

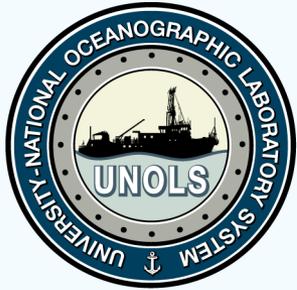


Policies, guidance and training for aircraft operations

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Scripps Institution of Oceanography

August 17 2017





UAS Policy (endorsed by the UNOLS Council in summer 2016):

With the recent publication of the FAA small UAS rule, a policy for UNOLS ships has become necessary. Effective immediately, operation of Unmanned Aircraft Systems (UAS), or drones, from or over UNOLS ships may not take place without demonstrated compliance with national or international regulations (ICSA, FAA) and specific approval of the ship's captain or designee, as a minimum. This applies to crew, techs and members of the science party, and refers to all operations, whether recreational, educational, or professional. Obtaining national approvals, such as FAA's Sec 333 exemption or Certificate of Authority or Waiver (COA), as well as pilot qualifications, are not a guarantee the operations will be approved by the ship's captain. Recreational or hobbyist freedom of use over land is not available at sea, so the importance of contacting the ship's operator ahead of time is critical. Detailed policies and processes are in development by SCOAR to provide guidance and training.



Goals: Develop UAS Policy and guidance documents for Shipboard Operations on UNOLS ships

leveraging existing and on-going efforts by NSF, NOAA, USCG

Members:

Luc Lenain (SIO, UNOLS SCOAR Chair)

David Johnston (Duke)

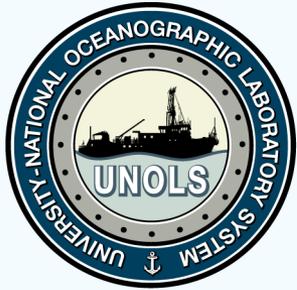
David Fisichella (WHOI)

Jeff Garrett (RVOC Safety Committee Chair)

Steve Hartz (UAF)

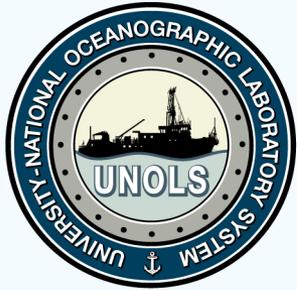
Tim McGovern (NSF)

JC Coffey (NOAA)



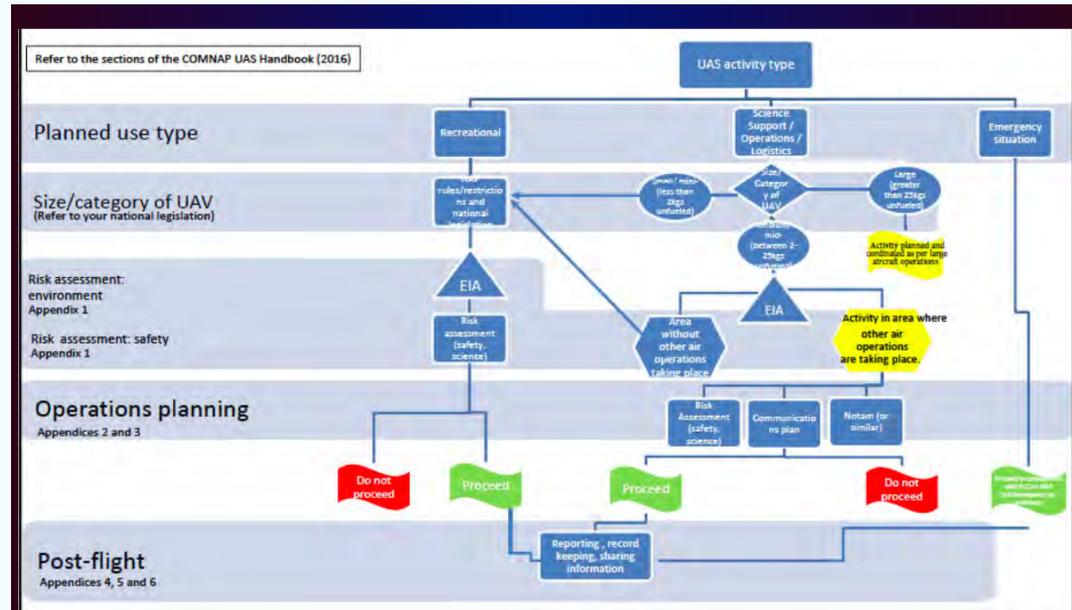
In the process of

- Compiling guidance documents and information to the research community who are interested in using airborne assets in support of their research (e.g. FAA POC per region, aircraft operators with contact information, recent field deployments summary with POCs etc.)
- Developing pilot training for UAS operations from ships
- Draft guidance document (handbook) for PIs who are planning UAS operations from ships
- Discussing policy on use of UAS for non-research purposes from ships



1 - Develop guidelines on how to implement UAS policies based on NSF/USAP procedures.

