APPENDIX B Marine Mammal Observer Explosives Monitoring

Part I:

Cruise Report Marine Mammal Observer UNDET Monitoring

Hawaii Range Complex, 15 July 2010

Prepared for: US Pacific Fleet

Prepared by: Dr. Robert K. Uyeyama and Dr Sean F Hanser, NAVFAC Pacific

1. INTRODUCTION

1.1 MONITORING PLAN

In order to train with mid-frequency active sonar (MFAS) and underwater explosives, the Navy consulted under the Endangered Species Act and has obtained a permit from the National Marine Fisheries Service (NMFS) under the Marine Mammal Protection Act. The Hawaii Range Complex (HRC) Monitoring Plan, finalized in December 2008, and modified in late 2009 was developed with NMFS to comply with the requirements under the permit. The monitoring plan and reporting for the HRC and other Navy ranges provides science-based answers to questions regarding whether or not marine mammals are exposed and reacting to Navy training. The study questions 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, do they redistribute geographically 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?

The Marine Mammal Observer (MMO) effort is intended to primarily address question 5, as well as potentially question 4.

1.2 UNDERWATER DEMOLITION

Purpose—To provide training in the identification and destruction or neutralization of inert ground mines and floating/moored mines and possibly excess ship hulks.

Description—Underwater demolition exercises are mainly training in the detection and explosive attack of inert, underwater mines. Tactics against ground or bottom mines involve the diver placing a specific amount of explosives, which when detonated underwater at a specific distance from a mine results in neutralization of the mine. Floating, or moored, mines involve the diver placing a specific amount of explosives directly on the mine.

Location—The activities for this exercise took place offshore in the Pu'uloa Underwater Range (called Keahi Point in prior RIMPAC Environmental Assessments), Pearl Harbor.

Duration—Each demolition activity generally lasts 1 to 4 hours.

Standard Procedures—All demolition activities are conducted in accordance with Commander Naval Surface Forces Pacific (COMNAVSURFPAC) Instruction 3120.8D, Procedures for Disposal of Explosives at Sea/Firing of Depth Charges and Other Underwater Ordnance (Department of the Navy, 1993). Before any explosive is detonated, divers are transported a safe distance away from the explosive and a thorough search is made of the area to identify marine mammals or sea turtles. If any are seen, the exercise is delayed for thirty minutes after the animals are last observed. Specifically, all mitigation measures as described in the MMPA permit and Hawaii Range Complex EIS are followed. Standard practices for tethered mines in Hawaiian waters require ground mine explosive charges to be suspended 3 meters (10 feet) below the surface of the water. For mines on the shallow water floor (less than 40 feet of water), only sandy areas that avoid/minimize potential impacts to coral would be used for explosive charges.

2. METHODS

2.1 MARINE MAMMAL OBSERVERS

MMO monitoring was conducted from a shipboard platform: a small rigid-hull inflatable boat (RHIB) less than 30 ft long, provided and piloted by Mobile Diving Salvage Unit One (MDSU-1). Two MMOs were on board, each equipped with a pair of 7x50 binoculars, watch, and access to VHF communications with the other boats. One MMO was the data recorder as well as a secondary observer, and was equipped with a clipboard with data entry sheets (Table 1) and a handheld chart-plotting marine GPS unit. The MMOs were on effort throughout the duration of the day, from the time of the vessel leaving the dock, until its return. All sightings by MMOs and Navy lookouts were recorded, as well as whether mitigation measures were followed. Monitoring surveys from other platforms were not conducted for this UNDET monitoring effort.

2.2 COMMUNICATIONS

Communication between MMOs and MDSU-1, and the other participating vessels (see "Results" below) were performed via VHF radio or direct communication with Navy personnel on the boat.

3. RESULTS

3.1 UNDET MONITORING PARTICIPANTS

MMOs

1. Julie Rivers - Commander, Pacific Fleet (CPF)
2. Robert Uyeyama – Naval Facilities Engineering Command Pacific (NAVFAC PAC)

Cooperating Naval Dive Teams

1. US Navy - Mobile Diving Salvage Unit 1 (MDSU-1)
2. Royal Australian Navy - Clearance Diving Team One
3. Royal Australian Navy - Clearance Diving Team Four
4. Canadian Forces Maritime Command - Canadian Fleet Diving Unit

Vessels Involved in UNDET exercise

1. 4X RHIB ~24 ft (one with 4 Navy MDSU personnel and 2 Navy Biologist MMOs)
2. 2X soft-bottom Zodiac, ~12 ft

3.2 DESCRIPTION OF ACTIVITY

MDSU-1, in cooperation with two diving units from the Royal Australian Navy and one from the Canadian Forces Maritime Command, performed one underwater detonation (UNDET) event each, for a total of four events, on 15 July 2010 in the center of the Pu'uloa underwater training area (Fig. 1) at N21º 17' 29", W157º 59' 14", approximately 1.7 nm from Keahi Point. GPS tracks of the MMO's RHIB are shown in Figure 2.

The intent of the exercises was for training in the disabling of limpet mines, which are mines typically attached magnetically to hulls or surfaces of vessels or structures. A simulated mine was attached to a 1.2 m x 1.5 m (4 ft x 5 ft) metal plate that was suspended underwater between an anchor and a set of two buoys (Fig. 3). The bottom depth of the training location was approximately 15 m. The diving teams were training in the application of an explosive device to disable limpet mines, as well as using the opportunity to observe the methods and protocols of the other participating diving units. Although similar in function, different devices were used by the various diving units. The MDSU-1 divers used a device known as the Limpet Mine Disposal Equipment (LMDE), whereas the Canadian and Australian divers used a Shock Wave Generator (SWAG) (Fig. 4). All of the devices used in the four detonations each contained 0.113 kg (0.25 lbs) net explosive weight (NEW). The UNDET exercise was one of a series of training events involving the cooperation of various Navy dive teams from the United States, Australia, and Canada as part of the multinational major training exercise Rim of the Pacific (RIMPAC).

