UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NOAA Marine and Aviation Operations
Marine Operations Center
439 W. York Street
Norfolk, VA 23510-1114

APR 26 2013

MEMORANDUM FOR: Lieutenant Commander Nicholas Chrobak, NOAA
Commanding Officer, NOAA Ship *Nancy Foster*

FROM: Captain Anita L. Lopez, NOAA
Commanding Officer, NOAA Marine Operations Center-Atlantic

SUBJECT: Project Instruction for NF-13-04
Spring Ichthyoplankton Survey

Attached is the final Project Instruction for NF-13-04, Spring Ichthyoplankton Survey, which is scheduled aboard NOAA Ship *Nancy Foster* during the period of 26 April – 31 May, 2013. Acknowledge receipt of these instructions via e-mail to **OpsMgr.MOA@noaa.gov** at Marine Operations Center-Atlantic.

Attachment

cc:
MOA1

US Department of Commerce

National Marine Fisheries Service

75 Virginia Beach Dr.

Miami, FL 33149

Project Instructions

Date Submitted: 14 March 2013

Platform: NOAA Ship *Nancy Foster*

Cruise Number: NF-13-04 (NMFS)

APR 26 2013

Project Title: Spring Ichthyoplankton Survey

Cruise Dates: 26 April – 31 May 2013

BY DIRECTION

Prepared by: _____ Dated: 4/23/2013
John Lamkin
Chief Scientist
Southeast Fisheries Science Center

Approved by: _____ Dated: 4/23/13
Dr. James Bohnsack
Chief, Protected Resources and Biodiversity Division
Southeast Fisheries Science Center

Approved by: _____ Dated: 4-26-13
Dr. Bonnie Ponwith
Center Director
Southeast Fisheries Science Center

Approved by: _____ Dated: 26 APR 13
Captain Anita L. Lopez, NOAA
Commanding Officer
Marine Operations Center - Atlantic

Commanding Officer
NOAA Ship *Nancy Foster*

PROJECT INSTRUCTIONS
NOAA Ship *Nancy Foster* Cruise NF-13-04

I. Overview

A. Project Period: 26 April -31 May 2013

B. Operating Area: Entire Gulf of Mexico (Gulf) to a maximum sampling depth of 500 m and the western Caribbean including the Yucatan Channel. Bahamian waters will be sampled if unable to secure sampling permits from the Mexican Republic Government.

C. Summary of Objectives:

1. *Primary Objectives*

a. Directed sampling targeting potential bluefin tuna (*Thunnus thynnus*) and other tuna spawning areas in the waters of the western Caribbean Sea including the Republic of Mexico.
b. Assess the occurrence, abundance, and geographical distribution of the early life stages of spring spawning fishes, especially bluefin tuna, from mid-continental shelf to deep Gulf waters using a neuston frame fitted with a 0.505 mm net at stations in support of annual stock assessments.
c. Describe the pelagic habitat of fish larvae through measurements of various physical and biological parameters:
    i. Record profiles through the water column of temperature, salinity, fluorescence, dissolved oxygen, and turbidity using a CTD.
    ii. Measure chlorophyll a in replicate water samples taken at surface, mid, or maximum chlorophyll layer and near bottom (to a maximum of 500 m) depths using bench top fluorometry.
    iii. Detect and measure frontal features along the survey cruise track using data from the ship's Fluoro-thermosalinograph flow-through system (TSG) and the Acoustic Doppler Current Profiler (ADCP); and from daily satellite products (sea surface height, temperature and color) accessed through the ship's internet system or transmitted to the ship by email.

2. *Secondary Objectives*

a. Measure the vertical distribution of fish larvae by sampling at discrete depths in the water column at selected locations using a 1 m Multiple Opening and Closing Net Environmental Sensing System (MOCNESS).
b. Evaluate trophic pathways relative to the early life dynamics primarily of Atlantic bluefin tuna larvae with the use of stable isotope analysis of samples collected using a CALVET bongo net fitted with one 55 µm and one 20 µm mesh net.

D. Participating Institutions:

National Marine Fisheries Service- Miami Laboratory
University of South Florida
University of Miami, CIMAS
Instituto Nacional de Pesca (Mexico)
El Colegio de la Frontera Sur (Mexico)
Instituto Español de Oceanografía (Spain)

E. Personnel (Science Party)

See Appendix A for PUMA Scientific Party

Name	Title	Sex	Organization	Citizenship
LEG 1 (April 30 – May 10, 2013)				
Estrella Malca	Field Party Chief	F	CIMAS[1]	US
Trika Gerard	Fishery Biologist	F	NMFS	US
Aaron Maggied	Florida Bay OPS	M	OMAO	US
Barbara Muhling	Associate Scientist	F	CIMAS	US Res Alien/Australia
Jacob Barbaro	Casual Worker	M	CIMAS	US
Katherine Dale	Casual Worker	F	CIMAS	US
Sarah Privoznik	Research Associate	F	CIMAS	US
Kathryn Doering	Casual Worker	F	CIMAS	US
Luis Martinez Cruz	Fisheries Biologist	M	INAPESCA[2]	Mexico
Selene Morales	Fisheries Biologist	F	ECOSUR[3]	Mexico
Giraldo Alarcon	Director of Oceanography	M	SEMAR[6]	Mexico
Laura Carrillo Bibriezca	Physical Oceanographer	F	ECOSUR	Mexico
Maurice Estes		M	NASA[4]	US
LEG 2 (May 13 – 25, 2013)				
Estrella Malca	Field Party Chief	F	CIMAS	US
John Lamkin	Fisheries Biologist	M	NMFS	US
Raul Laiz	Fisheries Biologist	M	IEO[5]	Spain
Katie Davis	Fishery Biologist	F	NMFS	US
Katherine Dale	Casual Worker	F	CIMAS	US
Sarah Privoznik	Research Associate	F	CIMAS	US
Kathryn Doering	Casual Worker	F	CIMAS	US
Kenneth Cervera	Fisheries Biologist	M	INAPESCA[2]	Mexico
Felipe Eloy Sosa	Fisheries Biologist	M	ECOSUR[3]	Mexico
Selene Morales	Fisheries Biologist	F	ECOSUR	Mexico
Jacob Barbaro	Casual Worker	M	CIMAS	US

[1]Cooperative Institute for Marine and Atmospheric Studies
[2]Instituto Nacional de Pesca (México)
[3]El Colegio de la Frontera Sur (México)
[4]National Aeronautic and Space Administration
[5]Instituto Español de Oceanografía (Spain)

[6]Secretaria de Marina Armada de México

F. Administrative:

1. Points of Contact:

Florida Bay Operations Officer: LTJG Aaron D. Maggied; 75 Virginia Beach Dr. Miami, FL 33149; (305)361-4573 Aaron.Maggied@noaa.gov
Operations Officer: LT Joshua Slater; NOAA Ship *Nancy Foster*, 439 W. York St. Norfolk, VA, 23510; (843)991-6326; OPS.Nancy.Foster@noaa.gov

2. Diplomatic Clearances: This cruise involves Marine Scientific Research in waters under the jurisdiction of Mexico. Diplomatic clearance has been requested. If clearance is not received, adaptive sampling in Bahamian waters will be initiated (Table 2). Additional adaptive sampling based upon current oceanographic conditions will also be conducted where points of interest occur.

3. Licenses and Permits:

This cruise will be conducted under the following permits:

-Southeast NMFS Regional Permit,
-Marine Mammal Permit,
-Highly Migratory Species Permit
-Mexican Scientific Sampling Permit

II. Operations

A. Cruise Plan/Itinerary:

Itinerary:

Leg	Date	Location
Transit/PUMA OPS	April 26, 2013	Depart Charleston, SC
	April 29, 2013	Arrive Miami, FL
1	April 30, 2013	Depart Miami, FL
	May 10, 2013	Arrive Progresso, Mexico
2	May 13, 2013	Depart Progresso, Mexico
	May 25, 2013	Arrive Miami, FL
Transit	May 29, 2013	Depart Miami, FL
	May 31, 2013	Arrive Charleston, SC

B. Staging and Destaging: April 29-30, 2013; MIAMI
May 25-26, 2013; MIAMI

C. Operations to be conducted:

Operational Plans:

NOAA Ship *Nancy Foster* will depart Charleston, SC on April 26, 2013 to conduct the

spring ichthyoplankton survey with adaptive sampling protocol for larval bluefin tuna. The 31-day cruise will be divided into two legs (not counting the two 3DAS transits and PUMA operations): Leg 1, April 30-May 10, 11 DAS; Leg 2, May 13-25, 13 DAS. **It is requested that the small boat be deployed to pick up the visiting scientists from Cozumel at the beginning of Leg 1.**

This cruise will be conducted to test the relationship between several environmental parameters such as temperature/water mass, chlorophyll, salinity and larval tuna distributions. All legs will contain directed sampling: allowing stations to be targeted following communications with the Miami Laboratory using daily satellite imagery to locate fronts and eddies that can concentrate larvae. The cruise will target potential bluefin and other tuna spawning areas in the waters of the Gulf including the Republic of Mexico, if clearance is granted, or the Western Caribbean including Bahamian waters as an alternate sampling area. This will be a joint effort with Instituto Nacional de Pesca (INAPESCA) of Mexico, El Colegio de la Frontera Sur (ECOSUR) of Mexico, and the Instituto Español de Oceanografía (IEO) of Spain to extend bluefin sampling into this area. This research cruise will consist of transects across frontal systems identified by satellite analysis. These transects will be selected based upon daily imagery, both sea surface temperature (SST) and chlorophyll as available. The Miami Lab and the NASA's Earth System Science Biodiversity and Ecological Forecasting Team Research Project will provide the daily satellite analysis. Bluefin tuna do not spawn in waters less than 23° C and the locations of stations and transects will be dependent upon the location of this minimum SST. We expect these temperatures will be found south in the western Caribbean and along the Loop current. The Miami Lab will provide sampling location updates to the science party at least 2 times per day. This allows for both an adaptive sampling experimentation based upon frontal analysis, and a comprehensive survey to be completed. The stop at Cozumel will be made to pick up scientists at the beginning of leg 1.

