APPENDIX A
Navy Activity Descriptions

This page intentionally left blank.

Final
Environmental Impact Statement/Overseas Environmental Impact Statement
Atlantic Fleet Training and Testing

TABLE OF CONTENTS

APPENDIX A NAVY ACTIVITY DESCRIPTIONS ____ A-1

A.1 Description of Sonar, Munitions, Targets, and Other Systems Employed in Atlantic Fleet Training and Testing Events ____ A-1

A.1.1 Sonar Systems and Other Acoustic Sources ____ A-1
A.1.2 Munitions ____ A-7
A.1.3 Targets ____ A-11
A.1.4 Defensive Countermeasures ____ A-12
A.1.5 Mine Warfare Systems ____ A-13
A.1.6 Military Expended Materials ____ A-15

A.2 Training Activities ____ A-16

A.2.1 Major Training Exercises ____ A-17
A.2.1.1 Composite Training Unit Exercise ____ A-17
A.2.1.2 Fleet Exercise/Sustainment Exercise ____ A-20
A.2.2 Integrated/Coordinated Training ____ A-22
A.2.2.1 Navy Undersea Warfare Training Assessment Course ____ A-22
A.2.2.2 Surface Warfare Advanced Tactical Training ____ A-24
A.2.2.3 Anti-Submarine Warfare Tactical Development Exercise ____ A-26
A.2.2.4 Amphibious Ready Group Marine Expeditionary Unit Exercise ____ A-28
A.2.2.5 Group Sail ____ A-30
A.2.3 Air Warfare Training ____ A-32
A.2.3.1 Air Combat Maneuver ____ A-32
A.2.3.2 Air Defense Exercise ____ A-34
A.2.3.3 Gunnery Exercise Air-to-Air Medium-Caliber ____ A-35
A.2.3.4 Gunnery Exercise Surface-to-Air Large-Caliber ____ A-37
A.2.3.5 Gunnery Exercise Surface-to-Air Medium-Caliber ____ A-39
A.2.3.6 Missile Exercise Air-to-Air ____ A-41
A.2.3.7 Missile Exercise – Man-Portable Air Defense System ____ A-44
A.2.3.8 Missile Exercise Surface-to-Air ____ A-46
A.2.4 Amphibious Warfare Training ____ A-48
A.2.4.1 Amphibious Assault ____ A-48
A.2.4.2 Amphibious Marine Expeditionary Unit Integration Exercise ____ A-50

A.2.4.3 Amphibious Raid A-51
A.2.4.4 Amphibious Vehicle Maneuvers A-53
A.2.4.5 Humanitarian Assistance Operations A-54
A.2.4.6 Marine Expeditionary Unit Certification Exercise A-55
A.2.4.7 Naval Surface Fire Support Exercise – At Sea A-57
A.2.4.8 Naval Surface Fire Support Exercise – Land-Based Target A-59
A.2.5 Anti-Submarine Warfare Training A-61
A.2.5.1 Torpedo Exercise – Helicopter A-62
A.2.5.2 Torpedo Exercise – Maritime Patrol Aircraft A-64
A.2.5.3 Torpedo Exercise – Ship A-66
A.2.5.4 Torpedo Exercise – Submarine A-68
A.2.5.5 Tracking Exercise – Helicopter A-70
A.2.5.6 Tracking Exercise – Maritime Patrol Aircraft A-72
A.2.5.7 Tracking Exercise – Submarine A-74
A.2.5.8 Tracking Exercise – Ship A-76
A.2.6 Electronic Warfare A-78
A.2.6.1 Counter Targeting Chaff Exercise – Aircraft A-78
A.2.6.2 Counter Targeting Chaff Exercise – Ship A-80
A.2.6.3 Counter Targeting Flare Exercise A-82
A.2.6.4 Electronic Warfare Operations A-84
A.2.6.5 High-Speed Anti-Radiation Missile Exercise (Air-to-Surface) A-86
A.2.7 Expeditionary Warfare A-88
A.2.7.1 Dive and Salvage Operations A-88
A.2.7.2 Maritime Security Operations – Anti-Swimmer Grenades A-89
A.2.7.3 Personnel Insertion/Extraction – Air A-91
A.2.7.4 Personnel Insertion/Extraction – Surface and Subsurface A-93
A.2.7.5 Personnel Insertion/Extraction – Swimmer/Diver A-94
A.2.7.6 Underwater Construction Team Training A-95
A.2.8 Mine Warfare A-96
A.2.8.1 Airborne Mine Countermeasure – Mine Detection A-96
A.2.8.2 Airborne Mine Countermeasure – Towed Mine Neutralization A-98
A.2.8.3 Civilian Port Defense – Homeland Security Anti-Terrorism/Force Protection Exercise A-100
A.2.8.4 Coordinated Unit-Level Helicopter Airborne Mine Countermeasures Exercise A-102
A.2.8.5 Mine Countermeasures – Ship Sonar A-104
A.2.8.6 Mine Countermeasures – Mine Neutralization – Remotely Operated Vehicle A-106