A total of 6 boats participated together, four RHIBs and two soft-bottom Zodiacs, operated by the cooperating dive teams of the U.S., Australian, and Canadian navies (Fig. 5). The two MMOs were passengers on one of the RHIBs which also carried four members of MDSU-1, including the pilot. The MMO's RHIB departed the dock within Pearl Harbor at 10:11, and arrived at the training location at 10:28. The seastate remained at Beaufort 3 throughout the effort, with a swell height of ~1 m (3-4 ft) and winds of 0-2 kts. Cloud cover was 20% and visibility was excellent throughout the exercise.

During transit to the UNDET site, one green sea turtle was observed at approximately 10:20 at a distance of 5m to the port side of the vessel within the Pearl Harbor channel approximately a third of the distance between the two sets of channel buoys, i.e., just after Buoys 3 and 4, but before Buoys 1 and 2. No waypoint was taken, although the approximate location was N21º 18' 23" W157º 57' 35", which lies ~3.3 km from the training location (Fig. 1).

The RHIB with the MMOs on board was the final vessel to arrive at the training location. It arrived at 10:28, after the metal plate and its mooring buoy had already been placed by the teams from the other vessels. The first dive team was already in preparation for the first underwater detonation of the day. No marine mammals or sea turtles had been observed by the combined Navy dive teams near the UNDET site prior to the arrival of the MMO's RHIB. Because the vessel with the MMOs on board was not explicitly operating any of the detonation activities, it served as the primary Navy lookout vessel. The dive team vessels were arranged around the detonation location at ranges of approximately 0 to 150m in order to observe the UNDET procedures as well as to monitor the perimeter for animals and approaching civilian vessels. The largest distance between vessels was approximately 300m, therefore covering a wide area of observation. During the course of the day, three civilian vessels visible near the site were monitored, and one was intercepted in order to be directed away from the area. A secondary mission of the RHIB with the MMOs was also to visually confirm the location of a recently sunk tugboat (YTB) at the border of the Pu'uloa underwater training area at N21º 17' 05.9" W157 º 59' 24.5" (Fig. 1), where the participating dive units were scheduled to conduct further upcoming cooperative training during the course of RIMPAC. This transit also allowed the MMOs to conduct an informal survey of the intervening waters, along a transit route of length ~776m between the UNDET and YTB locations. No marine mammals or sea turtles were observed.

The RHIB returned to the UNDET site at 11:02, just after the execution of the first detonation (or "shot") at 11:00. As the NEW was small, no plume or surface disturbance was visible during the detonation as the RHIB approached, and no dead fish were observed at the surface upon subsequent examination. The subsequent three UNDET shots were performed at 11:29, 12:03, and 12:35, with the MMO's RHIB observing at a distance of ~75 m. As before, no surface disturbance or plume was visible due to the small explosive weight (Fig. 7). After all of the four scheduled UNDET shots were complete, at 12:37 the MMO's RHIB made one final inspection directly above the detonation location at the buoy, and no dead fish were observed. The buoys, metal plate, and anchors were removed by the Navy divers by 12:52 (Figs. 8, 9, 10, 11). The MMO's RHIB departed the site at 12:55. No marine mammals or sea turtles were observed in 360º scans using both naked eye and binoculars throughout the entire effort including the four detonation shots and subsequent collection of the equipment, nor were any reported by the Navy divers. Therefore no post-sighting monitoring periods were implemented, although the MMOs did verbally confirm that the MDSU-1 Navy divers were aware of the exclusion zone and the required 30 minute monitoring period should any marine mammals or sea turtles be sighted within it. During the return transit to Pearl Harbor, a green sea turtle was observed ~10m to port at 12:58. A GPS waypoint was recorded approximately 20 seconds after the sighting at N21º 17' 27.2" W157º 58' 36.9" (Fig. 1); the distance of this waypoint from the test location is 1.07 km. When accounting for the delay in recording the waypoint at an approximate vessel speed of 15 knots (approximately 155m), the distance of the sighting from the test location was ~ 915 m. The vessel returned to the dock at 13:10, and the Navy divers and two MMOs disembarked, for a total boat time of 2 hours 59 minutes.

