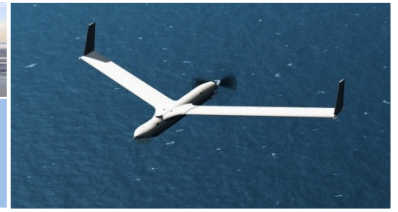
NAVY-NSF/UNOLS
Research Vessel Technical Enhancement Committee (RVTEC), Nov. 18-21, 2013
Texas A&M University, College Station, Texas



UNMANNED AIRCRAFT USE IN SHIPBOARD OCEANOGRAPHY 2012-2013

NAVY-NSF/UNOLS Scientific Committee on Oceanographic Aircraft Research (SCOAR)

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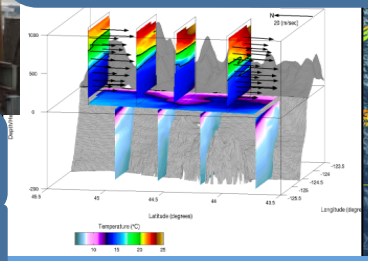
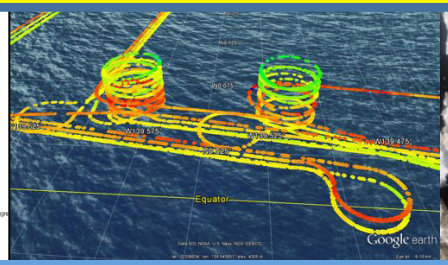
Abstract. Manned aircraft have been used in support of oceanographic studies since the 1930s. Recently unmanned aircraft systems (UAS) provide new opportunities as platforms for ocean studies. We review ongoing and potential uses for UAS in oceanography. Challenges for UAS use in marine science remain, including launch and recovery methods, data storage, analysis and archiving, and integration into ship science computer systems. ..

ScanEagle UAS launched from NOAA ship McARTHUR for marine mammal surveys.

Aerovel Flexrotor – 1st UAS launched and recovered from Autonomous Surface Vessel





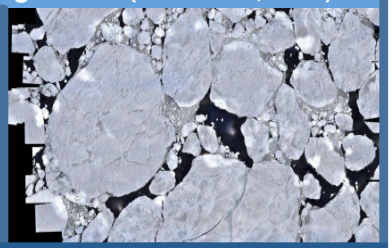
Left: UAS can complement ocean observatories by providing 3D wind data related to coastal upwelling (J. Bane, OSU). Center: UAS can provide vertical distributions of air-sea flux data over diurnal periods (K. Melville, SIO). Right: UAS can also be used for marine mammal distribution and population census over large areas (G. Walker, UAF).

Recent Activities. UAS have recently been used for: census of marine mammals; sea ice surveillance ; launch and recovery of AUVs in icy seas; detection of fronts and oil spills; air-sea flux studies; hurricane research, and coastal erosion . Significantly studies have shown use of multiple UAS, both stacked vertically, and also autonomously detecting and mapping ocean features.

Future Activities: Work is underway by the SCOAR Committee to develop safety standards for shipboard launch and recovery of UAS. This will permit the use of UAS for integration into ship and ocean observing systems..

Photos left and right: WHOI UAS deployment and result of Antarctic sea ice mapping.

Photos below (left to right) : NOAA PUMA UAS; RAVEN UAS icebreaker deployment; CGC HEALY imaged by NOAA PUMA ; recovery & launch of FLYING FISH UAS for marine debris studies



Data & Sensor Priorities:

UAS: Differential GPS, Inertial navigation, altitude, attitude, heading, true airspeed, speed & course over ground, climb rate, distance above surface.

Atmosphere: Temperature, Pressure,Humidity, Wind speed and direction; Turbulence; Liquid water; Aerosol; Trace gases, (CO_2, SO_2, others); Radiation; SST;SSSalinity; Visible, IR, UV & hyperspectral imaging, digital video, Visible spectrometry,
Wave height, Bathymetry, Scanning RADAR and LIDAR,

Deployable Sensors: Dropwindsonde, AXBT, AXCTD, AXCP, sonobuoys, Argo/other floats.

Summary & Recommendations: Development and UNOLS Council approval of UAS ship operational safety standards remain before broad shipboard use of UAS is possible. UAS video data ingestion, archiving & availability on ship computers remain issues to be resolved. Experiments with multiple UAS and integration of UAS with AUVs/ASVs holds great potential.