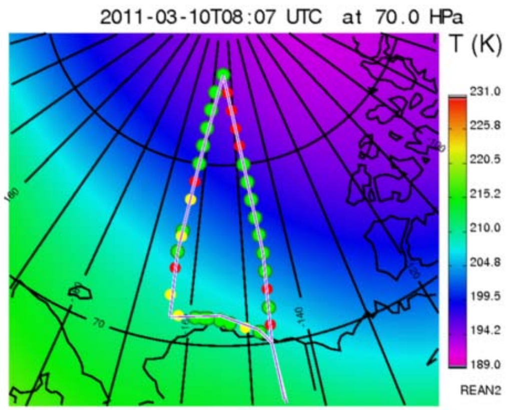
Parameter for 65” hull	Value
Tethered Buoy Sleep Mode	100+ hours
Battery Storage	240 Whrs to 1920Whrs (1 to 8 packs)
5mph patrol	600 minutes
Speed	13 mph with 46 lbs payload (max of 30 mph)
Duration	30 mph - 20 minutes
	13 mph - 39 minutes with 46 lbs
	1-2 mph - approximately 20 hours
Dimensions	65” length, 15” width, 8” height
Payload Capacity	Up to 80 lbs
Buoyancy	80.0 L (4882 $inch^3$) or 170 lbs

Turning Vision Into Reality

First NOAA Global Hawk Science Team preparing for Global Hawk Pacific (GloPac) experiment

Video of first Global Hawk dropsonde release

Video of first Global Hawk hurricane mission over Hurricane Earl



Flight track and dropsonde release locations of 10 February 2010 Global Hawk flight to the Arctic

Backup Slides

Backup Slides

Metrics for UAS Technology Assessment

Technology Readiness Level	Description
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TRL 8	System demonstration in an operational environment
TRL 9	System totally operational

NOAA UAS
Program Review Process

John “JC” Coffey

December 2011

System Engineering, Planning & Review…

The plan is nothing; the planning is everything.

Dwight Eisenhower

Plans are only good intentions

unless they immediately degenerate into hard work.

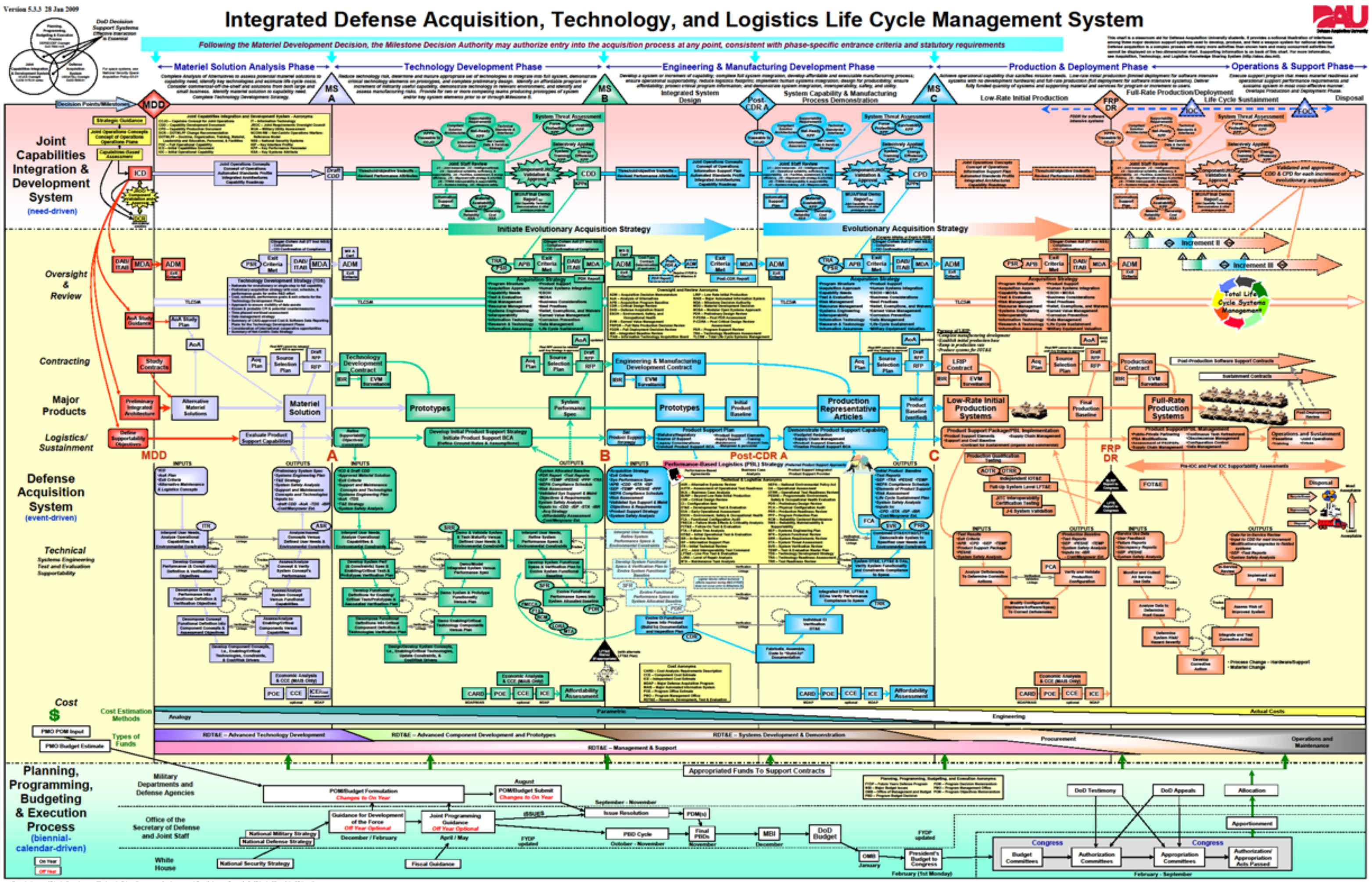
Peter Drucker, *Pioneering management guru (1909-2005)*

