APPENDIX D Marine Mammal Monitoring Submarine Commanders Course 09-3 Hawaii Range Complex: Cruise Report

Prepared for the US Pacific Fleet

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SECTION 1: Introduction

In order to train with mid-frequency active sonar (MFAS), the Navy has obtained a permit from the National Marine Fisheries Service (NMFS) under the Marine Mammal Protection Act and Endangered Species Act. The Hawaii Range Complex (HRC) Monitoring Plan, finalized in December 2008 for implementation in January 2009, was developed with NMFS to comply with the requirements under the permit. The monitoring plan and reporting will provide science-based answers to questions regarding whether or not marine mammals are exposed and reacting to Navy MFAS. The objectives of the monitoring plan are to answer the following questions:

1. Are marine mammals and sea turtles exposed to MFAS at regulatory thresholds of harm or harassment? If so, at what levels and how frequently are they exposed?

2. If marine mammals and sea turtles are exposed to MFAS in the HRC, do they redistribute geographically in the HRC as a result of repeated exposure? If so, how long does the redistribution last?

3. If marine mammals and sea turtles are exposed to MFAS, what are their behavioral responses? Are they different at various levels?
4. What are the behavioral responses of marine mammals and sea turtles that are exposed to various levels and distances from explosives?
5. Are the Navy's suite of mitigation measures for MFAS and explosives (e.g., Protective Measures Assessment Protocol [PMAP], measures agreed to by the Navy through permitting and consultation) effective at avoiding harm or harassment of marine mammals and sea turtles?

In order to answer these questions, data is to be collected through various means, including contracted vessel and aerial surveys, tagging, passive acoustics, and placing marine mammal observers (MMOs) aboard Navy warships.

As part of this data collection effort, two U.S. Navy MMOs (Ms. Amy Farak and Mr. Tom Vars) participated in the 2009-3 Submarine Commanders Course (SCC) on August 27-29, 2009. These MMOs were stationed aboard the USS LAKE ERIE (CG 70). The primary goals of the SCC 09-3 monitoring effort were to:

1. Coordinate transit to the Pacific Missile Range Facility (PMRF) to allow LAKE ERIE and the survey aircraft opportunity to test communications and to familiarize the ship to the survey aircraft transect profiles;

2. Collect data on marine mammals observed during operations;
   a. Are marine mammals and sea turtles exposed to MFAS
   b. If so, at what levels
   c. Did exposed marine mammals/sea turtles show a behavioral response; and

3. Achieve close coordination between the contracted aerial survey team, Navy aircraft on the range, range control, and the MMO team aboard LAKE ERIE to facilitate maximizing survey time and project safety.

A secondary goal for the SCC 09-3 was to familiarize the MMOs with at-sea Navy operations and to gather information to facilitate future MMO opportunities. The results of this secondary goal are captured as "lessons learned" in Section 0.

SECTION 2: SCC 09-3 Description

SCC Ops are a requirement to provide the necessary training to prospective submarine commanders in rigorous and realistic scenarios involving undersea warfare.

Participants in SCC 09-3 included USS LAKE ERIE (CG 70), USS REUBEN JAMES (FFG 57), maritime patrol aircraft (fixed-wing patrol squadron), HSL-37 (helicopter antisubmarine squadron), submarines, and range control for subsurface, surface, and air.

SECTION 3: Methods

Shipboard Marine Mammal Monitoring

On the morning of 24 August, the MMOs, Commander Pacific Fleet Environmental representative, survey aircraft pilot, and aerial principle investigator participated in the pre-sail brief for all vessel and aircraft participants in the SCC 09-3 exercise. The original intent was for the MMOs to be stationed on the USS CHUNG-HOON (DDG 93). However, it was announced at the pre-sail that the CHUNG-HOON may not be participating due to an unspecified casualty to the ship, and the MMOs were subsequently transferred to the LAKE ERIE. During the pre-sail, the details regarding airspace concerns were finalized, as discussed in Section 0. Typically, the purpose and function of the MMOs are briefed at the pre-sail and/or to the ship on which the MMOs embark. There was not an opportunity to present this information at the pre-sail nor did the commanding officer of the LAKE ERIE request a briefing.