Areas to be sampled are noted in Figure 1. However, the stations listed are **for reference only**. **Daily oceanographic conditions will dictate areas for operations.** Thus, there will be daily updates of sampling sites provided to the bridge. An example of the changing oceanographic conditions we wish to sample can be found at the **Naval Research Laboratory Global Ocean Analysis and Modeling website**

http://www7320.nrlssc.navy.mil/global_nlom/navo/GOM_nlomw12930doper.gif

Operations will begin with a CTD cast to 500 m, a 10 min, oscillating subsurface tow with a 505 µm neuston net, followed by a 10 min subsurface CALVET bongo tow (20 cm) at each station. MOCNESS tows will be conducted at select stations if 2 or more bluefin are found in the sample. MOCNESS tows will be taken from 50 m to the surface, in 10 m increments. If 10 or more bluefin are found in the subsurface tow, in addition to the MOCNESS, additional sampling sites will be created in a diamond pattern around the original station. These stations will be at a distance of 5 miles from the initial station. Traditional neuston (.950 mm) sampling will occur at the discretion of the FPC.

Cyclonic rings in the western Gulf have been shown to concentrate larvae. These physical features may be targeted (time permitting) as they are encountered. A blend of satellite products

(ROFFS) and ocean models will be used to delineate these features. Smaller scale features and large anti-cyclonic rings have also been found to concentrate bluefin larvae in the eastern Gulf. These features may be targets if time allows.

Ichthyoplankton operations will be conducted throughout the day and night. The survey will require 24 hour operations with two scientific watches: 0000-1200 and 1200-2400.

The FPC will need to access satellite imagery through the ship's internet system or through email downloads several times a day in order to monitor frontal boundaries between water masses. The TSG on the ship will also be used to monitor sea surface parameters that are characteristic of the fronts and to collect environmental surface data. Therefore, the Seapoint SCF fluorometer will need to be in working condition, If time permits, additional sampling may be conducted along these fronts using several gear types (nets, CTD, etc.).

Communication between the ichthyoplankton team and the bridge, while on station, will be accomplished via handheld radios. During rough weather, the watch leader, with consultation from the ship's crew, will determine if all sampling gear can be deployed safely. The FPC should be notified of any delays to sampling due to mechanical, medical, or weather issues, as well as any time a station location change occurs. We request to deploy the CTD (SBE 9/11 plus) and the SEACAT with a weight prior to arriving at the first station. This will allow for testing of the winches, hydraulics, CTD array, and SEACAT (SBE 19). Any problems can then be corrected prior to arriving on the first station.

STATION OPERATIONS

At the Bridge's 10 min warning, scientists and deck personnel will proceed to duty stations and prepare for station. Scientists and deck personnel should be ready and standing by for bridge's call that the ship is on station and ready to proceed.

Neuston Sampling

The neuston net is a 1 x 2 m frame outfitted with a 0.950 mm mesh net. Each neuston tow will be conducted for 10 min at a vessel speed of approximately 2 kt to keep half the frame (~0.5 m) submerged in the water. If necessary, the ship should steam forward in a wide arc to keep the neuston net (mouth opening) out of the influence of the prop wash. The duration of a neuston tow may be shortened up to 5 min when there are high concentrations of jellyfish, ctenophores, Sargassum, floating weed and/or debris. After retrieval, plankton is rinsed into the cod end with seawater while the net hangs over the side (if windy, the watch leader may request the net to be brought directly on board and rinsed on deck). Samples will be preserved in 95% ETOH initially and later transferred to new 95% ETOH after 24 h.

Oscillating Neuston Sampling or "Spanish Neuston"

A neuston net fitted with 0.505mm mesh net in line with the SBE 19 will be towed at the standard 2 kt speed while the gear is oscillated between the surface and a depth of 10 m. This evolution will occur for 10 min and observed by the scientific computing system (SCS) controller. After retrieval, plankton is rinsed into the cod end with seawater while the net hangs

over the side (if windy, the watch leader may request the net to be brought directly on board and rinsed on deck). Samples will be preserved in 95% ETOH initially and transferred to new 95% ETOH after 24 h.

CALVET/MiniBongo Sampling

A 20 cm bongo, fitted in line with the SBE 19, will be towed at the standard 2 kt speed while the gear is oscillated between the surface and a depth of 10 m. This evolution will occur for 10 min and observed by the SCS controller. After retrieval, plankton is rinsed into the cod end with seawater while the net hangs over the side (if windy, the watch leader may request the net to be brought directly on board and rinsed on deck). Samples will be preserved in 95% ETOH initially and transferred to new 95% ETOH after 24 h.

SEAMAP CTD Profiles

The CTD unit with the SBE 32 water carousel with 3 Niskin bottles will be deployed to just below the surface of the water at the discretion of the OOD. When at the surface, the lab scientist will start the CTD recording. The sampler must then remain submerged for 3 min at the surface for the temperature gauge to adjust to the water temperature after sitting on deck between stations. After the 3 min soak period it will be lowered to a depth of 200 m or 500 m (or as close to the bottom as deemed safe by the ship). After the cast, the CTD is carefully set on deck, taking care not to jar the sensitive electronics. We request the Electronics Technician periodically clear the Y-connections throughout the cruise. During each CTD profile, water samples will be collected at the surface, bottom (or max depth), and the in situ observed chlorophyll maximum. Survey tech will provide guidance to scientific party to conduct CTD casts and file processing if survey tech is unavailable to conduct the cast and process the files.

1 m MOCNESS Sampling

The MOCNESS will be deployed from the stern with the MOCNESS winch. Prior to deployment, the ship speed should be maintained at 2 kt. Once deployed, a series of 9 nets (0.505 mm mesh) can be opened independently at specific depths to obtain a discrete sample of that depth. Winch and ship speed will be manipulated by the watch leader through communication with the deck and bridge in order to filter a target volume of 250 m^3 for each net. After retrieval, samples will be rinsed into cod ends with seawater before bringing the MOCNESS on deck. Each oblique sample (surface to maximum depth) will be initially preserved in and transferred to 95% ETOH after 36 h. The remaining nets will be initially preserved in 95% ETOH and transferred to fresh 95% ETOH after 24 h.

Other Environmental Parameters

Environmental data will be collected at each designated ichthyoplankton station during daylight hours such as secchi disc depth and water color. The TSG will be in use 24 h/day.

Modifications to Field Operations

The FPC or watch leader may alter sampling protocol in order to optimize sampling for time conservation. The FPC may alter the project instructions in order to accomplish mission objectives, but will do so only after consulting with the Commanding Officer. If additional time becomes available during a leg, the FPC will provide the ship with further station locations at

that time, after consultation with the Commanding Officer.

D. Dive Plan: N/A

E. Applicable Restrictions: N/A

F. All oceanographic electronic gear (SBE9 and SBE19) must be deck tested by April 29, 2013. This includes primary and backup systems. The Electronic Technician will ensure that data is being properly recorded and that communications between the equipment and computers is being transmitted. **Spare slip rings will be on board and available as needed.** To increase available deck space, the removal of all boats except the Fast Rescue Boat is requested. Flow thru system will be cleaned and flushed a minimum of 2 days prior to sailing. The ADCP will be tested and data files sent to the FPC to ensure the correct data files are being collected. The FPC will be notified that testing has been completed and will be kept advised of any equipment failures.