Introduction

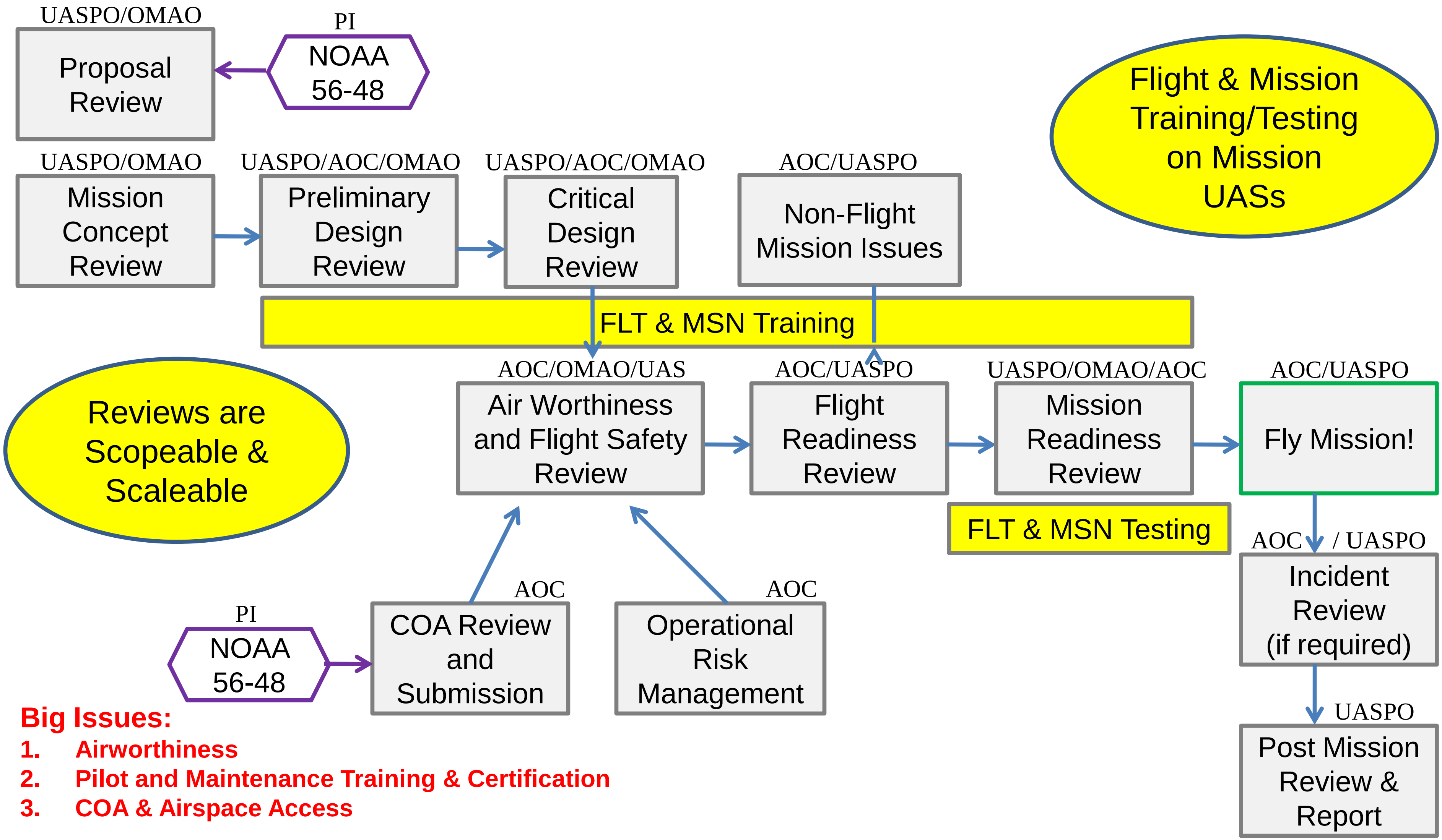
- NOAA UAS Program will follow a ***disciplined***, phased management approach designed to ***maximize*** effectiveness of the airworthiness, mission success, and science & technology (S&T) development of the project.