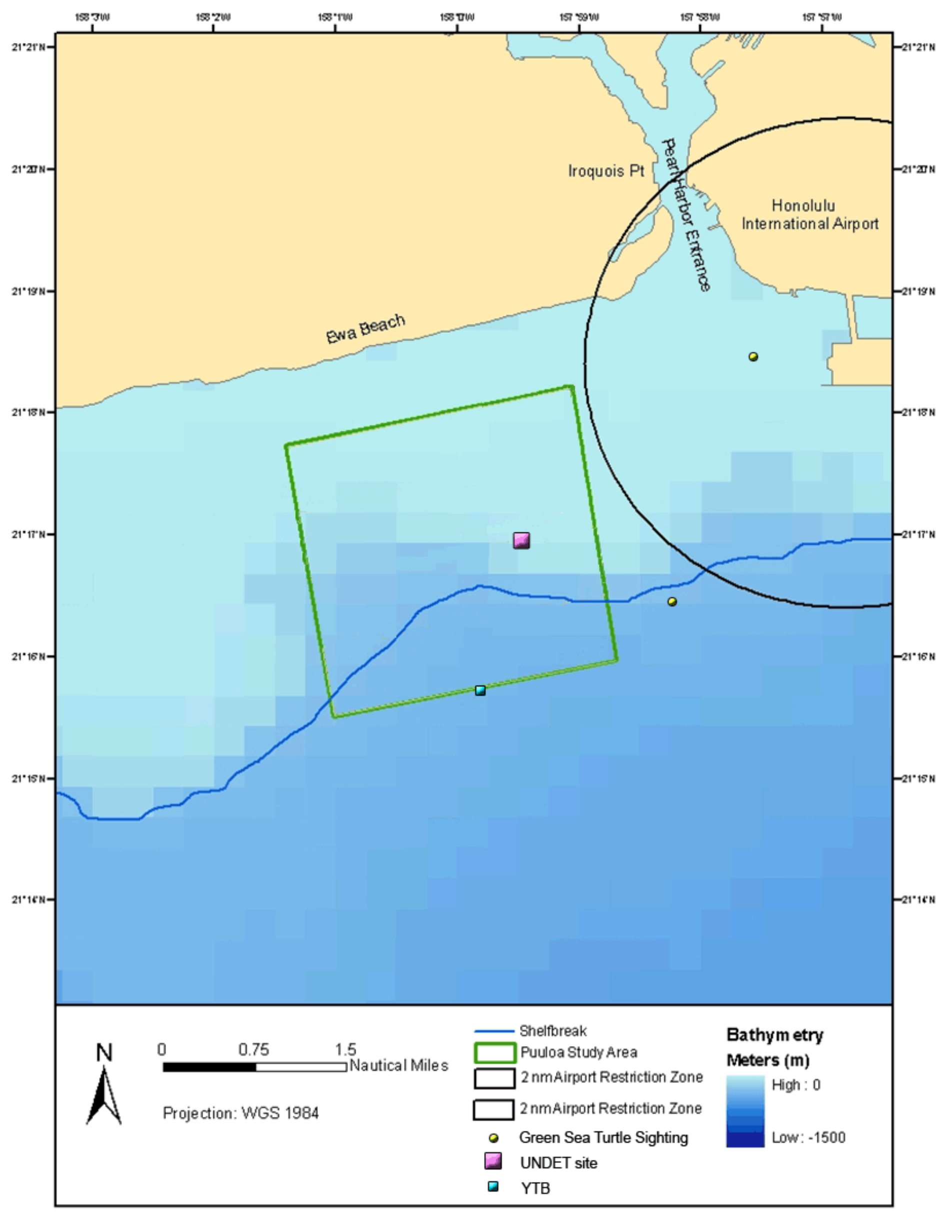

Figure 1. Map of UNDET site and sightings

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Figure 2. GPS Track of MMO's RHIB between dock and UNDET site – GPS tracks plotted onto Google Earth map

Figure 3. Surface buoys over the UNDET site

Figure 4. One of the two Australian units preparing for a SWAG limpet mine disabling exercise

Figure 5. Four of the vessels involved in the event (three RHIBs, and one Zodiac)

Figure 6. Intercepting approaching civilian vessel traffic after sighting it approaching the exercise area

Figure 7. Undisturbed water surface at the UNDET site at the moment as shot #4 occurs. In the foreground is an unrelated whitecap.

Figure 8. Approaching the site to prepare for collection of all exercise equipment

Figure 9. Retrieval of buoys

Figure 10. Retrieval of 4 ft x 5 ft metal plate

Figure 11. Retrieval of anchor

4. CONCLUSIONS

4.1 MARINE MAMMAL MONITORING

MDSU-1 was cooperative and instrumental with the coordination of placing MMOs on board for monitoring the UNDET events. In general, the UNDET training requires Navy divers to be vigilant with a number of safety considerations, not only for the environment, but for the personnel on board and civilians in the vicinity. Overall they knew the mitigation requirements well and followed them as described in the MMPA permit and Hawaii Range Complex EIS. The MMO time spent with the Navy divers help foster the understanding of why these mitigation measures are in place and how important these measures are to protecting marine life and Navy training. Protocols for the coordination of future UNDET monitoring efforts were also clarified.

4.2 RECOMMENDATIONS

This effort was valuable for the MMOs to observe an UNDET event comprised of multiple cooperating groups, as well as learning about the use of a smaller explosive charge (0.25 lb NEW) and different training context (limpet mine disabling) than previously observed. The UNDET monitoring from the previous year (2009) noted that typical sea turtle observations were made at ranges of ~40 yds, and dolphins at ~200 yds, such that monitoring near the perimeter of the 700 yd exclusion zone might result in missed observations near the UNDET location. During the current effort, the MMOs were able to monitor both the waters immediately adjacent to the

UNDET location and perform an opportunistic transit to the YTB examination to a point just outside the exclusion zone at 776 m before the first shot. During the transit the other vessels remained approximatly 0 – 150 yds away from the UNDET location in various directions. These vessels were able to observe the waters nearer to the UNDET location while the MMO platform was at the perimeter. Therefore, the 2009 recommendation that Navy lookouts focus monitoring near the UNDET site rather than primarily at the exclusion zone perimeter was followed. Although three of the vessels were participants from foreign navies all vessels monitored the water for the presence of civilian vessels and animals, and several civilian vessels were sighted and monitored. If fewer vessels are present, following circular paths at 100-200 yds from the UNDET site might be considered, as it would likely be an improvement over being stationary at that range, or following a perimeter scan a 700 yds. As no animals were sighted except outside the exclusion zone during the transits before and after the effort, the waiting periods were not required. The MMO's vessel was the first to leave the site at 20 minutes past the final detonation, although the other vessels remained longer than 30 minutes.