MMO surveys were conducted on a not-to-interfere basis, which means that the MMOs would not replace required Navy lookouts, would not dictate operational requirements/maneuvers, and would remove themselves from the bridge wing if necessary for the LAKE ERIE to accomplish its mission objectives. The only exception

would be if a marine mammal was sighted by the MMO within the shut-down zone during MFAS (200 yards [yds]) and was not sighted by the lookout. In this case the MMO would report the sighting to the lookout for appropriate reporting and action.

The MMO survey was conducted on the bridge wing of the LAKE ERIE (62 feet [ft] above water's surface), with one MMO on each wing. During on-effort surveys, the MMOs used the naked eye and 7X50 magnification binoculars to scan the area from dead ahead to just abaft of the beam. In searching this area, the MMOs started at the forward part of the sector and searched aft. Binoculars were held so that the horizon was in the top third of the field of view. The field of view was scanned from the horizon towards the ship. Once the field of view was scanned, the binoculars were repositioned and the field of view was scanned again (Figure 1). Once the scan with the binoculars was completed, the eyes were rested for a few seconds and the entire sector was scanned with the naked eye.

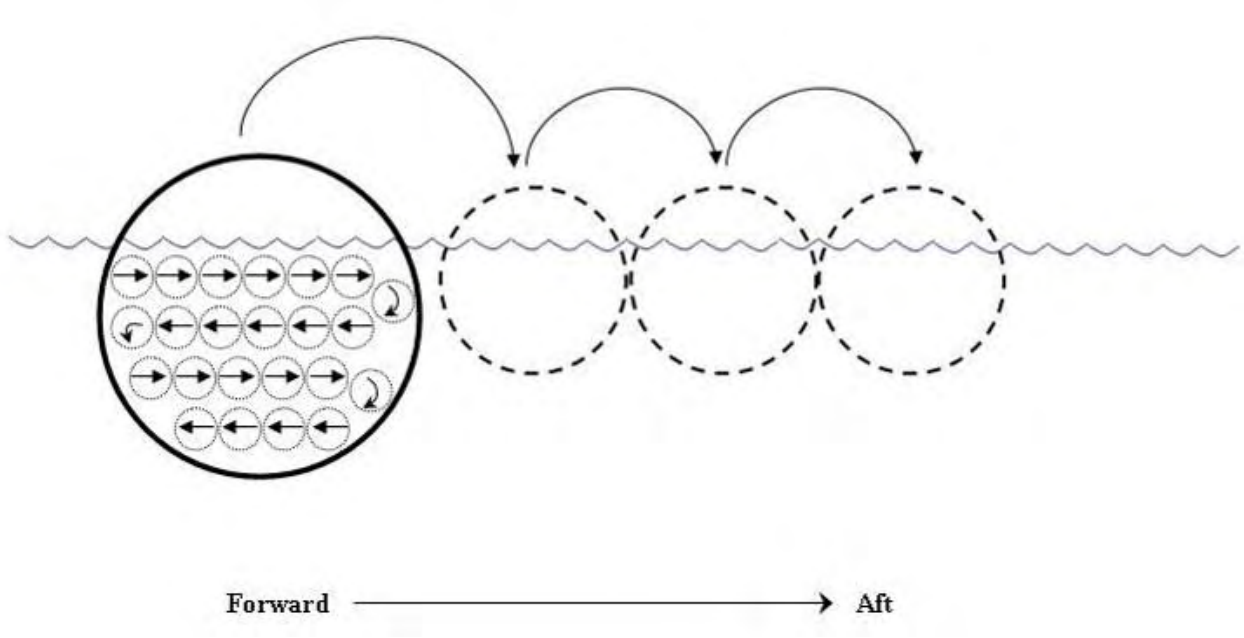

Figure 1. MMO Surface Searching Procedure

If an animal was visually detected, the MMO would collect information on twenty-three sighting, environmental, and sonar parameters (Table 5). Photographs would be taken using a Canon EOS 20D digital camera with a 100 – 400 mm zoom lens.

In addition to collecting data on each sighting, the MMOs would alert the survey aircraft, via a hand-held avionics very high frequency (VHF) radio (Section 0), of the location(s) of the animal(s) so that the aircraft could conduct a focal follow of the animal. If the aircraft was currently in a focal follow and another sighting was made, the aircraft would wait until the first focal follow was complete before heading to the second sighting. MMOs were not to inform the survey aircraft of the ships operations, particularly if MFAS was in use, so as to not bias any behavioral observations made by the survey aircraft.