- Scopeable & Scaleable

NASA & DoD Reviews



NOAA UAS Project Reviews



Big Issues:

1. **Airworthiness**
2. **Pilot and Maintenance Training & Certification**
3. **COA & Airspace Access**

Technology and Manufacturing Readiness

Innovate, Incubate, Integrate…..

Identify Promising Technology	Optimizing Observing Strategies	Test and Optimizing CONOPS	Transition to Operations	OPERATIONS & SUPPORT

TRL 1	TRL 2	TRL 3	TRL 4	TRL 5	TRL 6	TRL 7	TRL 8	TRL 9	
Basic Principles Observed/ Reported	Technology Concept/ Application Formulated	Analytical/ Experimental Critical Function/ Characteristic Proof of Concept	Component And/or Breadboard Validation In a Laboratory Environment	Component And/or Breadboard Validation In a Relevant Environment	System/ Subsystem Model or Prototype Demo In a Relevant Environment	System Prototype Demo In an Operational Environment	Actual System Completed Qualified Through Test And Demonstration	Actual System "Mission Proven" Through Successful Operations	
		MRL 3	MRL 4	MRL 5	MRL 6	MRL 7	MRL 8	MRL 9	MRL 1O
		Manufacture Concepts Identified	Manufacture Processes Identified	Manufacture Concepts Developed Cost Drivers ID Subsystem Cost Goals Set	Critical Manufacture Processes Demonstrated Unit Cost Goal Set	Prototype Manufacture System Unit Cost Estimated and in range Of Goal	Process Maturity Demo Unit Cost Estimates Meet Goal	Manufacture Process Proven LRIP Actual Unit Cost Meet Goal	Lean Manufacturing Processes FRP Actual Unit Cost Meet Goal

Technology Readiness Levels

Defense Acquisition Guidebook para. 10.5.2

Manufacturing Readiness Levels

TriVector SERVICES INC.

Section 2366a of Title 10, United States Code, requires certification that: the technology in the program has been demonstrated in a relevant environment. [TRL 5 or TRL 6 ?]