Two sightings of sea turtles were made during transits to and from the UNDET location, but due to the speed of the vessel, the cameras and GPS were not available for both. In the future, our recommendation is for the MMO to be ready to mark a waypoint immediately with the GPS device available even during transit, since the unit we used (Garmin GPSMap 640) is highly water resistant. If possible, a properly shielded camera could also be available during transits. This way, sightings that occur during the transit to and from the UNDET site, especially those within the exclusion zone, can be recorded. The MMO platform should also request staying at the site the full 30 minutes after the final detonation, even if other Navy vessels remain at the site.

5. ACKNOWLEDGEMENTS

We thank the officers and crew of MDSU-1, including but not limited to CDR Thomas Murphy, LCDR R. Leith Parslow, and CWO3 Chris Lehner, for their outstanding support and hospitality.

APPENDIX B (CONTINUED)

Part 2: Cruise Report Marine Mammal Observer SINKEX Monitoring

Hawaii Range Complex, 10 & 17 July 2010

Prepared for:
Commander, Pacific Fleet

Prepared by:
Sean Hanser and Robert Uyeyama, NAVFAC Pacific

1. INTRODUCTION

In order to train with mid-frequency active sonar (MFAS) and underwater explosives, the Navy consulted under the Endangered Species Act and has obtained a permit from the National Marine Fisheries Service (NMFS) under the Marine Mammal Protection Act. The Hawaii Range Complex (HRC) Monitoring Plan, finalized in December 2008, and modified in late 2009 was developed with NMFS to comply with the requirements under the permit. The monitoring plan and reporting for the HRC and other Navy ranges provides science-based answers to questions regarding whether or not marine mammals are exposed and reacting to Navy training. The study questions 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 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?

The SINKEX monitoring effort is intended to provide data towards answering questions 4 and 5 above.

2. METHODS

2.1 SINKEX DESCRIPTION

The purpose of the sinking exercise (SINKEX) is to train personnel and test weapons against a full-size ship. Each SINKEX uses an excess vessel hulk as a target that is eventually sunk during the course of the exercise. Any exercise that normally uses a surface target, such as a Gunnery Exercise (GUNNEX) or a missile exercise (MISSILEX)—for example an air to surface missile exercise (ASMEX) or Surface-to-Surface Missile Exercise (SSMEX)-- can be a part of the SINKEX. The hulk ship is towed to a designated location (Fig. 1) where various platforms would use multiple types of weapons to fire shots at the hulk. Platforms can consist of air, surface, and subsurface elements. Weapons can include missiles, precision and non-precision bombs, gunfire and torpedoes. If none of the shots result in the hulk sinking, either a submarine shot or placed explosive charges is used to sink the ship. Charges ranging from 45 to 90 kilograms (100 to 200 pounds), depending on the size of the ship, would be placed on or in the hulk for this purpose.

The vessels used as targets are selected from a list of U.S. Environmental Protection Agency (EPA) approved destroyers, tenders, cutters, frigates, cruisers, tugs, and transports (Department of the Navy and U.S. Environmental Protection Agency, 1996). Vessel hulks that are used must have all hazardous material removed and be approved by EPA in accordance with the memorandum of agreement and the SINKEX permit (40 CFR 220-225, 227-229). In general, examples of missiles that could be fired at the targets include AGM-142 from a B-52 bomber, Walleye AGM-62 from FA-18 aircraft, and a Harpoon from a P-3C aircraft. Surface ships and submarines may use either torpedoes or Harpoons, surface-to-air missiles in the surface-to-surface mode, and guns. Other weapons and ordnance could include, but are not limited to, bombs, Mavericks, Penguins, and Hellfire warheads.

SINKEX is conducted at an approved site (minimum depth 1,800 meters [5,905 feet], at least 93-111 kilometers [50-60 nautical miles] northwest from shore) within PMRF Warning Area W-188 (Fig. 2). The exercise generally lasts 3 to 8 hours.For RIMPAC 2010, three SINKEXs were performed, with marine mammal and sea turtle monitoring studies conducted during the first and the third events. These SINKEX events occurred on 10 July and 17, respectively.

Figure 1. The former USS Anchorage being towed. The hulk utilized for the 17 July SINKEX is seen here on 15 July as it is towed from Pearl Harbor to the SINKEX site.