III. Equipment

A. Equipment and Capabilities Provided by the Ship:

1. Because of the importance of the CTD equipment package to record environmental data and the need for the Scientific Computing System (SCS) to populate the Fishery Scientific Computing System (FSCS), an Electronics Technician is imperative.
2. Three dedicated winches are necessary for operations:
   a. Dedicated hydrographic winch with SBE9, conducting cable, and meter readout to accomplish CTD/bottle casts and bongo tows up to 500 m depth. Winch speed should be variable to include 50 m/min during pay-out and 20 m/min during haul back (for bongo tows). **Spare slip rings for each winch.** Fully functional wire readouts for each winch.
   b. Dedicated winch with conducting cable and meter readout to accomplish MOCNESS deployment and recovery though the A-frame.
   c. Dedicated winch and block with conducting cable for deploying neuston and bongo nets. SBE 19 should be fitted in line with the sampling gear to obtain accurate real-time depth measurements during net deployment.
3. ADCP
4. One (1) Primary SBE 9plus CTD configured as follows;

a. Unit should be mounted horizontally and mounted in the water sampling frame. The frame should be examined to ensure it is in good physical condition and there are no breaks present in any of the welds supporting the frame.

b. The standard 12 position SBE 32 Carousel should be properly mounted in the water sampler section of the frame and tested to ensure that all 12 bottle positions are working properly and respond to software requests for firing.

c. The internal Digiquartz pressure sensor should be in good working order and have a calibration/service date not to exceed 365 days.

d. The primary sensor suite should be installed and consist of the following (the sensors should have a calibration date as recent as possible, not to exceed 365 days):

i. One (1) SBE 3 Premium Temperature sensor
ii. One (1) SBE 4 Conductivity sensor
iii. One (1) SBE 43 Dissolved Oxygen sensor
iv. One (1) "Y" air bleeder valve. Valve should be checked to ensure it is not clogged.
v. Two (2) Seapoint SCF
vi. One (1) SBE 5T pump that has been checked by Seabird within the last 365 days for proper operation.
vii. Two (2) Seapoint Turbidity Sensors
viii. Proper plumbing. Tubing should be checked to ensure it meets Seabird's recommended method of plumbing and is free from cracks and holes.

e. The secondary sensor suite should be installed and consist of the following (the sensors should have a calibration date as recent as possible, not to exceed 365 days):

i. One (1) SBE 3 Premium Temperature sensor
ii. One (1) SBE 4 Conductivity sensor
iii. One (1) SBE 43 Dissolved Oxygen sensor
iv. One (1) "Y" air bleeder valve. Valve should be checked to ensure it is not clogged.
v. Two Seapoint Fluorometers
vi. One (1) SBE 5T pump that has been checked by Seabird within the last 365 days for proper operation.
vii. Proper plumbing. Tubing should be checked to ensure it meets Seabird's recommended method of plumbing and is free from cracks and holes.

f. The unit should be properly terminated and connected to a properly functioning SBE 11 Deck Unit. The deck unit should be connected to allow the following:

i. Proper control of the SBE Water Sampler Carousel via the SEASAVE application.
ii. Integration of a proper NMEA signal from a GPS unit.

5. A second SBE 9plus profiler must be available as well. Unit will be configured as a complete functioning ready-to-install on the sea cable unit; and will have the following components available:

a. Sensors for a Primary suite (with a calibration date as recent as possible, not to exceed 365 days):

i. One (1) SBE 3 Premium Temperature sensor
ii. One (1) SBE 4 Conductivity sensor
iii. One (1) SBE 43 Dissolved Oxygen sensor
iv. One (1) "Y" air bleeder valve. Valve should be checked to ensure it is not clogged.

v. One (1) Wetlabs Wetstar pumped fluorometer
vi. One (1) SBE 5T pump that has been checked by Seabird within the last 365 days for proper operation.
vii. One (1) Wetlabs C-Star transmissometer
viii. Proper plumbing. Tubing should be checked to ensure it meets Seabird's recommended method of plumbing and is free from cracks and holes.

b. Sensors for a complete Secondary suite (with a calibration date as recent as possible, not to exceed 365 days), if available:

i. One (1) SBE 3 Premium Temperature sensor
ii. One (1) SBE 4 Conductivity sensor
iii. One (1) SBE 43 Dissolved Oxygen sensor
iv. One (1) "Y" air bleeder valve. Valve should be checked to ensure it is not clogged.
v. One (1) Wetlabs Wetstar pumped fluorometer
vi. One (1) SBE 5T pump that has been checked by Seabird within the last 365 days for proper operation.
vii. One (1) Wetlabs C-Star transmissometer
viii. Proper plumbing. Tubing should be checked to ensure it meets Seabird's recommended method of plumbing and is free from cracks and holes.

6. Two (2) (if available) fully operational SBE 19 SEACAT profilers should be tested and available. One of the units should be installed on the sea cable. Both units should have calibration dates not to exceed 365 days.
7. One (1) functional SBE 36 Deck units should be available, 1 for backup.
8. One (1) PDIM units should be available for use with the SBE 19 units. One of these PDIM units should be installed on the primary SBE19 on the sea cable.
9. A fully functional SBE 21 thermosalinograph should be available for the survey. The unit should have calibrations that do not exceed 365 days. The calibration data must be verified/entered into the SEABIRD-TSB.CAL file in the Ship Directory of SCS.
10. It is highly desirable to have the following additional spare sensors on-board if possible:

a. One (1) SBE 43 DO Sensor
b. One (1) SBE 3 Temperature Sensor
c. One (1) SBE 4 Conductivity Sensor
d. One (1) Wetlabs Wetstar pumped fluorometer
e. One (1) Wetlabs C-Star Transmissometer
f. One (1) SBE 5T Pump

11. Copies of all calibration sheets for CTD profilers, TSG, and spare sensors should be provided to the laboratories' Shipboard System Specialist prior to sailing.
12. CTD capable winch and J-frame for CTD casts, with sufficient electromechanical cable for casts to 500 m.
13. NMEA GPS input to CTD header file.

<u>The following data are requested of the SCS</u>

The SCS system should be fully operational for the duration of the survey. A listing of any sensors that will not be functional for the survey should be provided prior to sailing to the FPC, taking into consideration that event templates will have to be checked by the Shipboard System Specialists to ensure there will be no impact or an alternative sensor can be selected.

1. NMEA Enabled GPS
    a. UTC time
    b. Latitude
    c. Longitude
    d. Speed over ground
    e. Course over ground
2. NMEA Enabled GPS
    a. Latitude
    b. Longitude
    c. Speed over ground
    d. Course over ground
3. Sperry speed log
    a. Speed through the water
    b. Speed over ground
4. Knudsen Echosounder (depth in meters)
5. Gyro-heading
6. Air temperature (°C)
7. Corrected barometric pressure
8. True wind speed
9. True wind direction
10. Information should be passed to the Rotating ET to ensure the following:
    a. The Automatic Logger Control on the SCS Server must be enabled anytime ACQ is started and should use the default of 0:00:00 (Midnight GMT).
    b. The contents of the Event data folder should be allowed to remain present for the duration of the survey (they should not be deleted between legs). This will ensure that event IDs do not restart for the respective events during the survey.

SEASAVE SOFTWARE

Prior to sailing, the proper .CON files should be built in SEASAVE. The software should be set to look for the proper .CON file for the respective instrument.

B. Equipment and Capabilities Provided by the Scientists:

Southeast Fisheries Science Center Laboratory

1. Flowmeters (6)
2. 2- 1 x 2 m neuston frames, (4) 0.950 mm nets, (2) 0.505 mm net
3. 1 m MOCNESS frame, (9) 0.505 mm nets, and electronic equipment
4. CALVET bongo frame

5. Bongo/neuston gear and equipment box
6. Plankton sampling supplies box
7. Plankton preserving jars, lids and labels
8. Chemical transfer pumps
9. 150 gallons ethanol
    a. HAZMAT cleanup supplies for ethanol including absorbent material for potential spill containment (Prosorb) and absorbent pads including plastic bags to contain contaminated waste material generated in clean-up effort.
10. 4 Garden hoses for washing down nets, nozzles, and hose repair parts
11. Plankton transfer table
12. Waste Ethanol Receptacles
13. 5 gallon buckets
14. Various clerical supplies
15. length of 2 x 4 wood
16. section of carpet
17. 2 wooden pallets
18. Turner AU-10 Fluorometer

IV. Hazardous Materials

A. Policy and Compliance:

The FPC shall be responsible for complying with MOCDOC 15, Fleet Environmental Compliance #07, Hazardous Material and Hazardous Waste Management Requirements for Visiting Scientists, released July 2002. Documentation regarding those requirements will be provided by the Chief of Operations, Marine Operations Center, upon request. By Federal regulations and NOAA Marine and Aviation Operations policy, the ship may not sail without a complete inventory of all hazardous materials by name and the anticipated quantity brought aboard, MSDS and appropriate neutralizing agents, buffers, and/or absorbents in amounts adequate to address spills of a size equal to the amount of chemicals brought aboard. The amount of hazardous material arriving and leaving the vessel shall be accounted for by the FPC.

B. Radioactive Isotopes: N/A

C. Inventory:
Expected hazardous materials to be brought on board for this cruise are:
Ethanol - 165 gallons (3 x 55 gallon drums)

V. Additional Projects

A. Supplementary ("Piggyback") Projects: *AeroVironment Puma AE UAS unmanned aerial system Operations in/around Grays Reef National Marine Sanctuary*

B. NOAA Fleet Ancillary Projects: N/A

VI. Disposition of Data and Reports

A. Data Responsibilities:

The FPC is responsible for submission of a ROSCOP II form (NOAA, Form 2423) to the National Oceanographic Data Center within 30 days after cruise termination.