S&T to Operations

RDT&E

S&T

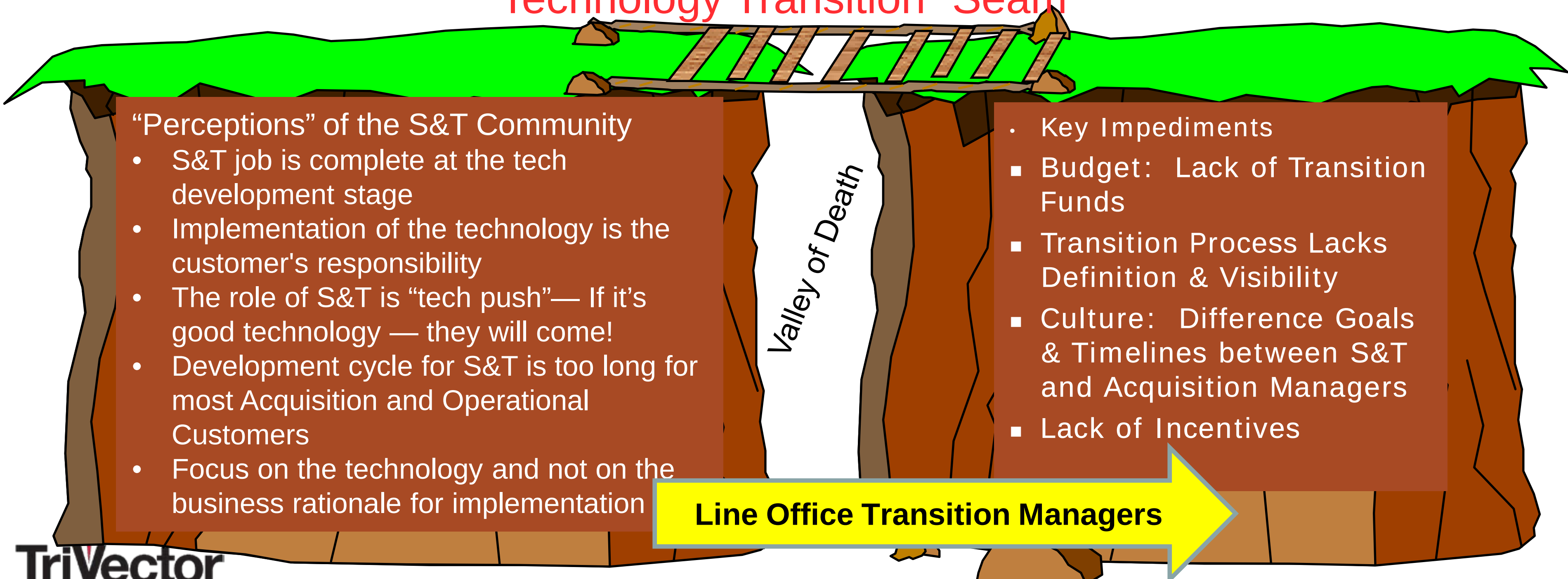
6.1 Basic Research	6.2 Applied Research	6.3 Adv Tech Dev	6.4 Adv Comp Dev & Prototype	6.5 Eng & Man Dev (EMD)	6.7 Op System Dev

Tech Base

Managed by Labs

Managed by Program Offices

Technology Transition “Seam”



“Perceptions” of the S&T Community

- S&T job is complete at the tech development stage
- Implementation of the technology is the customer's responsibility
- The role of S&T is “tech push”— If it’s good technology — they will come!
- Development cycle for S&T is too long for most Acquisition and Operational Customers
- Focus on the technology and not on the business rationale for implementation

- Key Impediments
- Budget: Lack of Transition Funds
- Transition Process Lacks Definition & Visibility
- Culture: Difference Goals & Timelines between S&T and Acquisition Managers
- Lack of Incentives

Line Office Transition Managers

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Summary

◆Projects funded by the NOAA UAS Program will follow a disciplined, phased management approach designed to maximize effectiveness of the airworthiness, mission success, and science & technology (S&T) development of the project.

◆Project reviews will be conducted in each phase of the project's life-cycle. This will reduce safety, mission & program risk!

◆The NOAA UAS Program Office and OMAO stand ready to support the project team in the implementation of these reviews, and ultimately enable the project team to succeed.

◆The NOAA UAS Program Director may waive requirements and combine reviews as appropriate for each project.