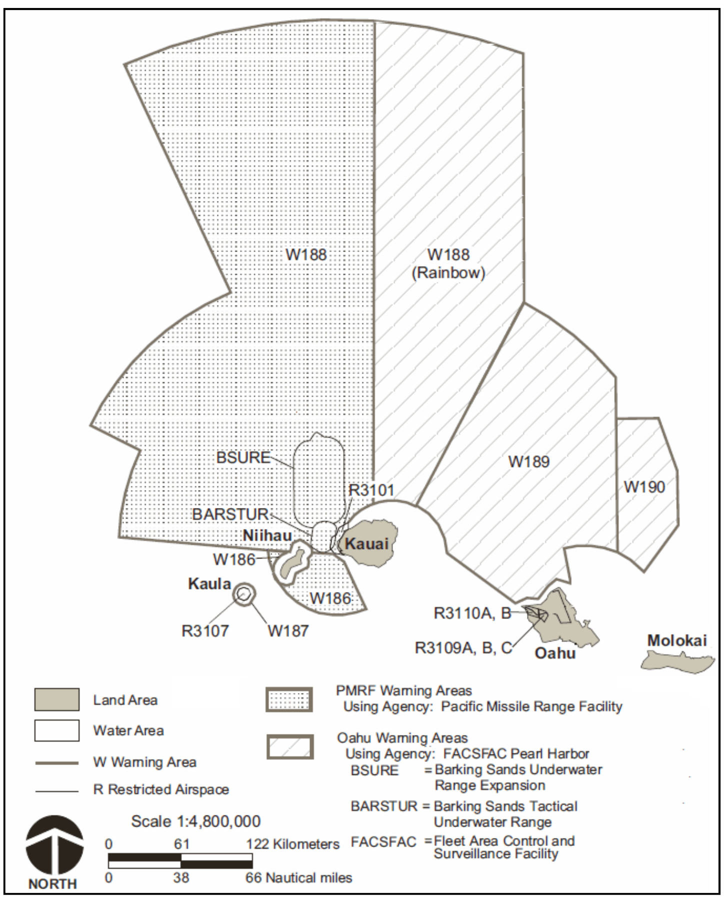

Figure 2. Depiction of PMRF Warning Area W-188 in relation to Hawaiian Islands

2.2 MARINE MAMMAL AND SEA TURTLE OBSERVERS

Monitoring by marine mammal observers (MMO) was conducted from Sikorsky S-61N helicopter platforms (Fig. 3) operated by Croman Corporation, flying from Barking Sands PMRF airfield. The helicopters' primary mission during the SINKEX was to provide an Extended Range Video System (ERVS) live video feed of the exercise to the operations center, as well as video and still photography material for incorporation into Navy media products. For this mission, the helicopters normally carry a total of five personnel: two pilots, one aircrew, and two ERVS operators consisting of the videographer and his assistant, for a total of three riders within the passenger cabin. For the marine mammal and sea turtle monitoring, either one or two Navy civilian biologists also rode on board in the passenger cabin. The biologist observers were equipped with digital still cameras and 7x hand-held binoculars. Additionally, one observer was equipped with a hand-held GPS device to record tracks and waypoints. Due to the mission requirement of providing a near-continuous video feed, a pair of helicopters rotated in the ERVS task. When one helicopter had expended enough fuel to be required to leave the exercise area to transit back to Barking Sand PMRF airfield for refueling, the alternate helicopter had already transited to the exercise location to continue the ERVS mission seamlessly. One MMO was placed in each of these two helicopters to provide maximum monitoring time from this platform. On the second monitored SINKEX on 17 July, both MMOs flew aboard the final flight for a total of five people in the passenger cabin, as it was not overlapping to a previous flight due to operational details, and was also known to be the final flight of the day.

Figure 3. Sikorsky S-61N helicopter used by MMOs. The second open door on the right (with no stairway) was used by the ERVS videographer; the rear door was secured closed during ERVS. The

open window at center between the two doors was open for the duration of the flight, as was a similar window on the opposite side.

2.3 SAFETY AND COMMUNICATION

The helicopter was flown at a prescribed safe altitude and distance from the hulk according to instruction from range control during the period before, during, and after live firing exercises upon the hulk. These standoff distances and altitudes varied according to the ordnance utilized in each portion of the exercise. Range control also deconflicted airspace with P3 aircraft that also participated in the exercise. After scheduled discharge of weapons upon the hulk was complete, the helicopter was cleared by range control to transit to the hulk to perform Battle Damage Assessment (BDA) mode for ERVS. BDA is a detailed visual inspection of damage resulting from the weapons, in the form of videography and photography performed while circling the hulk at close range and an altitude as low as 100m. After BDA, the helicopter ascended to a safe altitude and standoff distance for the subsequent portion of the exercise, and continued as above until relieved by the other ERVS helicopter.

Prior to participating in the monitoring event, the MMOs completed mandatory Helicopter Underwater Egress training instructed by Survival Systems at Marine Corps Base Hawaii (MCBH) consisting of two days of classroom and in-water training on 1-2 June 2010. In-water training included Shallow Water Egress Training (SWET), as well as a Modular Egress Training Simulator (METS) using blacked-out goggles, rifle, flak-jacket, two- or four-point seat belts, and a Helicopter Aircrew Breathing Device (HABD). Additional training acquired by the MMOs in the course included egress from an airborne platform, activating and operating life jackets, assembling and operating life rafts, operating survival equipment, and individual as well as group in-water survival techniques.

For the SINKEX monitoring flights, the MMOs were provided by Croman with life vests equipped with survival equipment including HABDs. Additionally flight suits, helmets, gloves, and communications headsets were provided. The helicopters were also outfitted with mandatory safety equipment. A mandatory safety briefing was attended before each day of flights. The MMOs were seated in the passenger cabin with seat belts, and were also equipped with a helicopter aircrew harness, which attached the MMOs to a webbing strap affixed to the interior attachment points on the ceiling of the cabin. The MMOs were restrained by seat belts for take-off, landing, and transits, but were unbelted and free to move within the cabin during ERVS and monitoring at the site. The aircrew harness was necessary because one of the doors was fully latched open (Fig. 4) during all times that the videographer was active during ERVS, at altitudes up to 10,000 ft. This door was secured when the ERVS task was inactive.

Communication between MMOs with the pilots and the other crew was by aviation headsets. The pilots maintained direct radio communication with the operations center and range controllers.