B. Pre and Post Cruise Meeting:
Pre-Cruise Meeting: On the ship prior to departure, the FPC will conduct a meeting of the scientific party to train them in sample collection and inform them of cruise objectives. Some vessel protocols, e.g., meals, etiquette, etc. will be presented by the ship's Operations Officer.

Post-Cruise Meeting: Upon completion of the cruise, a post-cruise meeting will be held and attended by the Operations officer, the Commanding Officer and the FPC to review the cruise. Concerns regarding safety, efficiency and suggestions for improvement for future cruises should be discussed. A cruise report will be prepared by the FPC and submitted to the Director, SEFSC, within 30 days after the cruise is completed.

C. Ship Operation Evaluation Report:
Within 7 days of the completion of the cruise, a Ship Operation Evaluation form is to be completed by the FPC. The preferred method of transmittal of this form is via email to OMAO.Customer.Satisfation@noaa.gov. If email is not an option, a hard copy may be forwarded to:

Director, NOAA Marine and Aviation Operations
NOAA Office of Marine and Aviation Operations
8403 Colesville Road, Suite 500
Silver Spring, MD 20910

A file copy of each completed evaluation form will be sent to the SEFSC Laboratory Director and the SEFSC Vessel Coordinator.

VII. Miscellaneous

A. Meals and Berthing:
Meals and berthing are required for up to 14 scientists on leg 1, 13 scientists on leg 2. Meals will be served 3 times daily beginning 1 hour before scheduled departure, extending throughout the cruise, and ending 2 hours after the termination of the cruise. Since the watch schedule is split between day and night, the night watch may often miss daytime meals and will require adequate food and beverages (for example a variety of sandwich items, cheeses, fruit, milk, juices) during what are not typically meal hours. Special dietary requirements for scientific participants will be made available to the ship's command at least 21 days prior to the survey. Scientific party will consist of 1 vegetarian and 3 lactose intolerant individuals. Please provide lactose-free milk and dairy free meal options for these individuals.

Berthing requirements, including number and gender of the scientific party, will be provided to the ship by the FPC. The FPC and Commanding Officer will work together on a detailed berthing plan to accommodate the gender mix of the scientific party taking into consideration the current make-up of the ship's complement. The FPC is

responsible for ensuring the scientific berthing spaces are left in the condition in which they were received; for stripping bedding and linen returned; and for the return of any room keys which were issued. The FPC is also responsible for the cleanliness of the laboratory spaces and the storage areas utilized by the scientific party, both during the cruise and at its conclusion prior to departing the ship.

All NOAA scientists will have proper travel orders when assigned to any NOAA ship. The FPC will ensure that all non-NOAA or non Federal scientists aboard also have proper orders. It is the responsibility of the FPC to ensure that the entire scientific party has a mechanism in place to provide lodging and food and to be reimbursed for these costs in the event that the ship becomes uninhabitable and/or the galley is closed during any part of the scheduled project.

All persons boarding NOAA vessels give implied consent to comply with all safety and security policies and regulations which are administered by the Commanding Officer. All spaces and equipment on the vessel are subject to inspection or search at any time. All personnel must comply with OMAO's Drug and Alcohol Policy dated May 7, 1999 which forbids the possession and/or use of illegal drugs and alcohol aboard NOAA Vessels.

B. Medical Forms and Emergency Contacts:

The NOAA Health Services Questionnaire (NHSQ, Revised: 08/08) must be completed in advance by each participating scientist. The NHSQ can be obtained from the Field Party Chief or the NOAA website at
http://www.omao.noaa.gov/medical/NHSQ_Final_wi_Instructions_fill.pdf
The completed form should be sent to the Regional Director of Health Services at Marine Operations Center. The participant can mail, fax, or scan the form into an email using the contact information below. The NHSQ should reach the Health Services Office no later than 4 weeks prior to the cruise to allow time for the participant to obtain and submit additional information that health services might require before clearance to sail can be granted. Please contact MOC Health Services with any questions regarding eligibility or completion of the NHSQ. Be sure to include proof of tuberculosis (TB) testing, sign and date the form, and indicate the ship or ships the participant will be sailing on. The participant will receive an email notice when medically cleared to sail if a legible email address is provided on the NHSQ.

Contact information:
Regional Director of Health Services
Marine Operations Center – Atlantic
439 W. York Street
Norfolk, VA 23510
Telephone 757.441.6320
Fax 757.441.3760
E-mail MOA.Health.Services@noaa.gov

Prior to departure, the FPC must provide a listing of emergency contacts to the Executive Officer for all members of the scientific party, with the following information: name, address, relationship to member, and telephone number.

C. Shipboard Safety:

Wearing open-toed footwear or shoes that do not completely enclose the foot (such as sandals or clogs) outside of private berthing areas is not permitted. Hard hats are required when working with suspended loads. Work vests are required when working near open railings, during small boat launch and recovery operations, and any other over the side operations. Hard hats and work vests will be provided by the ship when required.

D. Communications:

A progress report on operations prepared by the FPC may be relayed to the program office. Sometimes it is necessary for the FPC to communicate with another vessel, aircraft, or shore facility. Through various means of communications, the ship can usually accommodate the FPC. Special radio voice communications requirements should be listed in the project instructions. The ship's primary means of communication with the Marine Operations Center is via e-mail and the Very Small Aperture Terminal (VSAT) link. Standard VSAT bandwidth at 128kbs is shared by all vessels staff and the science team at no charge. Increased bandwidth in 30 day increments is available on the VSAT systems at an incurred cost to the scientific party. If increased bandwidth is being considered, program accounting is required it must be arranged at least 30 days in advance.

Communication between the bridge, the dry lab, and the deck during plankton operations will be by VHS radio. We request 30 min and 10 min notification prior to arriving at stations.

E. IT Security:

Any computer that will be hooked into the ship's network must comply with the OMAO Fleet IT Security Policy prior to establishing a direct connection to the NOAA WAN. Requirements include, but are not limited to:

(1) Installation of the latest virus definition (.DAT) file on all systems and performance of a virus scan on each system.
(2) Installation of the latest critical operating system security patches.
(3) No external public Internet Service Provider (ISP) connections.

Completion of these requirements prior to boarding the ship is required. Non-NOAA personnel using the ship's computers or connecting their own computers to the ships network must complete NOAA's IT Security Awareness Course within 3 days of embarking.

F. Foreign National Guests Access to OMAO Facilities and Platforms:

Foreign National Access and Deemed Export Controls

All foreign national access to the vessel shall be in accordance with NAO 207-12 and RADM De Bow's March 16, 2006 memo (http://deemedexports.noaa.gov). National Marine Fisheries Service personnel will use the Foreign National Registration System (FRNS) to submit requests for access to NOAA facilities and ships. The Departmental

Sponsor/NOAA (DSN) is responsible for obtaining clearances and export licenses and for providing escorts required by the NAO. DSNs should consult with their designated NMFS Deemed Exports point of contact to assist with the process (http://deemedexports.noaa.gov/contacts.html).
The following are basic requirements. Full compliance with NAO 207-12 is required.

Responsibilities of the FPC:

1. Provide the Commanding Officer with the e-mail generated by the FRNS granting approval for the foreign national guest's visit. This e-mail will identify the guest's DSN and will serve as evidence that the requirements of NAO 207-12 have been complied with.
2. Escorts – The FPC is responsible to provide escorts to comply with NAO 207-12 Section 5.10, or as required by the vessel's DOC/OSY Regional Security Officer.
3. Ensure all non-foreign national members of the scientific party receive the briefing on Espionage Indicators (NAO 207-12 Appendix A) at least annually or as required by the servicing Regional Security Officer.
4. Export Control - *The SEFSC currently neither possesses nor utilizes technologies that are subject to Export Administration Regulations (EAR).*

The Commanding Officer and the FPC will work together to implement any access controls necessary to ensure no unlicensed export occurs of any controlled technology onboard regardless of ownership.

Responsibilities of the Commanding Officer:

1. Ensure only those foreign nationals with DOC/OSY clearance are granted access.
2. Deny access to OMAO platforms and facilities by foreign nationals from countries controlled for anti-terrorism (AT) reasons and individuals from Cuba or Iran without written NMAO approval and compliance with export and sanction regulations.
3. Ensure foreign national access is permitted only if unlicensed deemed export is not likely to occur.
4. Ensure receipt from the FPC or the DSN of the FRNS e-mail granting approval for the foreign national guest's visit.
5. Ensure Foreign Port Officials, e.g., Pilots, immigration officials, receive escorted access in accordance with maritime custom to facilitate the vessel's visit to foreign ports.
6. Export Control - 8 weeks in advance of the cruise, provide the FPC with a current inventory of OMAO controlled technology onboard the vessel and a copy of the vessel Technology Access Control Plan (TACP). Also notify the FPC of any OMAO-sponsored foreign nationals that will be onboard while program equipment is aboard so that the FPC can take steps to prevent unlicensed export of Program controlled technology. The Commanding Officer and the FPC will work together to implement any access controls necessary to ensure no unlicensed export occurs of any controlled technology onboard regardless of ownership.

