NOAA Unmanned Aircraft Systems (UAS) Program Activities

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NOAA UAS Program Strategic Vision and Goals

- ***Vision***
  - **UAS will revolutionize NOAA observing strategies 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**

Program Progress

Conducted UAS market survey and developed data base of UAS performance capabilities and costs

Developed UAS Analysis of Alternatives:

- ***High altitude long endurance – Global Hawk***
- ***Medium altitude long endurance – Predator or Ikhana***
- ***Low altitude long endurance – ScanEagle***
- ***Low altitude short endurance – Puma or Vertical Take Off and Landing (VTOL)***

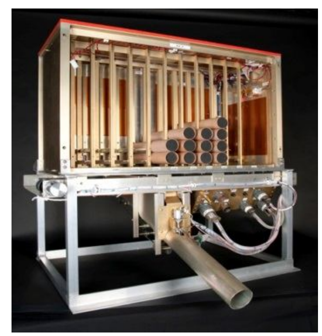
Developed technology review process for funded projects

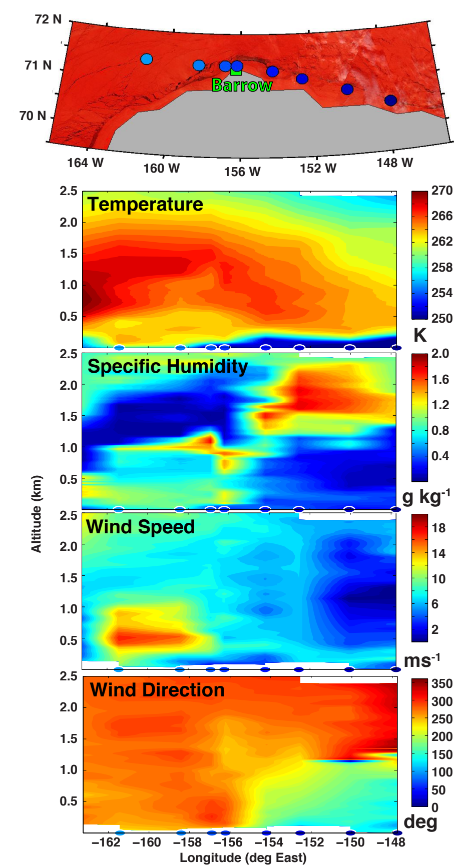
Supported operator training and initial concept of operations

High Impact Weather Monitoring

Key Accomplishments

- **Observations of oceanic weather systems in Atlantic, Arctic, and Pacific using NASA Global Hawk**
- **Development of Global Hawk dropsonde system with NSF**
- **Lower Mississippi River Forecast Center demonstration with Puma and**
- **Aircraft-launched UAS development through SBIR Phase I**
- **Development of Fire Weather UAS through NSF collaboration**
- **Development of EMILY unmanned surface marine vehicle**
- **Two peer-reviewed journal articles published in 2014**





Sensing Hazards Using Operational Unmanned Technology (SHOUT)

Overall Goal

- Demonstrate and test prototype UAS concept of operations that could be used to mitigate the risk of diminished high impact weather forecasts and warnings in the case of polar-orbiting satellite observing gaps

Objective 1

- Conduct data impact studies
  - Observing System Experiments (OSE) using data from UAS field missions
  - Observing System Simulation Experiments (OSSE) using simulated UAS data

Objective 2

- Evaluate cost and operational benefit through detailed analysis of life-cycle operational costs and constraints

SHOUT General Plan

FY14

- OSE with previous HS3 data underway
- OSSE with simulated data starting soon for Atlantic / Gulf of Mexico tropical cyclones and Pacific / Arctic weather systems
- 5 extra missions added to HS3
- NOAA aviation personnel supporting NASA and NOAA Global Hawk missions

FY15

- Continued OSE and OSSE studies
- 10 – 16 NOAA-dedicated Global Hawk missions
- NOAA aviation personnel supporting NASA and NOAA Global Hawk missions

FY16

- NOAA-dedicated Global Hawk missions and possible partnership with NASA Earth Venture experiment
- NOAA aviation personnel supporting NASA and NOAA Global Hawk missions
- Finalize data impact studies and analysis of cost and operational benefits