A GARMIN GPSmap 276C geographic positioning system (GPS) was used to track LAKE ERIE locations during transits. The GPS unit allowed the MMOs to obtain positional reports without needing to enter the wheel house on the bridge. Additionally, ship track lines were able to be plotted for the times when the MMOs were on watch.

Table 5. Shipboard MMO Data Category Descriptions

Data Category	Description
Sightings Information	
Effort (on/off)	**On effort means actively searching for marine mammals; time spent off effort could result from vacating the bridge wing for operational reasons.**
Date	**Format in mm/dd/yy.**
Time	**Time provided in Hawaii Standard Time (HST).**
Location	**This is the location of the LAKE ERIE at the time of the sighting, provided by monitors on the bridge.**
Detection Sensor	**Either visual or aural (if detected passively by the sonar technician) and which MMO observed the animal.**
Species/Group	**Determined by the MMO.**
Group Size	**Estimated by the MMO.**
# Calves	**Estimated by the MMO.**
Bearing (true)	**Estimated by the MMO.**
Distance (yds)	**Estimated by the MMO; reticled binoculars or other measurement devices not available.**
Length of contact	**Estimated by the MMO.**
Environmental Information	
Wave height (ft)	**Estimated by the MMO.**
Visibility	**Estimated by the MMO.**
BSS	**Estimated by the MMO.**
Swell direction (true)	**Estimated by the MMO.**
Wind direction (true)	**Estimated by the MMO.**
Wind speed (kts)	**Provided by monitors on the bridge.**
% glare	**Estimated by the MMO.**
% cloud cover	**Estimated by the MMO.**
Operational Information	
Active sonar in use?	**Specifically refers to MFAS.**
Direction of ship travel	**Provided by monitors on the bridge.**

Animal motion	**Estimated by the MMO.**
Behavior	**Individual behaviors: breach, porpoise, spin, bowride, feeding, head slap, social, tail slap, pectoral fin slap, other** **Whale behaviors: blow, no blow rise, fluke up, peduncle arch, unidentified large splash** **Group behaviors: rest, mill, travel, surface active travel, surface active mill**
Mitigation implemented	**If MFAS in use, the measures implemented, if any, but the LAKE ERIE.**
Comments	**Other comments as necessary.**

Aerial Marine Mammal Monitoring

Aerial surveys were conducted during SCC 09-3. The survey was undertaken from a twin-engine, fixed-wing Beech Aero Commander. The primary goals of the aerial monitoring were to locate and identify marine mammals and sea turtles during the training exercise, and to monitor and report observations of their behavior. This included monitoring for any potentially injured or harmed marine mammals and sea turtles and any unusual behavior or changes in behavior, distribution, numbers, and species associations of animals observed during the training exercise.

The SCC 09-3 exercise involved multiple large naval vessels, submarines, and both fixed-wing (P-3) and rotary-wing (helicopters) aircraft. Thus, coordination of airspace use was paramount to the safety of all aircraft involved. In general, the airspace was divided into altitude strata, such that the helicopters would remain below 500 ft, the survey aircraft would remain between 800 – 1500 ft, and the P-3 aircraft would remain above 3000 ft. However, when the P-3 aircraft was required to fly at lower altitudes to satisfy mission requirements, the P-3, survey aircraft, and range control would coordinate to ensure each aircraft could safely maneuver to the other stratum. Each morning, the survey aircraft would communicate with range control to determine the location of the LAKE ERIE and to verify the altitude in which they would enter the range. Radio communication between the aircraft and MMOs was also established and verified.

The schedule of events for the survey aircraft was to conduct lawn-mower track surveys on the day before and after the exercise to obtain animal presence and distribution data. During the SCC (27-29 August), the survey aircraft flew elliptical, "race-track" shaped patterns in front of the LAKE ERIE. The goal of this flight pattern is to visually cover an area extending from the shutdown zone 1500 yds in front of the ship out to 3000 yds and ~2 nautical miles (nm) wide. The pilot manually flew this pattern and frequently had to adjust the pattern due to non-systematic and unpredictable changes in speed and

headings of the LAKE ERIE as it conducted training exercises. This mode was to be maintained until a marine mammal/sea turtle sighting was made either by the aircraft or the shipboard MMOs, or until there was a potential conflict with naval airspace. In the event of a marine mammal/sea turtle sighting, the aircraft would cease the flight search pattern and begin circling the animal(s) sighted and initiate focal follow behavior mode.

