

AUTONOMOUS AERIAL OPERATIONS

Using Unmanned Aerial Vehicles for
Innovative Oceanographic Research

AUTONOMOUS AERIAL OPERATIONS

Team members and interest parties

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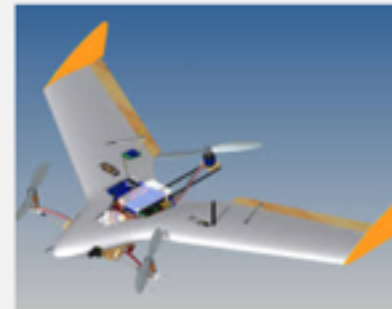
EMERGING UNMANNED AIRCRAFT SYSTEMS

- Unmanned Aerial Vehicles (UAVs) acquire high-resolution remote-sensing data at **lower cost** and increased **operational flexibility**.
- UAV are **not quadcopters**. UAV have fully autonomous flight capabilities.
- UAV offer a **safe, convenient, and low-disturbance** means of acquiring high-resolution imagery of aquatic environments.
- Spurred by growth in military applications, UAV technology is now **mainstream** and **affordable**.

EXAMPLE USES:

- AOSN and CANON-type joint experiments:
- Portugal 2014: AUVs and UAVs jointly measured surrounding ocean environment: current direction, speed, strength, temperature, water salinity and algal blooms.
- Scientists (2013) combined AUVs, UAVs, and ships to track marine animals and collect environmental data in real time.

VERTICAL TAKE OFF AND LANDING



1100 x 726 - deideworks.com

VERTICAL TAKE OFF AND LANDING



Payload Capability: 11 lbs 5 hours of flight time

VERTICAL TAKE OFF AND LANDING

A yellow FlexRotor aircraft is the central focus, standing on a grassy field. The aircraft has a vertical fuselage and long, thin wings. The word 'FLEXROTOR' is printed on the side of the fuselage. Two men are present: one on the left, partially visible, and another on the right wearing a black t-shirt, blue jeans, and large headphones, leaning forward towards the aircraft. The background consists of a dense line of green trees.

Max speed: 86 knots
Range at Max Speed: 500 miles
Max Range at 45 kt: **1800 nm**

**OVER 40 HOURS ENDURANCE IN WING-BORNE
FLIGHT WITH VTOL BASING**

FAA AND UNMANNED AERIAL VEHICLES

- June 21, 2016 FAA releases rules for commercial operations. Easing restrictions, citing **social benefits**.
- According to the FAA, UAVs for commercial purposes are expected to grow from 600,000 in 2016 to 2.7 million by 2020.
- A waiver will be required for flights beyond the visual line of sight.

BUSINESS

FAA's Drone Rules Break New Ground

The agency changes its economic calculus in taking a more flexible regulatory approach to



Rather than using traditional safety measures such as fewer anticipated accidents or incidents, the FAA focused this time on “social benefits” stemming from promoting growth of the fledgling unmanned aircraft industry while reducing compliance costs for companies and designated pilots.

By easing compliance, the FAA “essentially established one of the most flexible regulatory regimes” imaginable, according to Jim Williams, the agency’s former top drone official, who



A drone demon

By **ANDY PASZTOR**

June 24, 2016 6:32 p.m. ET

1 COMMENTS

UNOLS MEETING - TOMORROW

Tentative Agenda

**Scientific Committee for Oceanographic Aircraft Research (SCOAR)
CIRPAS Marina Airfield
3200 Imjin Road
Marina, California 93933
June 28-29, 2016**

1350 Manned and Unmanned Oceanographic Aircraft Development/ Operations at Institutions - (Non-NOAF):

- UAF UAV Operations – Ro Bailey (UAF) (15 min)
- WHOI Unmanned Aircraft Vehicle Operations – Report on WHOI UAV systems, operations, and planned activities – David Fisichella (15 min)
- UAS Activities at LDEO – Chris Zappa (15 min)
- Activities at Lone Star UAS FAA test site related to coastal mapping – Michael Starek (TAMUCC) (15 min)

1505 Manned and Unmanned Oceanographic Aircraft Development/ Operations at Institutions (Non-NOAF) *(continued)*:

- SOI's plans for UAS operations from R/V *Falkor*– Stian Alesandrini (SOI) (10 min)
- U. Miami Helicopter Operations – Roni Avissar (10 min)
- Duke Marine Lab's UAS facility – David Johnson (Duke U) (20 min)
- MBARI UAS program – Steve Haddock (5 min)
- Survey to identify which institutions have, or are interested in a UAS program - David Fisichella (15 min)

NOAA INCORPORATING UNMANNED AERIAL VEHICLES

- **Strait of Juan de Fuca, Washington** - Orca Whale Photogrammetry.
- Aerial photographs will be used to assess the body condition and nutritional status of Southern Resident killer whales.
- **Sandy Point, Bahamas** - Bahamas Beaked Whale
- Aerial images will assist in developing a baseline data set to determine the health of whales in a control population, not regularly disturbed by ship sonar.
- **Aleutian Islands, Alaska** - Aleutian Stellar Sea Lion
- The primary objective is to capture images to obtain counts of sea lions (pup and non-pups) to be used in modeling abundance trends.

Some Science Uses for Aerial Assets at MBARI

Biological Surveys

- HABs
- Jellyfish
- Whales (infrared)
- Sharks
- Otters
- Turtles
- Kelp
- Ocean color

Habitat Surveys

- Hyperspectral mapping
- Lidar
- Mercury in fog
- Physical parameters

Payloads

- Remote water sampling
- Data transfers for other assets

Reconnaissance

- Ship-launched surveys
- *Sargassum* patches



UNIQUE ADVANTAGES

- *Perspective*
- *Range*
- *Time-series*

PROJECT DELIVERABLES

- FAA Permit requirements
- MBNMS permit requirements
- Fish and Game requirements
- Insurance implications
- Pilots license requirements
- Partners identified in the community
- Science mission requirements that lead to a platform selection or specification.
- Labor impact to operate UAV
- Proposed operating plan for UAV operations to complete Proposed science missions
 - Frequency, range, duration, instruments