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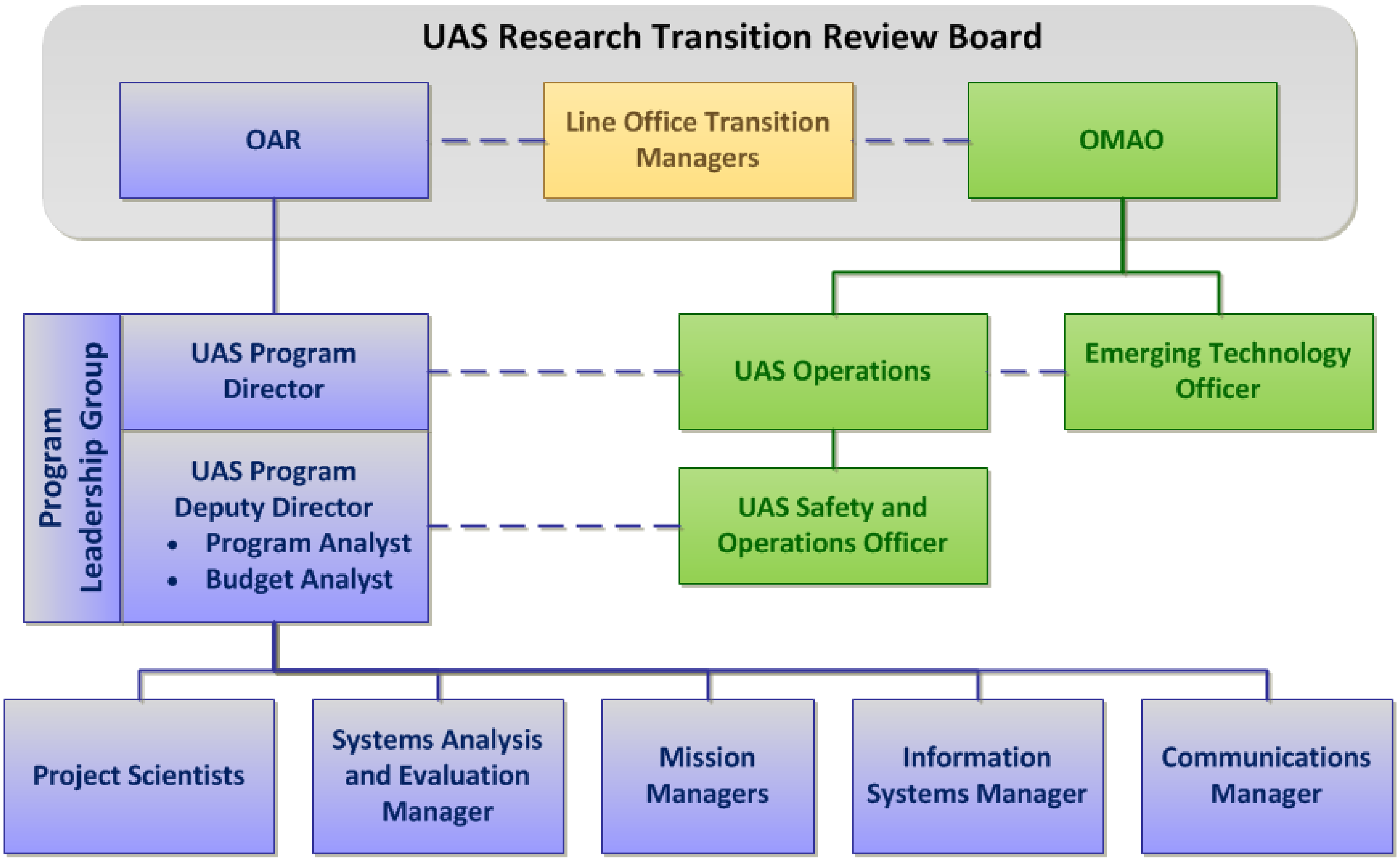
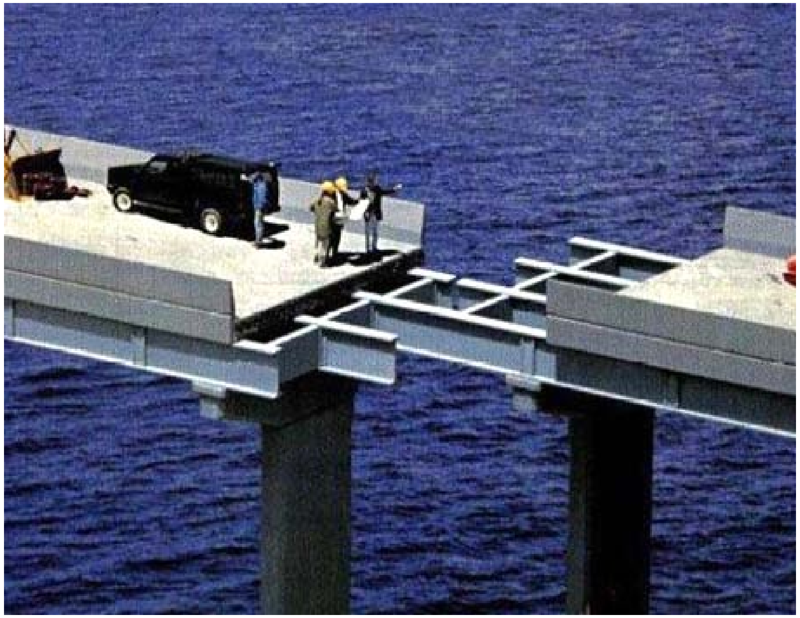
Backups