Figure 4. Extended Range Video System (ERVS). Videographer (right) is operating through an open door during flight. Note webbing restraints from ceiling attached to harnesses of all occupants. The MMO (left) was able to stand and move within the cabin to view the water through several windows on both sides of the craft, as well as through the open door.

3. RESULTS

For the two monitored SINKEXs, the hulks utilized as targets were:

1) 10 July: Former USS New Orleans (LPH-11) helicopter landing platform amphibious assault ship

2) 17 July: Former USS Anchorage (LSD-36) dock landing ship.

3.1 MONITORING FROM THE HELICOPTER

For both events, one MMO rode aboard each of a pair of Sikorsky S-61N helicopters operated by Croman Corporation, flying from Barking Sand PMRF airfield. As described above, a pair of two helicopters rotated flight shifts to provide continuous coverage of the event (Fig. 5). The helicopters transited to the exercise site, then began performing ERVS while flying at a safe standoff distance and altitude. One MMO was equipped with a hand-held GPS device, and tracks from the flights were recorded, but not all portions of all flights were recorded due to limited battery life of the unit (Figs. 6, 7). Because the hulk was unanchored at the beginning of the exercise, it drifted in position during the course of the exercise (e.g., Fig. 6). ERVS was performed by videographer seated in front of a cabin door that was latched open at the right front of the passenger cabin. The videographer's assistant helped with positioning the videographer, as well as occasionally taking digital still photographs. The pilots maneuvered the aircraft to allow the videographer a view of the hulk from his position at the open door. The MMO was able to move within the cabin, and was therefore able to view the hulk and the waters surrounding it from behind or below the videographer, and were also able to utilize several windows on the same side of the aircraft, one of which was open (Fig. 8). Because the aircraft was almost always level, the

MMO was also able to view the water from the open and several closed windows on the opposite (left) side of the aircraft.

Figure 5. Helicopter rotation. ERVS helicopter with MMO aboard (above right) flying near the hulk, as viewed from the second ERVS-MMO helicopter during a rotation between shifts

Figure 6. Tracks for two flights on 10 July. Right: 0847-1149 flight, Left: 1430-1730 (track ends at 16:15). Note drift of hulk between flights, which is unanchored during course of the exercise. Second track truncated due to limited battery capacity of GPS device. GPS tracks are plotted onto Google Earth maps.

Figure 7. Track for one flight on 17 July. 0830-1212 flight. GPS tracks are plotted onto Google Earth maps.

Figure 8. Open window. Monitoring could be conducted and photographs could be taken through the open door, two open windows, or other windows, without interfering with the ERVS crew.

3.2 MONITORING TIME

The MMOs performed 27 hrs 27 min of monitoring in total across both SINKEX exercises on 10 July and 17 July (Table 1). On 10 July, sunrise was approximately at 0602 (as computed by the NOAA Earth Systems Research Laboratory Sunrise/Sunset Calculator (http://www.srrb.noaa.gov/highlights/sunrise/sunrise.html), and the first ERVS helicopter departed the airfield at 0847 then arrived at the hulk at 0935, before the first discharge of ordnance at the hulk. On 17 July, sunrise was approximately at 0604, and the first ERVS departed the airfield at 0830, briefly returned to the airfield due to range fouling, departed again at 0925, and arrived at approximately 0955, also before the first discharge of ordnance. Therefore the beginning of firing ordnance at the hulk during both events occurred well past one hour after sunrise, in accordance with mitigations requirements. The sinking of the hulks due to damage sustained from the live fire exercises was observed on the final ERVS flight of both days. On 10 July, the hulk sank during BDA after a gunnery exercise. On 17July, the hulk sank during BDA after a torpedo exercise.

Range clearance and surveillance operations were conducted by P3 aircraft, and not by the ERVS helicopters.

Table 1. MMO monitoring times

10 July				17 July			
MMO 1		MMO 2		MMO 1		MMO 2	
0847-1139	2 hr 52 min	1035-1343	3hr 08 min	0830-1215	3 hr 45 min	1136-1452	5 hr 16 min
1225-1345*	1 hr 20 min	1430-1730	3hr 00 min	1640-1924	2 hr 44 min	1640-1924	2 hr 44 min
1623-1901	2 hr 38min	-		-		-	
Subtotal 6 hr 50 min		Subtotal 6 hr 08 min		Subtotal 6 hr 29 min		Subtotal 8 hr 00 min	
Overall total: 27 hr 27 min							

Times represent in-air time from “wheels-up” to “wheels-down”; MMOs rode in separate aircraft except for the final flight of 17 July.

*Rotation was ended early due to safety requirements of upcoming use of laser-guided munitions during exercise

Figure 9. Sinking of hulks. MMOs observed the SINKEX exercise from the ERVS helicopters until the hulks were sunk: views from BDA. Top:10 July (former USS New Orleans). Bottom: 17 July (former USS Anchorage).

3.3 VISIBILITY AND SIGHTINGS

Beaufort sea state at the site on 10 July was generally between 4 and 6, with the exception of sea state ranging between 3 and 5 on the first flight of the day. Sea state on 17 July ranged from 3 to 5. Proportion of unit time observed for each sea state was not computed, because it was judged that the observers' sea state estimates from the wide variety of altitudes traveled (~300 ft to 10,000 ft; ~91 m to 3,048 m) were likely not to be consistent enough for tabulation. Sightability of marine mammals and turtles within the exercise mitigation zones (i.e., exclusion zone, buffer zone, and safety zone) was judged to decrease in proportion to increasing altitude and distance of the helicopter from the hulk. Cloud cover was generally not an issue because the ERVS mission required the pilots to attempt to maintain a clear line of sight to the hulk, even when flying above the cloud layer. On 10 July the cloud cover ranged from 30% to 100%, although the helicopter was maneuvered such that the hulk was visible >~90% of the time; the exception was first flight of the day which began with 100% cloud cover, but began to show enough breaks through which to view the hulk by the time of the first ordnance shots. On 17 July the cloud cover at the hulk ranged from 20% to 50%. During BDAs, the helicopter flew below the cloud cover near the hulk.