7. Ensure all OMAO personnel onboard receive the briefing on Espionage Indicators (NAO 207-12 Appendix A) at least annually or as required by the servicing Regional Security Officer.

Responsibilities of the Foreign National Sponsor:

1. Export Control - The foreign national's sponsor is responsible for obtaining any required export licenses and complying with any conditions of those licenses prior to the foreign national being provided access to the controlled technology onboard regardless of the technology's ownership.
2. The DSN of the foreign national shall assign an on-board Program individual, who will be responsible for the foreign national while on board. The identified individual must be a U.S. citizen, NOAA (or DOC) employee. According to DOC/OSY, this requirement cannot be altered.
3. Ensure completion and submission of Appendix C (Certification of Conditions and Responsibilities for a Foreign National Guest) as required by NAO 207-12 Section 5.03.h.

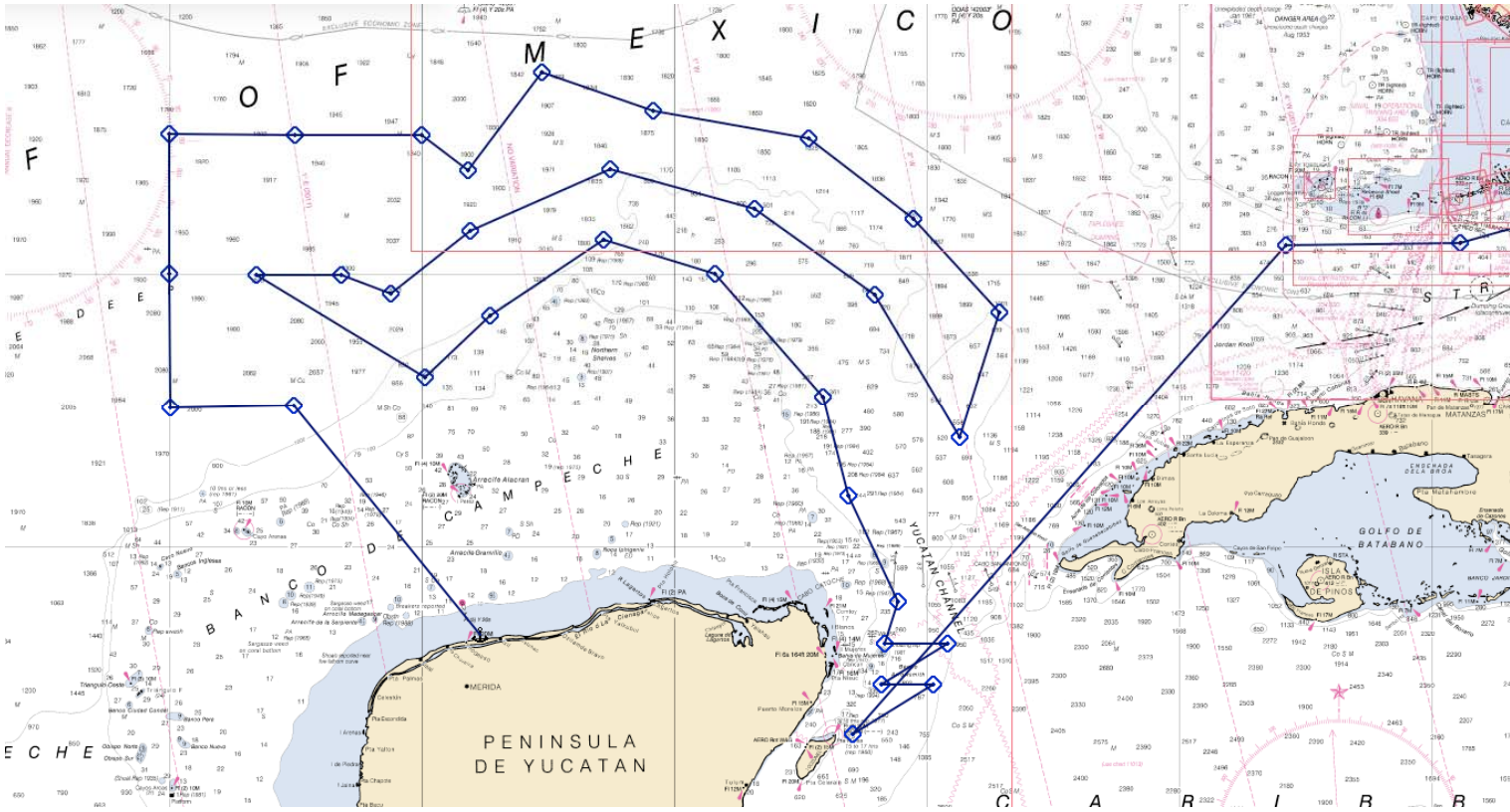


Figure 1. Proposed cruise track for Leg #1 with bluefin tuna stations for NOAA Ship *Nancy Foster* Cruise 13-04, April 30–May10, 2013.

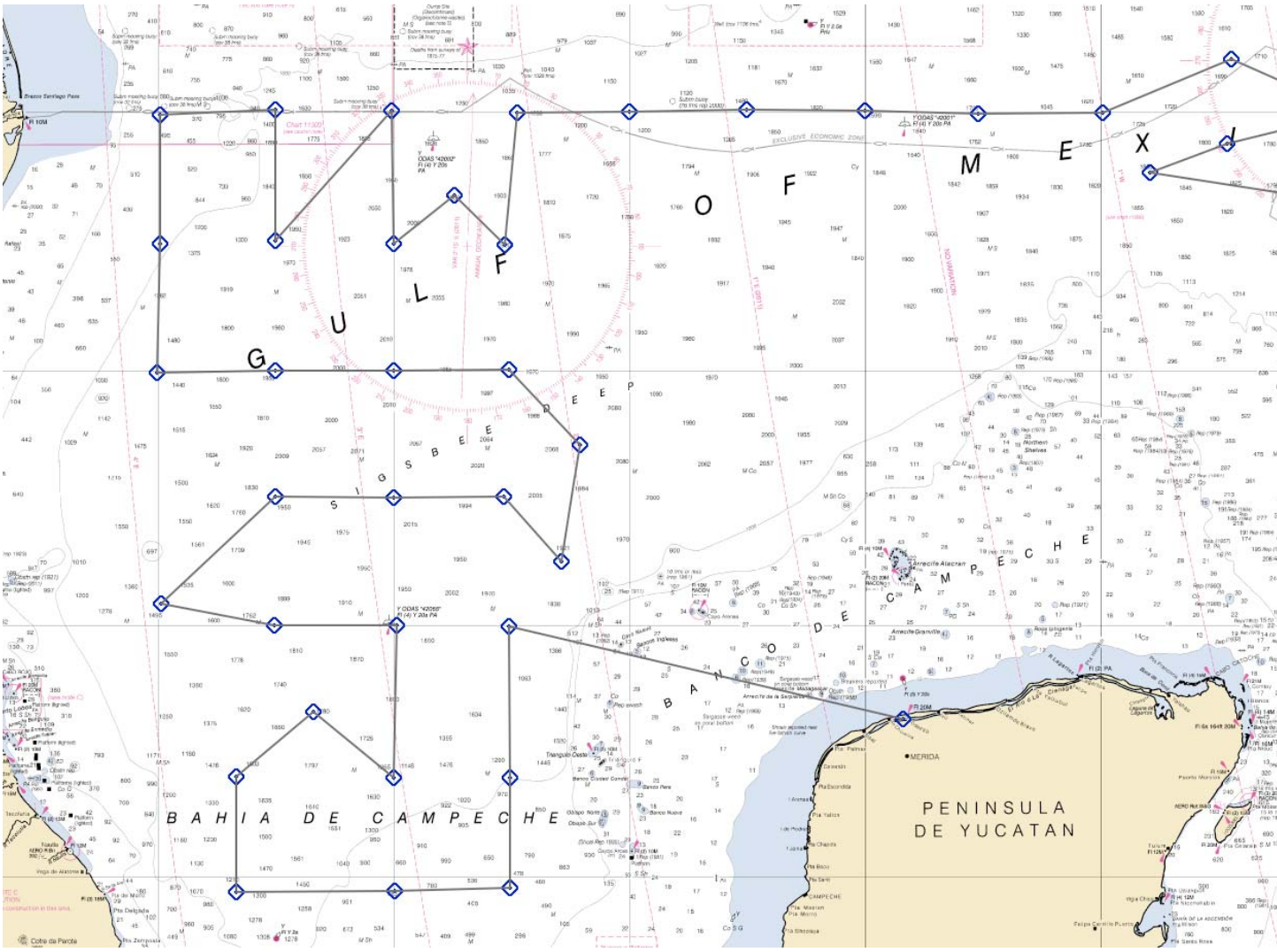


Figure 2. Proposed cruise track for Leg #2 of NOAA Ship *Nancy Foster* Cruise 13-04, May 13-25, 2013.