COMNAP UAS Manual – Decision Flow Chart



This includes the creation of a ship operator/PI handbook, to identify and manage risks associated with ship-based UAS operations and to develop guidelines to mitigate those risks. The document itself is a living document, as UAS technology and regulations evolve.



Important aspects included in the handbook

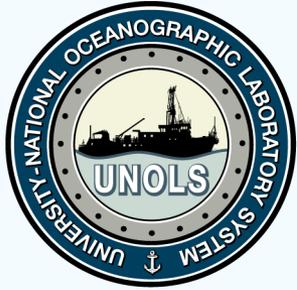
- 2 – Educate operators and scientists about regulatory restrictions (e.g. Section 333, Part 107 exemptions, pilot certification)
- 3 - Identify institutional approval processes (e.g. UC now requires internal approval, to demonstrate FAA rule compliance and requiring to file a flight plan prior to each event for all UC operators and UC owned platforms)



- 4 – stress the importance of flight clearance in the planned operation area.

Many areas of the coastal waters are in Navy restricted areas where the airspace is controlled from the **surface and up** (Navy range clearance and coordination required)

On the left figure, all areas with the blue boundaries are controlled down to the surface.

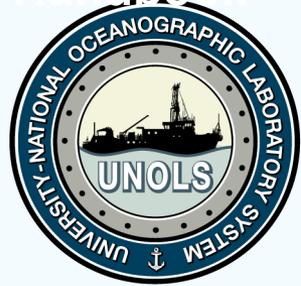


5 – Develop for future science users examples of how UAS have been used from ships in the past.

A list of Points of Contacts (POCs) of groups/people experienced in UAS operations from ships would also be useful; such as ship operators with UAS operation experience, as well as, experienced UAS operators.

This last point motivated the UNOLS survey sent to ship earlier this year

Unmanned Aerial Systems (UAS) Operations from UNOLS Ships: Operator's Handbook



Status: First draft completed, will be sent this week to the SCOAR Subcommittee on UAS Shipboard Operations for review.