Research Transition Review Board



System Engineering & Reviews



We were so close!!!!!!!!

Proposal Preparation

- Proposals for UAS funded projects will contain the following:

1. Abstract description of the project objectives/benefits
2. Research to operations transition
3. Expected & traceable scientific and operational significance
4. Mission Plan describing the UAS platform; sensors; and CONOPS
5. Management Plan with cost; schedule; performance, risk and critical milestones/reviews
6. Data deliverables - systems; sets; and reports
7. Comparative technology

Project Reviews

Mission Concept Review (MCR)

- The MCR examines the proposed mission's objectives and the concept for meeting those objectives.
- Successful completion of the MCR results in approval to proceed with the detailed mission planning and authorization of funds.
- The MCR is held following receipt of the project proposal and typically occurs 18 to 24 months prior to the proposed mission flight campaign.

Preliminary Design Review (PDR)

- The PDR demonstrates that the preliminary design meets all system requirements with acceptable risk and within the cost and schedule constraints.
- It establishes the basis for proceeding with detailed design and shows that the correct design options have been selected, interfaces have been identified, and verification methods have been described.
- PDR typically occurs 9 to 18 months after the start of the project.
- Following successful completion of the PDR, approval is given to proceed with the detailed design and completion of the technology development/selection.

Project Reviews (Cont)

Critical Design Review (CDR)

- The CDR demonstrates that the maturity of the design is appropriate to support proceeding with full-scale fabrication, assembly, integration, and test.
- CDR determines that the technical effort is on track to complete the flight and ground system development and mission operations planning, and is meeting mission performance requirements within the identified cost and schedule constraints.
- The CDR typically occurs 6 to 9 months after the start of the project.

Airworthiness and Flight Safety Review (AFSR)

- The NOAA Aviation Safety Board (NASB) and OMAO will conduct the AFSR.
- The AFSR certifies the system is ready for flight and all safety issues have been addressed and adequately resolved.
- The AFSR typically occurs 3 to 6 months prior to the planned test flight date for the flight campaign.

Project Reviews (Cont)

Flight Readiness Review (FRR)

- The FRR examines tests, demonstrations, analyses, and audits that determine the system's readiness for safe and successful flight mission operations.
- It also ensures that all flight and ground hardware, software, personnel, and procedures are operationally ready for flight-testing.
- At the completion of the FRR, the system is approved for flight-testing.
- The FRR typically occurs 2 to 3 months prior to the planned test flight date for the mission flight campaign.

Mission Readiness Review (MRR)

- The MRR examines the actual system characteristics and operational procedures to ensure that all system and support (flight and ground) hardware, software, personnel, procedures, and user documentation accurately reflect the deployed state of the system.
- At the successful completion of the MRR, the system is approved for deployment and flight mission operations.
- The MRR typically occurs 1 month prior to the planned deployment date for the flight campaign.

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Project Reviews (Cont)

- **Post-Mission/Technology Assessment Review (PM/TAR)**
  - The PM/TAR is a post-mission evaluation of the performance of the system during flight operations and the initial science results.
  - The technology readiness of the instrument; platform; and integrated system is assessed.
  - Research & paper plan
  - The PMR/TAR typically occurs 1 to 3 months after the completion of the flight campaign.