Polar Monitoring

Key Accomplishments

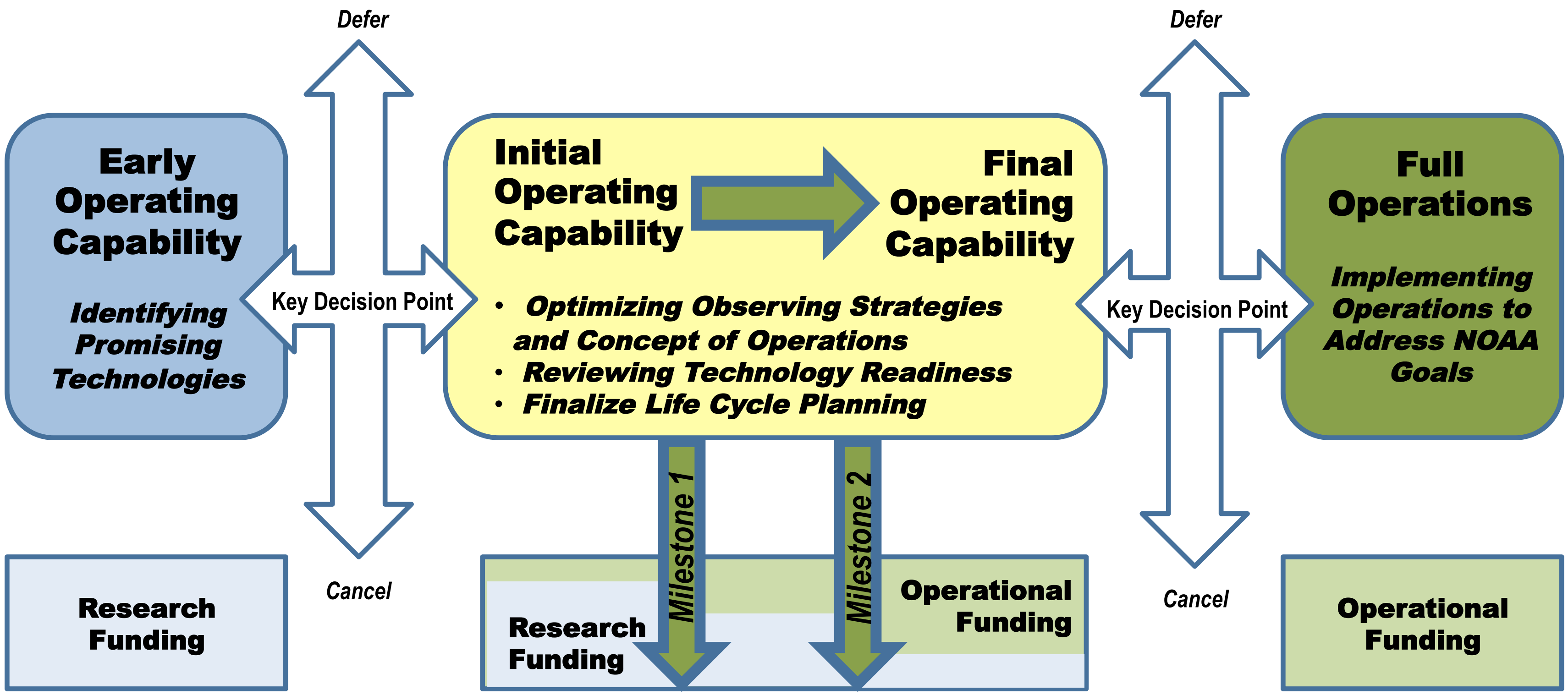
- Peer-reviewed journal article based on black carbon mission using Manta in Norway
- Deployment of three different UAS during Marginal Ice Zone Experiment in partnership with NASA
- Puma UAS deployed from US Coast Guard Healy Ice Cutter ship for marine awareness and oil spill detection
- Development of partnership with Conoco Philips for ScanEagle flights in the Arctic

Marine Monitoring

Key Accomplishments

- Acquisition and deployment of two Puma UAS
- Two years of Puma missions in partnership with National Marine Sanctuaries Program
- Development of Puma Transition Plan in collaboration with OMAO and NOS
- Demonstration of NASA Ikhana and observing capabilities for long distance monitoring of Hawaiian marine monument
- Development of medium altitude UAS observing capabilities for gravity measurements and coastal mapping through SBIR Phase II study