UNOLS SCOAR

Rev 1.2

Unmanned Aerial Systems (UAS) Operations from UNOLS Ships: Operator's Handbook

Revision

Rev 1.0: June 21 2017, by Luc Lenain

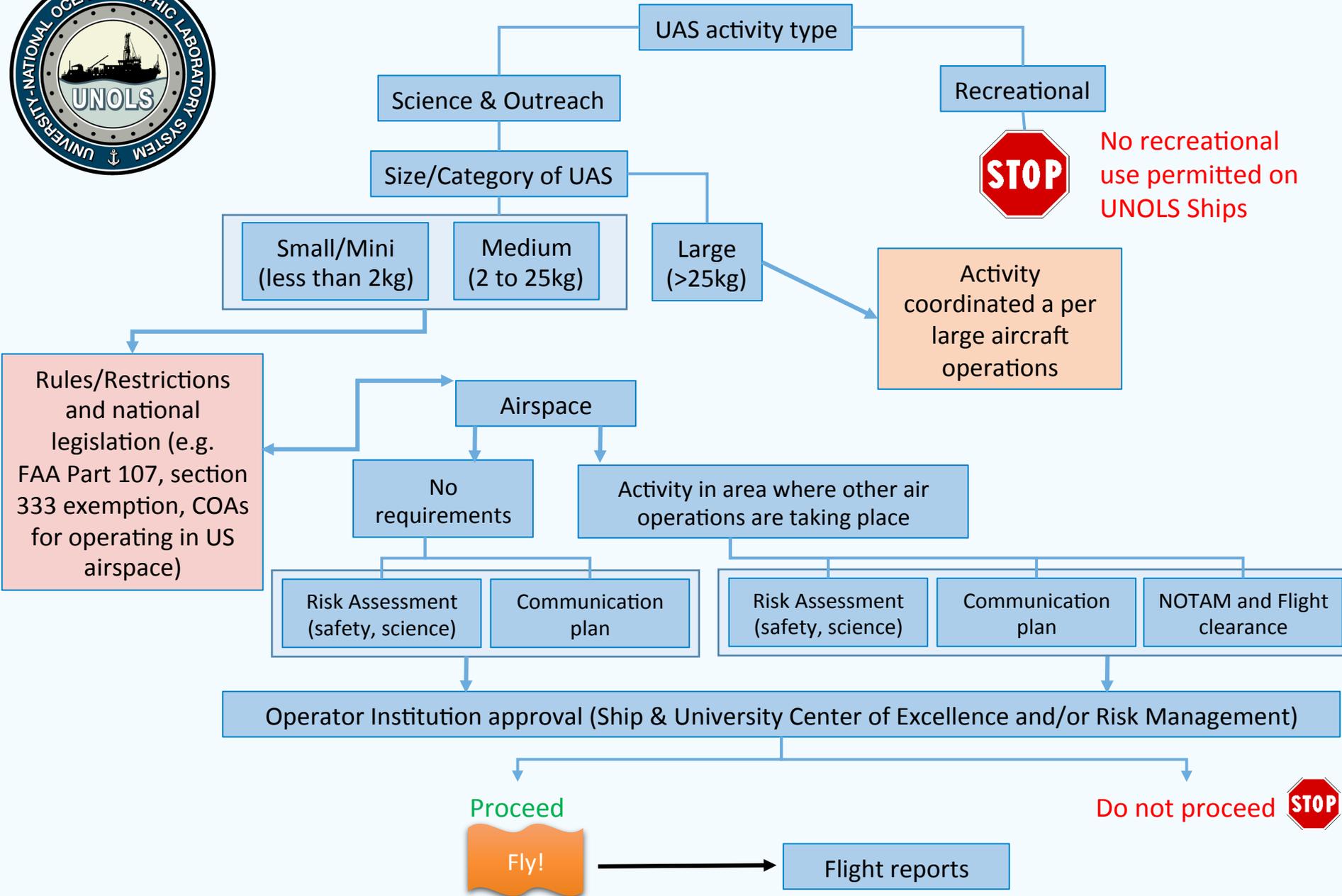
Rev 1.1: August 1 2017, by Luc Lenain

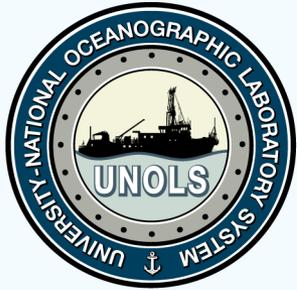
Rev 1.2: August 15 2017, by Luc Lenain

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Flowchart for decision-making (to be revised/completed!)





UAS use on UNOLS Vessels

(Message to Marine Superintendents on March 10th 2017)

Dear Marine Superintendents,

The use of Unmanned Aerial Systems (UAS) from UNOLS vessels will continue to increase over the coming years. In response, the SCOAR UAS Subcommittee is working to draft guidance documents for carrying out UAS operations from UNOLS ships. The documents will be a useful resource for both UAS science users as well as ship operators.

Last year we conducted a survey on the UAS operations from UNOLS vessels to better understand the needs of the research community. The survey results were very helpful and we thank you for your response. We would like to once again conduct a survey of UAS operations from your ship(s) that took place in the calendar year 2016 through March 2017. The information of interest is:

- Cruise dates
- Project title/description/PI name
- Vehicles used and operators (i.e. University vs. commercial provider)
- Brief summary of cruise research accomplishments/highlights (if known)
- Were there any operational or logistic challenges encountered

Luc Lenain, SCOAR chair, will make a presentation at the RVOC meeting in April to describe this activity in more detail.

Your feedback is greatly appreciated and requested by **Tuesday, April 3rd**. Please reply to Annette at office@unols.org. **Thank you.**

Regards,

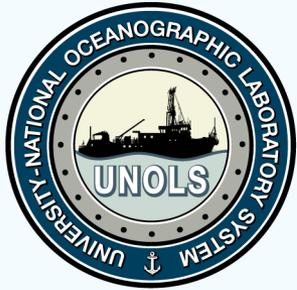
Luc Lenain, SCOAR Chair and Annette DeSilva



UAS use on UNOLS Vessels

(Table includes feedback from 2016 and 2017 data calls)

	Cruises with UAS Operations		
	2015 and earlier	2016	2017
KNORR	2006 and 2013	N/A	N/A
ATLANTIS	0	1	0
R. REVELLE	0	0	0
LANGSETH	0	0	
T.G. THOMPSON	0	0	0
SIKULIAQ	2 cruises in 2015	1	1
ARMSTRONG	N/A	Multiple	0
SALLY RIDE	N/A	1	0
KILO MOANA			
ENDEAVOR	0	0	0
OCEANUS			
ATLANTIC EXPLORER	0	0	0
HUGH R. SHARP	0	0	0
PELICAN			
WALTON SMITH	1 cruise in 2015	1	0
R. SPROUL -	0	1	0
SAVANNAH	0	0	0
BARNES	0	0	0
BLUE HERON	0	0	0
FLIP	-	-	1