In addition to this Navy cruise report focusing on ship-board activities, the aerial survey contractor (Dr. Joseph Mobley, University of Hawaii) will provide a comprehensive scientific report detailing their methods, observations, and recommendations.

Communications

Communication between LAKE ERIE officers and MMOs was accomplished during meals in the wardroom, evening operational briefs, and on the ship's bridge as required.

Communication between the MMOs and survey aircraft was conducted using hand-held avionics VHF radios.

Schedule of Events

LAKE ERIE departed Pearl Harbor, Hawaii, on 26 August at 1245 Hawaii Standard Time (HST). SCC 09-3 operations commenced on 27 August at 0800 and were suspended at 0400 on 30 August, with intermittent periods of no MFAS use. MMOs transferred, via rigid hull inflatable boat, to the USS REUBEN JAMES for return to Pearl Harbor on 31 August 2009. A detailed schedule of events is provided below in Table 6.

Table 6. Schedule of Events

27 August	
Time	**Notes**
0800	MMOs on effort
0940	Survey aircraft on effort
1110	MFAS commence
1130	MFAS stop
1137	MMO (Vars) off effort
1155	MMO (Vars) on effort
1158	MMO (Farak) off effort
1218	MMO (Farak) on effort
1230	MMOs and survey aircraft off effort
1400	MMO (Farak) on effort
1404	Survey aircraft on effort
1410	MMO (Vars) on effort
1508	MFAS commence
1520	MFAS stop
1630	MMOs and survey aircraft off effort

28 August	
Time	**Notes**
0800	MMOs on effort
0824	Survey aircraft on effort
0921	MFAS commence
0942	MFAS stop
1110	MFAS commence
1126	MFAS stop
1130	MMOs and survey aircraft off effort

29 August	
Time	**Notes**
0730	MMOs and survey aircraft on effort
1031	Survey aircraft off effort
1058	MFAS commence
1111	MMOs off effort
1113	MFAS stop
1225	MMOs on effort
1251	Survey aircraft on effort
1400	Survey aircraft off effort
1415	MMO (Vars) off effort
1430	MMO (Vars) on effort
1538	MFAS commence (do not have stop time)
1630	MMOs off effort

1300	MMOs on effort
1336	Survey aircraft on effort
1447	MFAS commence
1456	Survey aircraft off effort
1527	MFAS stop
1600	MMOs off effort

SECTION 4: Results

4.1 Shipboard Marine Mammal Monitoring

Weather reports, including wind speed, direction, and Beaufort Sea State data, were recorded by the MMOs every half hour when possible (Table 7). The ship track is provided in Figure 2.

No marine mammal and sea turtle were sighted by the MMOs during SCC 09-3. During transit out of Pearl Harbor, two hardshell sea turtles were observed; on the return to port, one dolphin was observed within the harbor. Detailed information on these animals (e.g., location) could not be obtained, as the bridge wings were occupied by the navigational watch, and access to the bridge was not possible and the MMOs could not be on effort at these times.

Table 7. Weather Reports

27 August		
Time	**Wind Direction/ Speed**	**Beaufort Sea State**
0800	045°T / 17 kts	3
0920	073°T / 13 kts	4
1000	051°T / 23 kts	4
1030	072°T / 25 kts	5
1100	052°T / 23 kts	5
1132	081°T / 24 kts	5
1200	064°T / 21 kts	5
1230	069°T / 19 kts	5
1410	075°T / 16 kts	4
1500	048°T / 16 kts	3
1530	044°T / 23 kts	3
1600	057°T / 21 kts	4
1630	056°T / 25 kts	4

28 August		
Time	**Wind Direction/ Speed**	**Beaufort Sea State**
0800	083°T /15 kts	**2**
0830	046°T / 6 kts	**2**
0900	073°T / 14 kts	**2**
0930	090°T / 15 kts	**2**
1000	067°T / 14 kts	**2**
1030	075°T / 16 kts	**3**
1100	077°T / 17 kts	**3**