Safe altitudes flown by the ERVS helicopters were: 1) 10,000 ft (3,048 m) for discharge of AGM-65 Maverick missiles; 2) ~6,000-6,500 ft (1,828 – 1,981 m) for other types of missiles such as the AGM-84 Harpoon or AGM-88 HARM; 3) For the firing of the MK-48 torpedo from a submarine, the helicopter flew at an altitude of 2,000 ft (610 m) at a distance of 1 nautical mile on the disengaged side (behind) of the submarine; 4) For the GUNNEX (5-inch guns), the helicopter flew on the disengaged side of the firing surface ships (Fig. 10).

After all shots were completed, and clearance given by range control, the ERVS helicopter descended and approached the hulk for BDA, beginning by slowly circling and overflying the hulk at an altitude of approximately 300 ft, and incrementally circling around the hulk at successively higher altitudes up to 3,000 ft. One live fire portion upon the hulk that was not monitored was the discharge of laser-guided bombs from B-52 aircraft, due to the reason that the personnel and pilots aboard the ERVS helicopter were not equipped with laser-safety gear. The ERVS helicopter returned to the airfield until after this bombing exercise was complete, and then returned to the site of the hulk to conduct BDA.

No sightings of marine mammals or sea turtles were made by the MMOs, helicopter pilots and crew, or by the other subsurface, surface and aerial exercise participants. The events of these SINKEX exercises were therefore not ceased, delayed, or modified by marine mammal or sea turtle sightings, as would be required under mitigation guidelines.

Figure 10. Helicopter position for GUNNEX. ERVS helicopter with MMO aboard departing the

exercise site during preparation for a gunnery exercise (GUNNEX) upon the hulk, as viewed from the second helicopter during rotation between ERVS shifts. Helicopters were position on the disengaged side of the surface ships.

4. CONCLUSIONS

4.1 MARINE MAMMAL AND SEA TURTLE MONITORING

Range operations at Pacific Missile Range Facility, as well as the pilots, aircrew, and staff at Croman Corporation were cooperative and instrumental with the coordination of placing MMOs on board for monitoring the SINKEX events, including the safety requirements for helicopter "dunker" over-water emergency egress training for the MMOs. Dialogue with range operations before the event confirmed that the operators knew the mitigation requirements well and followed them as described in the MMPA permit and Hawaii Range Complex EIS. Protocols for the coordination of future SINKEX monitoring efforts were also clarified. Range clearance and surveillance operations were conducted by P3 aircraft, and not by the ERVS helicopters that the MMOs rode aboard. However if marine mammal and sea turtle sightings were made by the MMOs, these could be communicated via the ERVS pilots to range control.

The Battle Damage Assessment (BDA) portions of the flight were performed at low altitude combined with slow speeds, and therefore were judged by the MMOs to provide excellent observer coverage and sightability of the mitigation radius surrounding the hulk. Live, injured or dead marine mammals or sea turtles would likely be detected due to the low altitude and the helicopter's slow and continuous circular flight pattern around the hulk. Due to the close range of the helicopter to the hulk during BDA, observational effort for marine mammals and sea turtles were possible on both the sides of the aircraft, including the side facing the hulk for ERVS, as well as the opposite side. BDA began at approximately 300 ft (Fig. 11), an altitude lower than the 800-1000 ft typically used for aerial marine mammal and sea turtle surveys, then continued to rise in altitude with each circular path around the hulk to 2,000 ft and above, until reaching the safe altitude required for the next phase of the exercise. The groundspeed of the aircraft during BDA varied, but was always well below the typical 100 kts flown for aerial marine mammal surveys. Although no marine mammals or sea turtles were sighted during BDA, details such as flying sea birds and floating surface debris were easily detectable. (Figs. 12, 13)

At 2,000 ft altitude, isolated sea turtles and small marine mammals would likely not be visible even with hand-held 7x binoculars, and only larger marine mammals or larger groups of smaller marine mammals would be detectable with binoculars or naked eye, with the chances of detection becoming successively smaller at higher altitudes. At the higher altitudes of 6,000-10,000 ft used for safety during missile exercises, although it was judged possible that a large whale or a particularly large aggregation of marine mammals might be detectable with excellent sea state and little cloud cover using binoculars, it was deemed unlikely and not ideal for continuous monitoring for marine mammals and sea turtles (Figs. 14, 15); the same evaluation was given to sightability during gunnery and torpedo exercises due to the standoff distance on the disengaged side of the firing vessels (Figs. 16, 17). Details that were discernable included the impact of ordnance used during the exercise and the resulting smoke cloud, as well as any discoloration of the surrounding water (Fig. 18).

Therefore from the ERVS helicopter platform, the successive BDA segments between each shooting component of the SINKEX provided the MMOs with the best opportunity to monitor the exclusion zone surrounding the hulk in a periodic, serial fashion through the conduction of the exercise.

Video footage taken during the exercise will be provided for review, which may provide additional data.