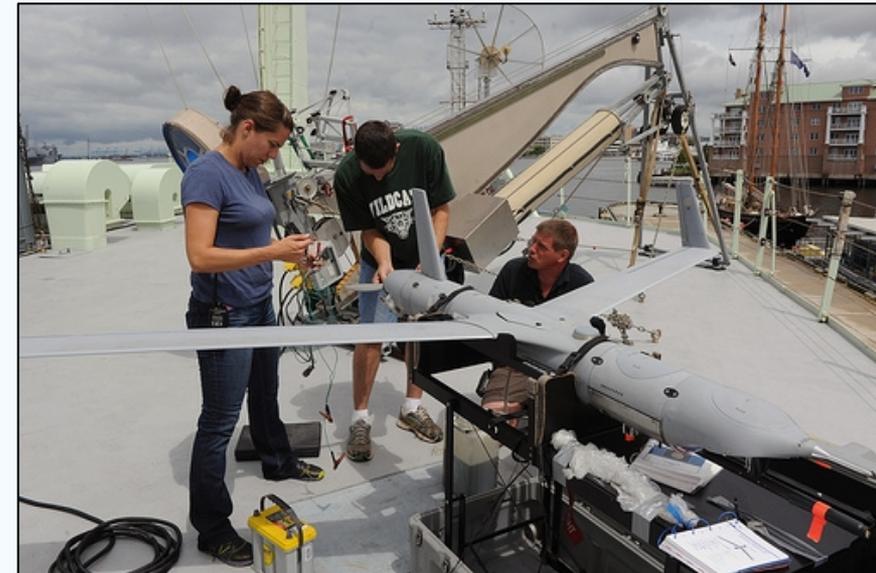
R/V Knorr

July 13 - 18, 2013

- 2013 Voyage KN211-02 "Trident Warrior":
- 50 Scan-Eagle UAV. See Images.
- Ch Scientist: Luc Lenain
- Multiple PIs
- <http://www.whoi.edu/cruiseplanning/synopsis.do?id=2162>
- <http://phys.org/news/2013-07-navy-uavs-radar.html>

Aug 23 to Sept 7, 2006

- 2006 Voyage KN185: SW-06
- Ch Sci: Bill Hodgkiss
- http://www.marine.whoi.edu/kn_synop.nsf/c2546b63c9e7f67985256291004e52e9/a6e80d6b8631326585257145006ba0bd?OpenDocument

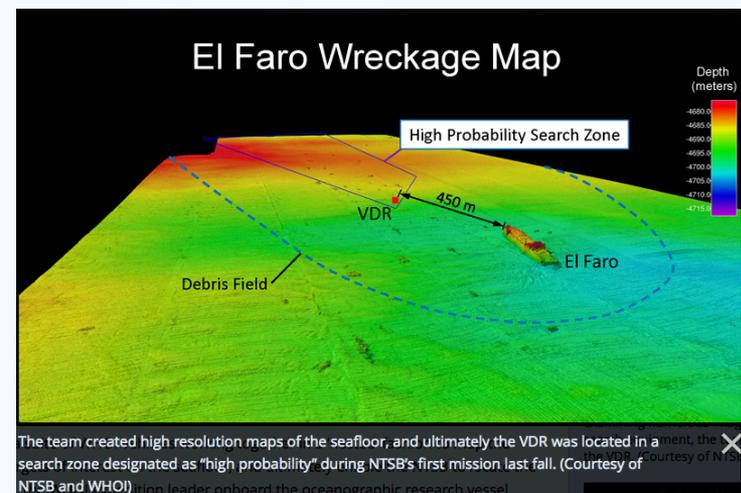




R/V Atlantis – 2016 UAS Operations

Cruise dates: 17 April through 5 May 2016

- NTSB Voyage to find the Voyage Data Recorder (VDR) from the lost Container Ship El Faro.
- The PI was an NTSB investigator Morgan Turrell.
- The UAS brought on board by NTSB and operated by Daniel Cojanu (from Under Current Productions) and/or Greg Kurras (from Seafloor Investigations, LLC) assisting.
- The UAS was used to overfly the area and take video of the operations. Some of the footage was presented on a 60 Minutes piece on CBS about the search and recovery of the El Faro VDR.
- All went very well. No issues.