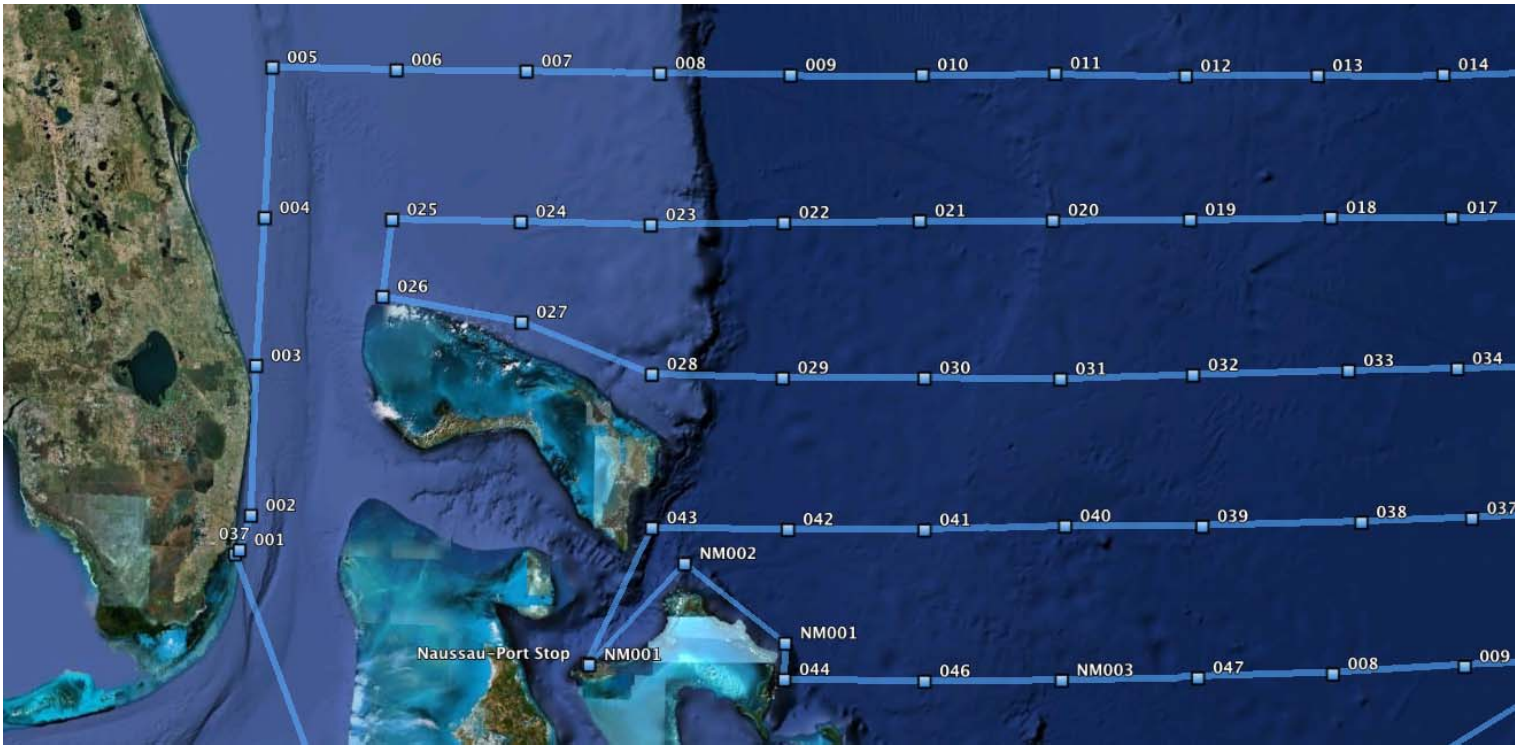


Figure 3. Alternate cruise track for Leg 1 of NOAA Ship *Nancy Foster* Cruise 13-04, April 30-May 10, 2013.

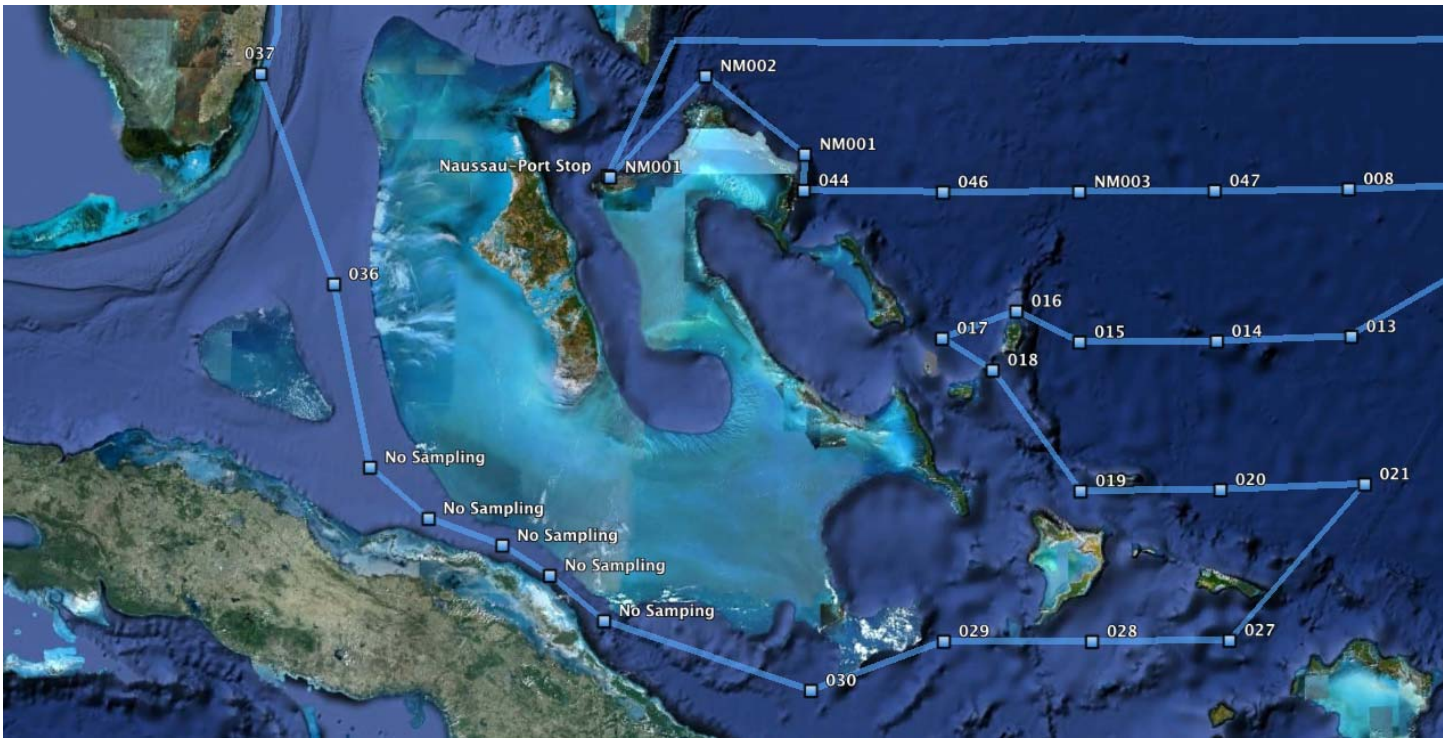


Figure 4. Alternate cruise track for Leg 2 of NOAA Ship *Nancy Foster* Cruise 13-04, May 13-25, 2013.

National Oceanic and Atmospheric Administration (NOAA)
Appendix A

April 16, 2013

MEMORANDUM:

To: Captain Randy TeBeest, Commanding Officer,
NOAA Aircraft Operations Center

Robbie Hood, Director NOAA UAS Program

FROM: Todd Jacobs
Channel Islands National Marine Sanctuary and
NOAA UAS Program

SUBJECT: Project Instructions for AeroVironment Puma AE UAS Operations in / around Grays Reef National Marine Sanctuary

1.0 BACKGROUND

Since 2009, the NOAA UAS Program Office (UASPO) and the Channel Islands National Marine Sanctuary (CINMS) have conducted multiple successful campaigns of UAS demonstration and operational flights from the deck of the 62' NOAA Research Vessel Shearwater within the military Special Use Airspace (SUA) that overlaps the boundaries of the Sanctuary. In 2012, CINMS successfully completed seabird surveys, enforcement operations, and blue whale tagging aerial support in the SUA within the Sanctuary using the PUMA UAS. Additionally, a similar enforcement operation was conducted in the Florida Keys National Marine Sanctuary in October.

The AeroVironment (AV) UASs have the highest statistical likelihood of successfully returning to base following a mission of any UAS in the Department of Defense's inventory. After thousands of sorties, there has never been a documented case of an AV UAS flyaway that was not determined to have been caused by operator error.

It is the intention of ONMS to concentrate our efforts using the PUMA AE UAS for the immediate future.

1.1 CURRENT MISSION:

The objective of ONMS is to fully integrate the PUMA system as part of standard sanctuary research and enforcement vessel operations, including Living Marine Research (LMR) surveys and marine zone enforcement.

This ONMS request is for one multi-sortie mission day operating the PUMA UAS from aboard the NOAA Ship Nancy Foster in and around the waters of the Grays Reef National Marine Sanctuary.