Figure 11. Sightability during Battle Damage Assessment (BDA). Viewing damage to the former USS New Orleans. The two photographs show the low altitude flown during BDA, providing a close view of the water. The open door at the ERVS videographer is an excellent viewing option for the MMO, in addition to the cabin windows on both sides of the aircraft.

Figure 12. Seabird sighted during BDA. One sea bird sighting was made during BDA across both days. A red-tailed tropicbird (Phaethon rubricauda) was sighted near the hulk during one Battle Damage Assessment on 10 July. It was judged by the MMOs that any marine mammals and sea turtles within the mitigation radius similarly would be visible during the performance of BDA.

Figure 13. Debris sighted during BDA. Small pieces of debris were visible at the surface of the water near the hulk during Battle Damage Assessment. It was judged by the MMOs that any marine mammals and sea turtles within the mitigation radius similarly would be visible during the performance of BDA.

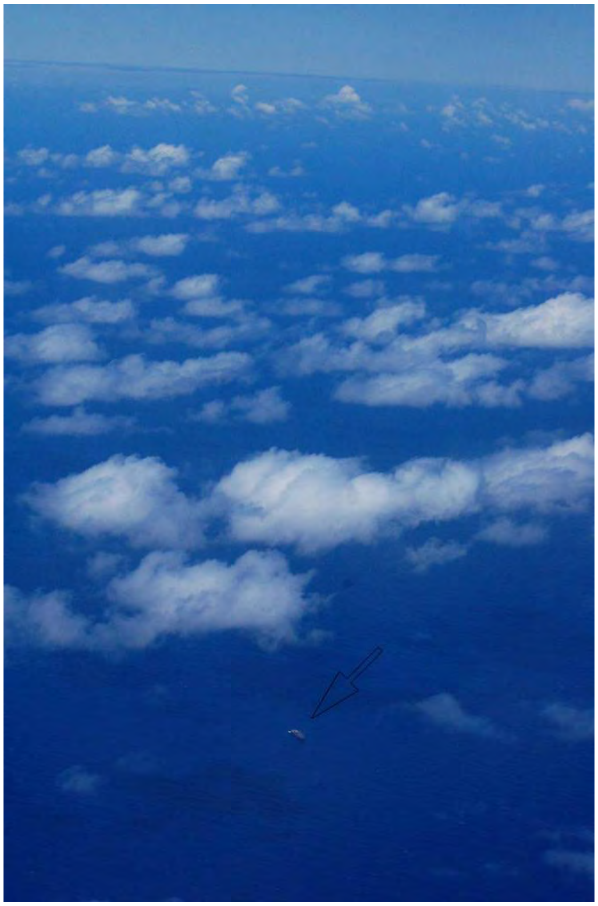

Figure 14. Sightability from 10,000 ft. Top: wide-angle view from 17 July showing hulk (indicated by arrow), cloud layer, and horizon. Bottom: full frame view from a 300mm digital SLR camera during missile impact.

Figure 15. Sightability from 6,000ft. Top: wide-angle view from 10 July showing hulk, cloud layer, and the bottom of the open helicopter door. Bottom: full frame view from a 300mm digital SLR camera.

Figure 16. Sightability during GUNNEX. Safety dictated flight on the disengaged side of the firing surface ships during gunnery exercises (GUNNEX) 10 July. Top: wide view of the surface ships; the hulk (former USS New Orleans) is visible at top right of photo. Bottom: full frame view from a 300mm digital SLR camera.

Figure 17. Sightability during torpedo exercise. Top: wide-angle view from 17 July showing hulk, submarine (center foreground), and P3 aircraft. Bottom: full frame view from a 300mm digital SLR camera during torpedo impact.

Figure 18. Discoloration of water. Wide angle photograph taken during descent to perform BDA, 17 July. Surface debris is also visible. Discoloration was originally sighted prior to BDA.

4.2 RECOMMENDATIONS

This effort was valuable for the MMOs to observe a SINKEX event comprised of multiple cooperating groups, as well as observing the discharge of different types of ordnance, including several missile types, guns, bombs, and torpedoes, as fired from surface ships, aircraft, and submarines. The BDA phase of the ERVS mission provided the MMOs with a clear view of the water within the mitigation area surrounding the hulk. Knowledge of the length of the hulk afforded a convenient reference with which to judge the mitigation area distances. Observational coverage during BDA was somewhat improved when two MMOs were aboard the same flight, since this format allowed one observer each to look out on both sides of the aircraft, scanning a view of the water towards, as well as away from, the hulk. However even with a single MMO, all waters within the mitigation area eventually became visible even when viewing from a single side of the aircraft, due to the circular path around the hulk continuously affording a good view of the waters between the aircraft and the hulk, as well as immediately beyond the hulk.

Due to safety considerations of altitude and distance, the MMOs were not able to monitor the mitigation area effectively from the ERVS platform during the portions of the flight during, and in preparation for, the firing of ordnance. Also, because the ERVS mission was not intended to provide range clearance, the MMOs were unable to evaluate the primary range clearance and surveillance activities conducted by aircraft such as the P3s. It is possible that MMO presence aboard these craft might provide information regarding the effectiveness of these measures. However, it is unlikely that MMOs aboard the P3s would have as good an observational opportunity between shots as an ERVS helicopter during BDA, due to the helicopters' particularly low altitude and groundspeed during BDA. Therefore MMO presence on both the range clearing/surveillance platform as well as all rotations of the ERVS platform should be considered for the monitoring of future SINKEX events.

5. ACKNOWLEDGEMENTS

We thank the staff at PMRF range operations, Croman Corporation, and Survival Systems for their outstanding support and hospitality in preparation for, and during the exercises.