29 August		
Time	**Wind Direction/ Speed**	**Beaufort Sea State**
0730	062°T / 17 kts	**2**
0830	078°T / 20 kts	**3**
0905	073°T / 20 kts	**3**
0930	095°T / 22 kts	**3**
1000	090°T / 23 kts	**3**
1030	084°T / 19 kts	**3**
1100	076°T / 21 kts	**3**
1225	097°T / 20 kts	**3**
1305	089°T / 20 kts	**3**
1330	077°T / 24 kts	**3**
1415	089°T / 18 kts	**3**
1430	079°T / 20 kts	**3**
1540	075°T / 21 kts	**3**
1600	062°T / 18 kts	**3**
1630	077°T / 17 kts	**3**

1130	058°T / 17 kts	**3**
1300	071°T / 25 kts	**4**
1330	068°T / 22 kts	**3**
1400	072°T / 19 kts	**3**
1430	069°T / 15 kts	**3**
1500	068°T / 21 kts	**3**
1530	074°T / 16 kts	**3**
1600	**069°T / 20 kts**	**3**

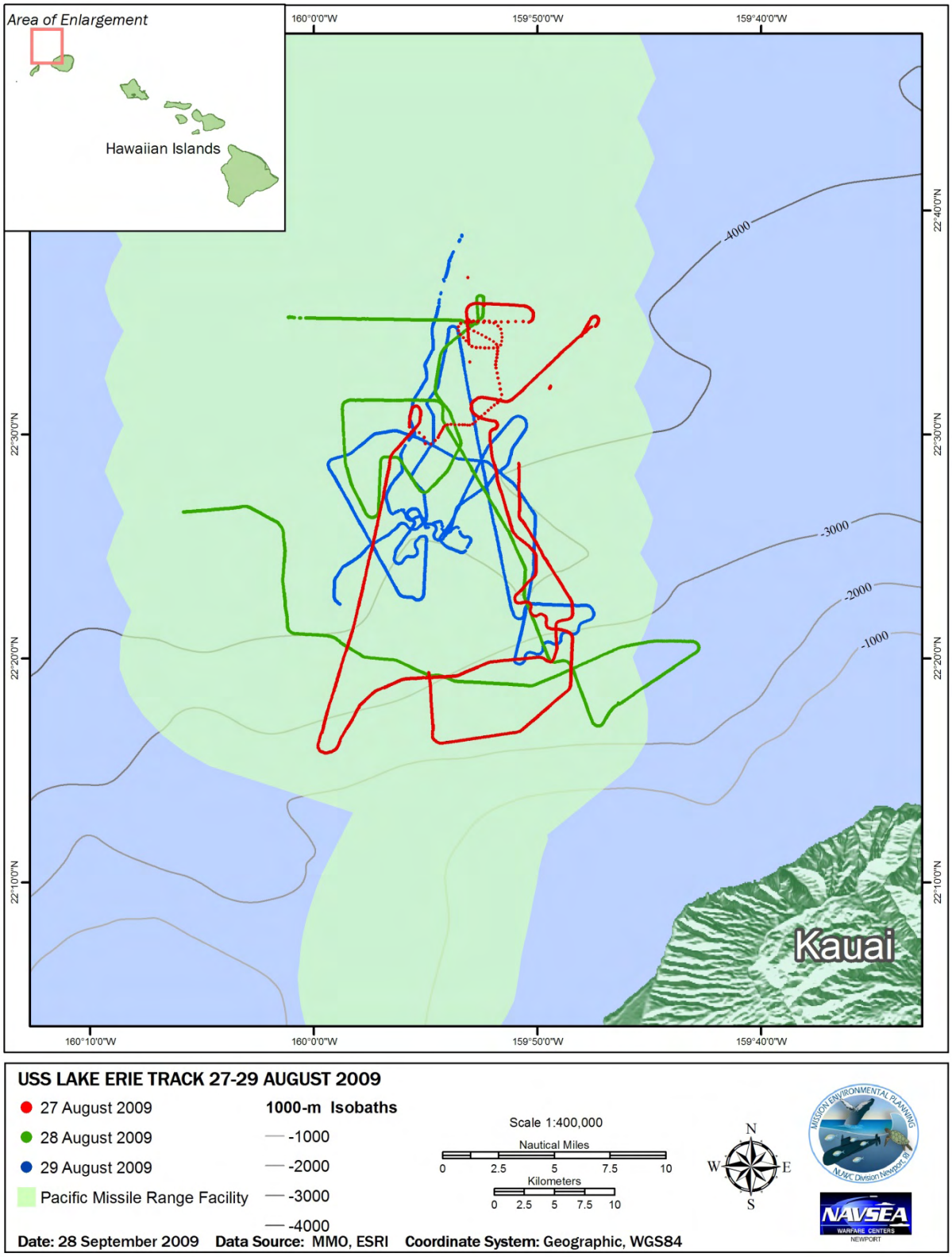

Figure 2. USS LAKE ERIE Ship Track

4.2 Aerial Marine Mammal Monitoring

Sightings and focal follow information will be reported by the contractor under a separate report.

SECTION 5: Conclusion

5.1 Marine Mammal Monitoring

The goals of the SCC 09-3 monitoring effort are provided below, with a conclusion regarding each of the goals:

4. Coordinate transit to the PMRF to allow LAKE ERIE and the survey aircraft opportunity to test communications and to familiarize the ship to the survey aircraft transect profiles

   The survey aircraft was scheduled to conduct pre-exercise surveys on the PMRF on the day prior to exercises commencement. LAKE ERIE was not on range during this period; therefore, no pre-exercise coordination occurred. VHF communication was coordinated during SCC 09-1 in February 2009, and the same procedures were expected. Pre-exercise coordination was unnecessary since VHF communications were established and verified each morning when the survey aircraft came on the range.

5. Collect data on marine mammals observed during operations
   a. Are marine mammals and sea turtles exposed to MFAS?

      No marine mammal or sea turtle sightings were obtained by LAKE ERIE MMOs during MFAS operations. Sea conditions and distance from prime marine mammal habitat severely limited the number of potential ship and aerial sightings during SCC 09-3 operations.

   b. If so, at what levels?

      No marine mammals or sea turtles were observed.

   c. Did exposed marine mammals/sea turtles show a behavioral response?

      No marine mammals or sea turtles were observed.

6. Achieve close coordination between the contracted aerial survey team, Navy aircraft on the range, range control, and the MMO team aboard LAKE ERIE to facilitate maximizing survey time and project safety