UAS Transition Process



Contact Information

UAS Web Site: http://uas.noaa.gov/

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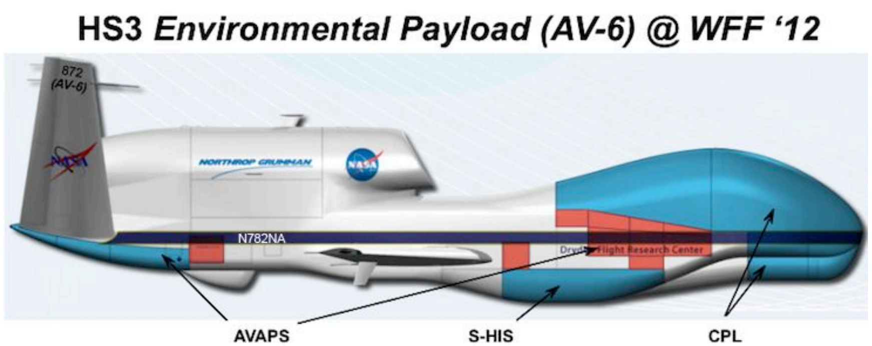
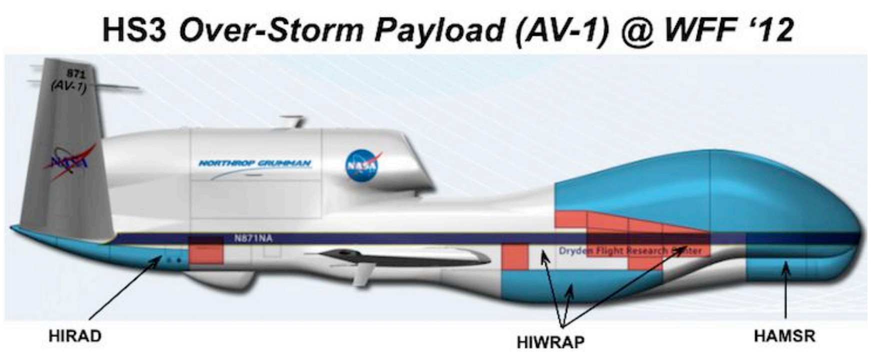
Backup Slides

Example of Weather Observations Being Collected During NASA Hurricane Severe Storm Sentinel (HS3) Experiment



Environment Observations

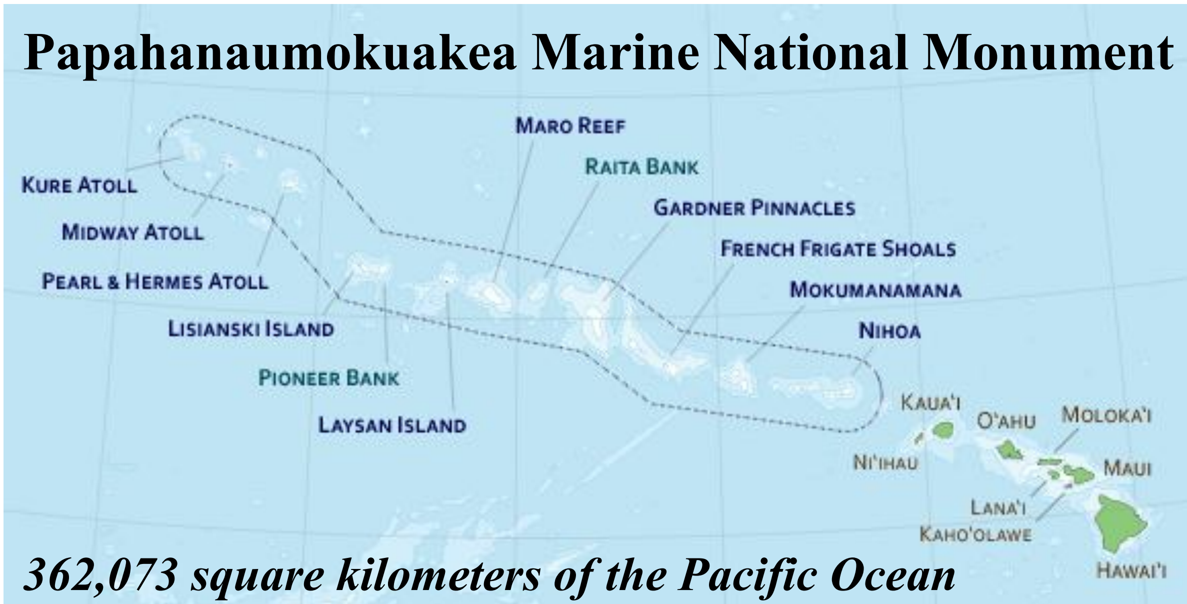
- **Profiles of temperature, humidity, wind, and pressure**
- **Cloud top height**
- **Cloud top temperature and profiles of temperature and humidity**



Over-storm Observations

- **Doppler velocity, horizontal winds, and ocean surface winds**
- **Profiles of temperature and humidity and total precipitable water**
- **Ocean surface winds and rain**

Hawaii Actitivies



NOAA PUMA

NASA IKHANA

GRAV-D Benefits From SBIR Program

- **Vast areas remain to be surveyed in remote regions that are difficult to access**
  - Aleutians, Pacific Islands
- **Survey blocks are outside the range of our usual aircraft (King Air) and would require very expensive P-3 survey**
  - Likely at least 50% cheaper with UAS
  - UAS much safer operation
- **SBIR program hastens our move to the superior TAGS System 6 sensor**
  - Relatively impervious to turbulence
  - Aurora will engineer this instrument onto their aircraft: we can use this effort to assist us in getting FAA/NAVAIR certification for this sensor