- **Mission & Program Hand-Off**
  - Jump the "Valley of Death"

UAS Funded versus Unfunded Projects

- UAS Funded Projects
- Unfunded Projects

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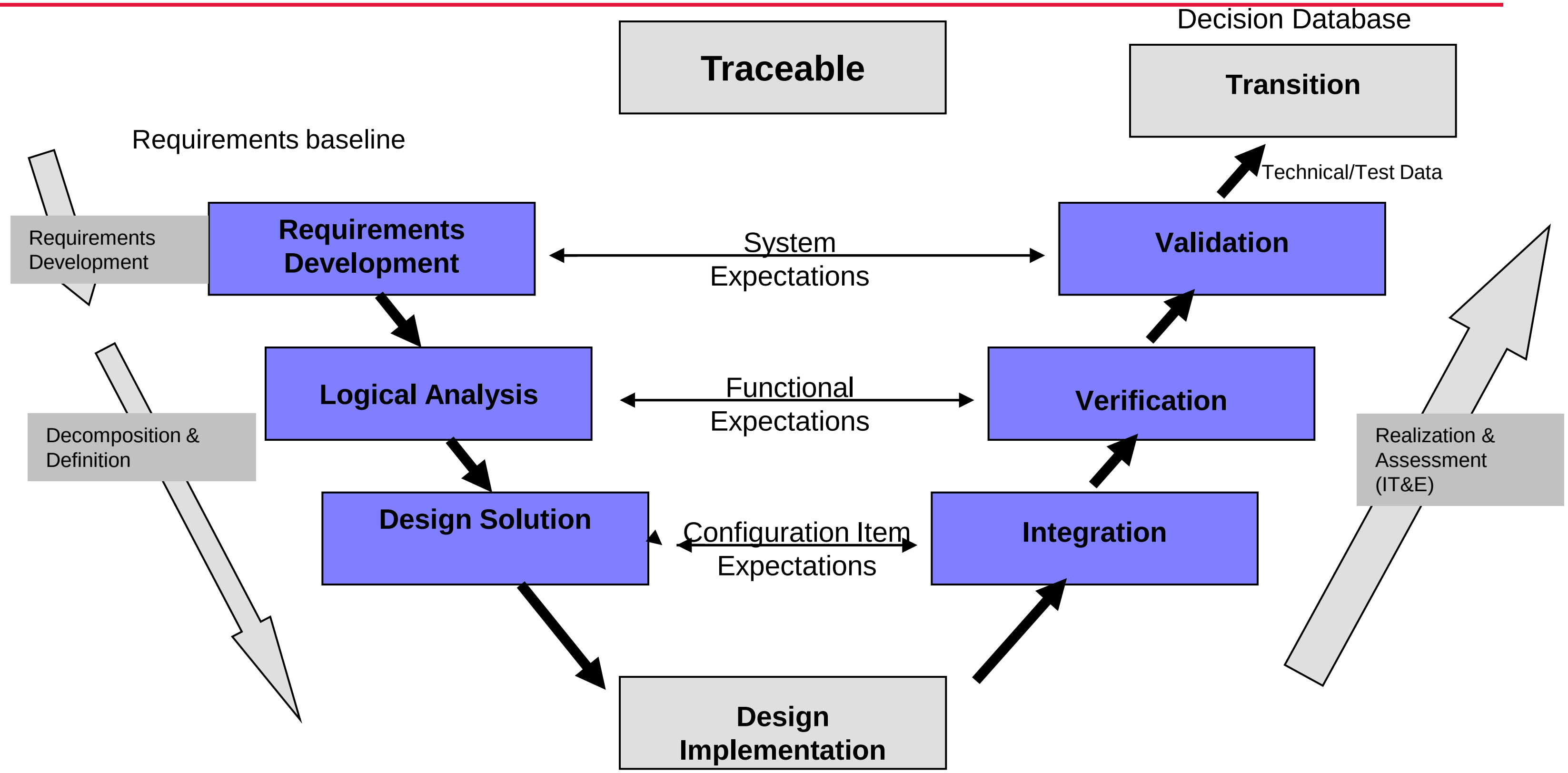
Systems Engineering “V” Model



The processes on the left-hand side of the “V” result in top-down development, definition, and documentation of the system and its constituent subsystems and components.

The processes on the right-hand side of the “V” result in system realization, assembly, and assessment against requirements from the bottom-up.

Requirements are traced throughout the “V” processes to ensure complete and balanced coverage from stakeholders’ input and derived requirements to the system and lower levels. On the left-hand side of the “V”, associated requirements are documented at each level of decomposition that will form the basis for assessment during the application of processes on the right-hand side of the “V.”

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