   Communication between the survey aircraft, MMOs, range control, and other aircraft was successful, maintaining safety of all participants.

5.2 Lessons Learned

Many lessons learned were noted for the SCC 09-3 exercise, and are separated into those for shipboard monitoring, aerial monitoring, and operational information below.

5.2.1 Shipboard Marine Mammal Monitoring

- Although MFAS is generally heard by the MMOs on the bridge wings, verification with the ship's and/or sonar logs is recommended to determine start and stop times of MFAS use.
- Observers tend to fatigue and lose focus after a couple hours, increased rotation is recommended. Recommend 3 observers per exercise, rotating at two hours on effort followed by one hour off effort.
- Improve access to VHF radio. A clip on the radio or an earphone would improve communications, as the radio often was difficult to hear given the wind noise on the bridge wing. The radio was either in hand (which has a potential for dropping) or in a pocket, which makes hearing the radio more difficult.
- Attending daily ship operations brief is highly recommended. It facilitates communication between the ship's officers and the MMOs and keeps the MMOs current on the daily operations of the ship.
- Use of a portable GPS allowed for easier access to ship's locations, without needing to enter the bridge. Plotting the ship track would also help verify locations of sightings, if made.

5.2.2 Operational Information

- Future marine mammal monitoring would be better suited to areas nearer prime marine mammal habitat to improve the cost effectiveness of the effort and during time periods of highest abundance.
- If passive detections of marine mammals are made by sonar, it would be beneficial to the MMOs (if time permits and it does not interfere with other duties). Especially in rough sea state, would help the MMOs focus their effort in a particular area. It may be helpful if the MMOs could wear headphones that are connected to the ships internal communication system such that sonar could report passive contacts.
- Identification of an alternate surface ship for MMO support is necessary during pre-exercise planning. Due to unexpected difficulties, the MMOs were notified at the pre-sail brief that the planned surface ship was unavailable to support the exercise. Having an alternate ship identified would reduce confusion immediately prior to embarkation.