R/V *Sikuliaq* – 2015 UAS Operations

July 9th – 14th 2015

- Magnetotelluric and Seismic Investigations of Arc Melt Generation, Deliver and Storage Beneath Okmok Volcano (NSF-1456710), Kerry Key,
- -DJI Phantom (PI provided)
- -Outreach

Oct 1st - November 10th 2015

- Sea State DRI, Shipboard and buoy measurements in the Beaufort and Chukchi seas during fall 2015 as part of large collaborative ONR Department Research Initiative (DRI). James Thomson, UW-APL
- DJI S1000, DJI Phantom, FX-61 Zeta flying wing, University of Tasmania's and WHOI
- Science and Outreach



R/V *Sikuliaq* – 2016 and 2017

UAS Operations

Cruise dates - June 13th - 25th – 2016

- ONC/Neptune Canada Maintenance - Ian Kulin (PI)
- Vehicle used: Core 3DR Solo
- Outreach operations with UAS
- No operational or logistic challenges encountered

Cruise dates - 19 Jan - 15 Feb – 2017

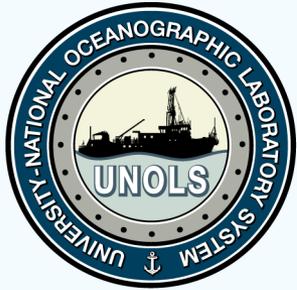
- Metabolic Index/sub - mesoscale and O₂ respiration study - Brad Seibel (PI)
- Vehicle used - Phantom Quad
- Outreach operations with UAS
- No operational or logistic challenges encountered. A Professional videographer worked with ACUSAI (UAF)



R/V *Armstrong* - 2016

Armstrong routinely used the Captain's UAS for all sorts of operations after leaving the shipyard in 2016:

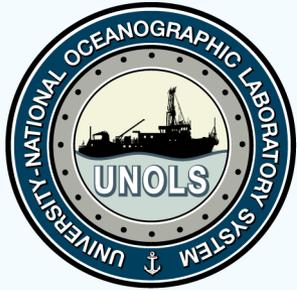
- Aerial footage of the Ex-Knorr/Armstrong rendezvous at sea
- Used to document proof that the OC AGORS have a dynamic trim by the bow.
- The footage from the vehicle documented that when the ship is trim at the same draft fore and aft that once moving, the ship nose dives and goes down approximately 10" by the bow.
- Unfortunately, it was extended beyond its battery life on one deployment and never returned. It has not as yet been replaced.



R/V *Sally Ride* - 2016

Cruise Dates: December 8-9, 2016

- PI: Sophia Merrifield
- Science Verification cruise for UAS
- Vehicles Used: Planck Aerosystem 650mm and 450mm quadcopter, SIO CORDC Tethered Fotokite UAV, and Autonomous Kayak
- University and Commercial Operators
- The objectives for this cruise were to deploy unmanned systems (aerial and marine vehicles) and interrogate the ability of the R/V Sally Ride to support these operations. Deployments were executed from the bow, stern, and from the small boat (work skiff) while the boat was in DP and moving.
- There was excellent communication between the science party and the crew. Safety was discussed prior to all operations.
- The unique nature of aerial vehicles presents new challenges for safety standards onboard vessels.



R/V *Walton Smith*

Cruise Dates: January 15 to February 15, 2016

- LASER (LAgrangian Submesoscale ExpeRiment) Expedition
- PI: Tamay Ozgokmen, UM/RSMAS
- Funding Agency: GOMRI
- Summary of Field Work: Study of sub-mesoscale feature in the GOM (Desoto Canyon area). Lagrangian experiment looking at Hydrocarbon transport using a combination of lagrangian drifters and shipboard instruments.
- Aerial Vehicles Used: midsize aerostat and quad copter
- LASER website: <http://carthe.org/laser/>



Photo credit Dan Carlston



R/V *Sproul*- 2016

Cruise Dates: July 20-25, 2016

- PI: Eric Terrill
- Engineering cruise, Observations of Langmuir Cells: Waves, Mixing, Bubbles
- Vehicles Used: SIO CORDC Tethered Fotokite UAV
- University Operator
- Testing of tethered quadcopter operations.
- UAS was a late addition after Pre-Cruise planning meeting. Some uncertainty over classification of tethered vehicle. Quadcopter did not work well, all operations were conducted safely.



FLIP - 2017

Cruise Dates: January 17 – February 1, 2017

- PI: Matthew Stowe
- Photo ops specific to instrument testing
- Vehicles Used: 3DR Solo
- University Operator
- Several flights were conducted to document instrument testing