Specific objectives are:

1. Standardization – Continued understanding of the PUMA system capabilities and limitations for future LMR and enforcement missions and the development of accepted standardized operational protocols and methodologies for OMAO, NOAA Ship, ONMS, and NMFS personnel.

2. Living Marine Resource (LMR) Surveys - Optimize LMR flight plans and protocols specific to GRNMS, and conduct survey operations targeted primarily at surface Loggerhead sea turtles.

3. Enforcement - Optimize enforcement flight plans and protocols specific to GRNMS, and conduct direct enforcement operations with the primary enforcement objective being the GRNMS Research Area. There is a potential for day flights to be conducted in conjunction with vessel operations in partnership with the United States Coast Guard (USCG).

NOAA Ship *Nancy Foster* will be the primary launch and recovery platform for the PUMA UAS. The R/V Joe Ferguson will act as personnel shuttle and assist with operations as needed.

Additionally, OMAO objectives include:
Objective #1: Demonstrate successful PUMA AE DDL launch operations from a Class III NOAA vessel such as *Nancy Foster*.

Success Criteria: PUMA will successfully demonstrate launch capability from *Nancy Foster* by successfully completing three hand launched evolutions. Launch locations may be demonstrated from the bow, midships and stern to help identify ideal location of PUMA pilots, ground control system and air vehicle.

Objective #2: Upon successful auto land command and water landing, demonstrate the ability of the ship's small boat crew to retrieve the PUMA AE DDL without damaging the air vehicle.

Success Criteria: Initial estimate to complete this evolution is 30 minutes to launch the small boat, recover the PUMA and recover the small boat. Recovery evolution will be timed to obtain a accurate 'real world' estimate for future operations. Sea state and environmental conditions will be noted.

Objective #3: Determine the ability of *Nancy Foster* to recover the PUMA AE DDL.

Success Criteria: Utilizing a PUMA fuselage (provided from manufacturer, not the operational air vehicle), *Nancy Foster* will utilize the Dynamic Positioning function to hold position on station with the deck department recovering the PUMA through a variety of recovery methods (boat hook, net, etc). If successfully accomplished, the amount of time should be compared with recovery utilizing the small boat.

Objective #4: Identify the ideal location for the PUMA operators and Ground Control Station during launch, operational and recovery operations.

Success Criteria: Identification of a location that provides electrical power to operate the Ground Control System, unrestricted visibility to the PUMA pilot and clear lined of communication to the bridge / OOD.

Objective #5: Exercise the draft NOAA PUMA Shipboard OPS manual for all launches and recoveries of the PUMA AE DDL. Provide the Command and Crew of *Nancy Foster* the ability to make edits and recommendations to the checklists identified PUMA Pre-Launch, Flight and Recovery checklist(s).

Success Criteria: The draft Shipboard OPS manual successfully incorporates the safety mitigation controls identified in the ORM, enhances ship-wide Situational awareness of PUMA operations and allows for the successful launch, operation and recovery of the PUMA AE DDL platform.

2.0 SCHEDULE AND AREA OF OPERATIONS

GRNMS, in conjunction with the NOAA Ship Nancy Foster plans to be engaged in UAS operations within the W-157A, Section 4X during daylight hours on 27 APR 13. Airspace approval has been obtained from NAS Jacksonville to work within the altitude constraint of surface to 2000ft MSL from 0700 - 1900 EDT. The draft schedule for operations is as follows:

24 April 2013:

~1200: LT David Gothan and ENS Michael Marino arrive in Savannah, GA (10 Ocean Science Circle, Savannah, GA 31411) to begin install of RVT aboard R/V Joe Ferguson. AOC tests all equipment.

~1700: Install and testing complete.

25 April 2013:

~1000: LT Gothan and ENS Marino arrive in Charleston, SC to begin install of GCS, Monitors, and cabling aboard NOAA Ship *Nancy Foster*. AOC tests all equipment.

~1700: Install and testing complete.

26 April 2013:

~0900: *Nancy Foster* gets underway for Gray's Reef NMS.

27 April 2013:

~ 0800: Commence daytime UAS ops. Multiple 1/2- 2 hr sorties.

~ 1700: Secure daytime UAS ops, *Nancy Foster* begins transit to Key West. PI's Todd Jacobs and Matt Pickett will join LT Gothan departing the area on R/V Joe Ferguson. ENS Marino will stay on NOAA Ship *Nancy Foster* until she arrives at USCG - Sector Key West (pier "D"). Access is through USN's Trumbo Point Annex in Key West with the *Nancy Foster* arriving into port on April 30th.

At the conclusion of UAS operations, there will be a debriefing in addition to the Post Mission Review to be conducted by UAS Program Office and AOC in the weeks after this operation.

An area map of work area is attached as appendix A.

3.0 RESOURCES

Lead Agency: National Oceanic and Atmospheric Administration (NOAA)

Unit	Point of Contact	Email	Phone
GRNMS	Sarah Fangman	sarah.fangman@noaa.gov	(912) 598-2428
MC	Todd Jacobs	Todd.jacobs@noaa.gov	(805) 455-1981
MC Alternate	Matt Pickett	Matt.Pickett@noaa.gov	(805) 705-9802
NAS JAX	Randall Wright	randall.c.wright.ctr@navy.mil	904-542-2028
Nancy Foster	LT Josh Slater LT Colin Kliewer	ops.nancyfoster@noaa.gov	(843) 991-6326
AOC Flight Team	LT David Gothan ENS Michael Marino	David.Gothan@noaa.gov	(619) 9470614

Vessel Assets:

- NOAA Ship *Nancy Foster* for UAS launch and recovery
- R/V Joe Ferguson

4.0 OPERATIONAL PLANS

The Puma AE UAS shall be hand launched from NOAA Ship *Nancy Foster*. In addition to the Ground Control System (GCS), the ship will be equipped with a remote video terminal RVT, which will allow people aboard to observe real video/data feed streaming from the Puma UAS. An additional RVT will be installed on the R/V Joe Ferguson. At the conclusion of each flight, the aircraft will complete a water landing and will be recovered from the water by personnel aboard NOAA Ship *Nancy Foster* via small launch. 3-4 flights are anticipated during daylight hours. The primary location of launching the PUMA system will be NOAA Ship *Nancy Foster*. Time and weather permitting, a launch and recovery utilizing the R/V Ferguson is possible.

Mission flight profiles:

Primary Objectives: NOAA Ship based UAS flights to demonstrate fitment and compatibility of NOAA Puma UAS operations in support of GRNMS Management

A hand-launched Puma AE UAS will be flown from the NOAA Ship *Nancy Foster* within the SUA, and used to identify and determine the location of targeted vessels or marine resources. Optical and infrared payloads will provide real time data feed via RVT

to onboard personnel. The UAS will take off from the *Nancy Foster* and will land and be recovered from the water in an area no less than 300' from the vessel. Participants will maintain communications via Iridium Phone and VHF Radio as well as with NAS JAX or FAA, as needed.

In the event that weather or sea conditions are not suitable for UAS operations, as determined by the NOAA Mission Coordinator (MC), the NOAA Pilot in Charge (PIC), or Commanding Officer, NOAA Ship *Nancy Foster,* if such conditions and prohibitive to the safe deployment of the small boat, operations will be cancelled or suspended for the day or night.

Puma AE software allows numerous mission profiles to be used to accomplish this test. Software can be used in a Waypoint configuration, which starts as a "Diamond Default" 4 point (500m) configuration around the GCS on the mapping software. This may be manipulated in anyway, but only contains 4 points. These points are lettered from "A" to "D" and if used the AV will fly on their path alphabetically until completion of flight. The software also gives three orbit points which also may be manipulated in any way as to location, but there will only be three. Manual flight modes of "Manual and "Altitude Hold may also be used. A combination of any of the previously mentioned software driven routes, orbits or manual flights modes may be used to meet the objectives of this test.

Roles/Responsibilities/Qualifications:

Clear roles and responsibilities, as outlined below, will be maintained for all UAS operations. For vessel-based UAS operations, the ship's command, in consultation with the UAS Pilot-In-Command (PIC) and Mission Coordinator (MC), will determine if weather, sea, vessel, aircraft, and human factors are such that safe UAS operations can be conducted in accordance with documented criteria.

The **Mission Coordinator (MC)** is tasked with overall responsibility for safe execution of the mission. It is the MC's responsibility to ensure that all crewmembers understand and can properly perform their specific roles for the flight. The MC is additionally responsible for ensuring all documentation, including pre and post-flight briefs are conducted. The MC is charged with ensuring adherence to all SOP and checklist requirements. The MC is responsible for communicating with the authorities about control airspace and maintaining communication with the appropriate Air Traffic Control Authority. NOAA controls the regulations that govern flying over land/sea sanctuary areas (minimum 1,000 ft floor without permit). NOAA has authorized themselves, under their "manager's permit", to operate the Puma AE below 1,000 ft Mean Sea Level.

The **UAS pilot-in-command (PIC)** functions as the "internal pilot" and will be present during any and all UAS operations. The PIC will have responsibility for aircraft system preparation, launch, airborne operations, landing, and preventative maintenance.

The **UAS operator** functions as the "mission payload operator" and is the individual responsible for the remote control of the aircraft. Typically the aircraft will be mechanically or hand-launched under remote manual control. When at survey altitude, the operator may cede control of the aircraft to the autopilot, which will be programmed to follow a pre-determined survey path. If flying on autopilot, the UAS operator shall

always be ready to take over manual control. This individual is also responsible for recording all operations.

External Observer (EO): There shall be at all times an external observer for "see and avoid" purposes.

At a minimum, there must be two individuals at all times present during operations to fulfill specified ground control system (GCS), operation of the UAS, and "see and avoid" roles/responsibilities.

Communications:

Required interchanges:

1 MC will inform NAS JAX when the vessel/ground team is entering ops area and 30min prior to launch

2 MC shall inform NAS JAX every time a UAS is launched and when it is recovered.

3 MC shall inform NAS JAX when aircraft operations are complete for the day and vessel is departing ops area.

4 MC shall inform NAS JAX if no operations will be conducted during a scheduled ops day.

Internal communications for participating vessels:

- Exchange VHF frequencies and iridium satellite phone numbers
- Protocol: R/V Ferguson will make initial contact to *Nancy Foster* on 16 before switching to a working frequency.

Contact identification is identified as:

NAS JAX (Radio Call Sign: SeaLord):

The PIC can contact SeaLord via one of the following methods, if necessary:

- VHF (Primary): 120.95
- VHF (Secondary): 133.95
- Victor Guard (121.5)

Flight restrictions and conditions

1 UAS operations will be conducted exclusively inside of W-157A Military Warning Area.

2 Operations will not be conducted if:

- Ceiling less than 500 ft minimum
- Visibility less than 2.0 nmi.

- Wind greater than 20 kts or
- Rain more than 0.25 in/hr.

3 MC and PIC will brief all participants on safe zones for launch and landing.

4 Maximum flight altitude is 2000 ft MSL, minimum altitude is 200ft MSL.

5 Max distance from GCS will be limited to Line of Sight operations (distance of 1.0 nautical mile), in daylight Visual Meteorological Conditions.

6 Notices to Airmen and Notices to Mariners shall be made in advance of this mission.

Mission Plans:

Prior to the mission on April 27th, a mission briefing shall be conducted by *Nancy Foster* CO, Mission Commander and PUMA Flight team. They shall review, at a minimum, the draft Nancy Foster PUMA Shipboard Operations SOP, verify the minimum weather conditions and obtain CO approval for PUMA UAS operations. The Mission Coordinator will conduct this briefing, it will include:

- Weather
- Safety
- Status of equipment and personnel
- Communications plan
- Objectives
- Other relevant information as necessary.

Missions will typically consist of launch, ingress to target area, perform data collection, egress from target area and recover. Individual flight duration is expected to be approximately two hours.

5.0 EQUIPMENT

NOAA AOC will provide:

- Puma AE DDL system and spare components
- Certified Puma operators
- Minimum of one additional UAS Ground Control Systems (GCS) to be used as Remote Video Terminal (RVT) to stream real-time video to the personnel aboard the R/V Joe Ferguson.
- Other components/tools, as necessary.
- VHF air band handheld transceiver, for communication with unforeseen aircraft.
- Satellite telephone

NOAA Ship Nancy Foster will provide:

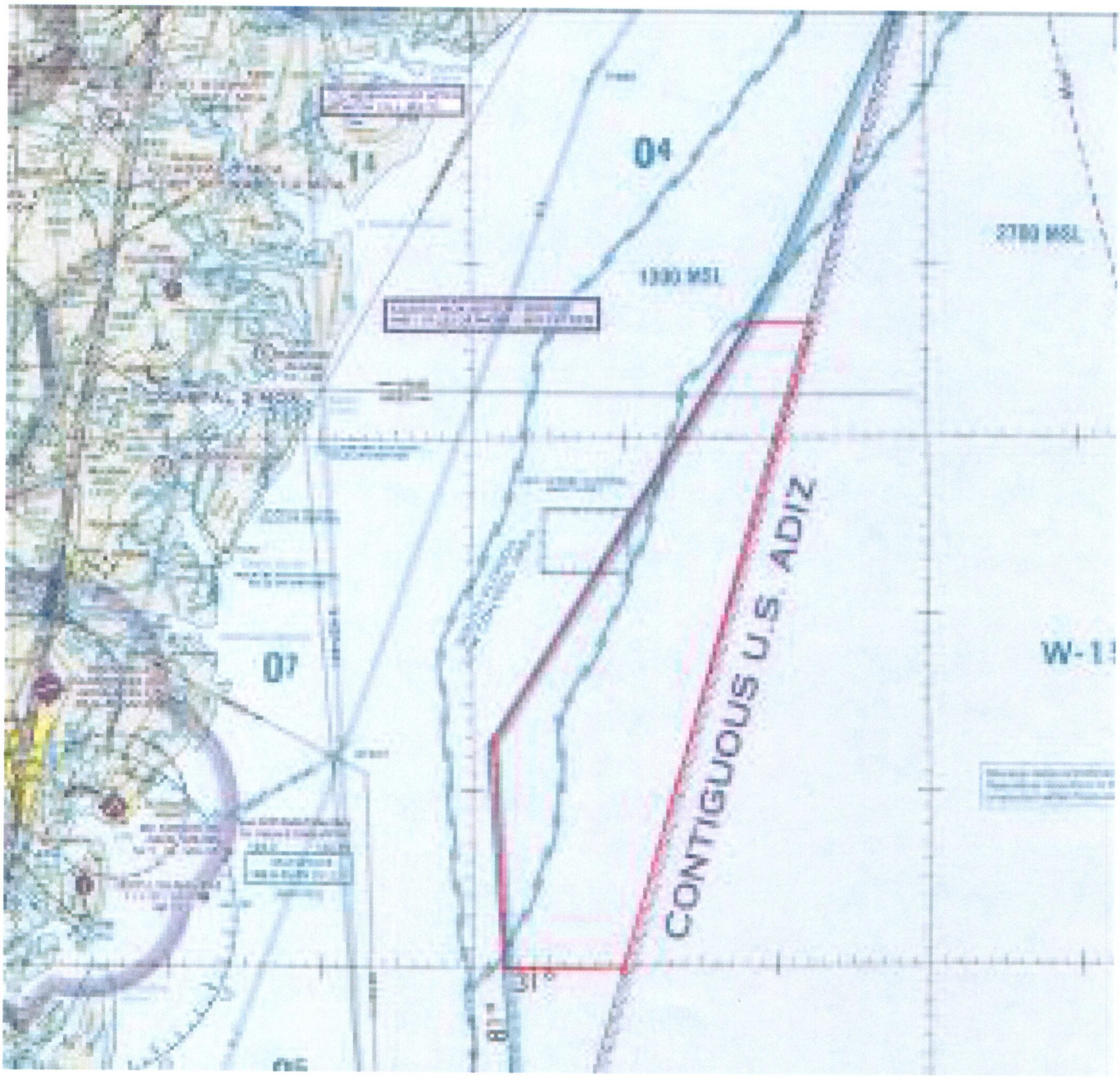
- First aid/Trauma Kit.
- Low-profile work vest/PFD for each member of the party as required.
- Small boat launch for PUMA AE recoveries.

6.0 RECORDS AND REPORTS

NOAA in cooperation with partner agencies shall prepare an after action report which summarizes recommendations and accomplishments with respect to the project objectives. PI's Todd Jacobs and Matt Pickett have the lead on generating these documents for the Post Mission Review held jointly with the UAS Program Office and AOC.

7.0 LIST OF APPENDICES

A: Air Chart of work area (red box).


04
1330 MSL
2780 MSL
07
CONTIGUOUS U.S. ADIZ
W-1
31°
81°

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
OFFICE OF MARINE AND AVIATION OPERATIONS

Aircraft Operations Center
P.O. Box 6829
MacDill AFB, Florida 33608-0829

April 17, 2013

MEMORANDUM FOR: The Record

FROM: Captain Randall J. TeBeest, NOAA
Commanding Officer, Aircraft Operations Center

SUBJECT: UAS Flight Authorization for PUMA UAS operations onboard the NOAA Ship *Nancy Foster*

Having received the recommendation of the Flight Readiness Review Board, which was convened on April 15, 2013 at the Aircraft Operations Center (AOC) for this mission, the operation on April 27, 2013 is approved as outlined in the operations plan and Operational Risk Management (ORM).

Operations are limited to line of sight, daytime VFR conditions with the PUMA to be operated no higher than 2,000 ft. MSL and a lateral distance of 1nm from the Ground Control Station. Any changes to the approved flight envelope or operations plan must be requested in writing by the Principal Investigator and approved by the Commanding Officer, AOC.

cc: Deputy Director of Operations, Marine and Aviation Operations
CAPT Anita Lopez, Commanding Officer, MOC-A
Mrs. Robbie Hood, Director, UAS Program Office
Mr. Todd Jacobs (Co-Principal Investigator)
Mr. Matt Pickett (Co-Principal Investigator)