A.2.8.7 Mine Laying A-108
A.2.8.8 Mine Neutralization – Explosive Ordnance Disposal A-110
A.2.8.9 Underwater Mine Countermeasure Raise, Tow, Beach and Exploitation Operations A-112
A.2.9 Surface Warfare Training A-114
A.2.9.1 Bombing Exercise Air-to-Surface A-114
A.2.9.2 Fast Attack Craft and Fast Inshore Attack Craft A-116
A.2.9.3 Gunnery Exercise Air-to-Surface Medium-Caliber A-118
A.2.9.4 Gunnery Exercise Air-to-Surface Small-Caliber A-120
A.2.9.5 Gunnery Exercise Surface-to-Surface Boat Medium-Caliber A-122
A.2.9.6 Gunnery Exercise Surface-to-Surface Boat Small-Caliber A-124
A.2.9.7 Gunnery Exercise Surface-to-Surface Ship Large-Caliber A-126
A.2.9.8 Gunnery Exercise Surface-to-Surface Ship Medium-Caliber A-128
A.2.9.9 Gunnery Exercise Surface-to-Surface Ship Small-Caliber A-130
A.2.9.10 Integrated Live Fire A-132
A.2.9.11 Laser Targeting – Aircraft A-134
A.2.9.12 Laser Targeting – Ship A-135
A.2.9.13 Maritime Security Operations A-136
A.2.9.14 Missile Exercise Air-to-Surface A-138
A.2.9.15 Missile Exercise Air-to-Surface – Rocket A-140
A.2.9.16 Missile Exercise Surface-to-Surface A-142
A.2.9.17 Sinking Exercise A-144
A.2.10 Other Training Exercises A-146
A.2.10.1 Elevated Causeway System A-146
A.2.10.2 Precision Anchoring A-148
A.2.10.3 Search and Rescue A-149
A.2.10.4 Submarine Navigation A-151
A.2.10.5 Submarine Sonar Maintenance and Systems Checks A-153
A.2.10.6 Submarine Under Ice Certification A-154
A.2.10.7 Surface Ship Object Detection A-155
A.2.10.8 Surface Ship Sonar Maintenance and Systems Checks A-157
A.2.10.9 Waterborne Training A-158
A.3 Testing Activities A-160
A.3.1 Naval Air Systems Command Testing Activities A-160
A.3.1.1 Air Warfare A-160
A.3.1.2 Anti-Submarine Warfare A-170
A.3.1.3 Electronic Warfare A-181
A.3.1.4 Mine Warfare A-187

A.3.1.5 Surface Warfare A-197
A.3.1.6 Other Testing Activities A-208
A.3.2 Naval Sea Systems Command Testing Activities A-218
A.3.2.1 Anti-Submarine Warfare A-218
A.3.2.2 Electronic Warfare A-233
A.3.2.3 Mine Warfare A-235
A.3.2.4 Surface Warfare A-241
A.3.2.5 Unmanned Systems A-251
A.3.2.6 Vessel Evaluation A-258
A.3.2.7 Submarine Sea Trials – Weapons System Testing A-277
A.3.2.8 Other Testing A-283
A.3.3 Office of Naval Research Testing Activities A-298
A.3.3.1 Acoustic and Oceanographic Science and Technology A-298

List of Figures

Figure A.1-1: Principle of an Active Sonar A-2
Figure A.1-2: Guided Missile Destroyer with an AN/SQS-53 Sonar A-4
Figure A.1-3: Submarine AN/BQQ-10 Active Sonar Array A-4
Figure A.1-4: Sonobuoy (e.g., AN/SSQ-62) A-4
Figure A.1-5: Helicopter Deploys Dipping Sonar A-5
Figure A.1-6: Current United States Navy Torpedoes A-5
Figure A.1-7: Anti-Submarine Warfare Targets A-6
Figure A.1-8: Mine Warfare Systems A-6
Figure A.1-9: Shipboard Small Arms Training A-7
Figure A.1-10: Shipboard Medium-Caliber Guns A-8
Figure A.1-11: Shipboard Large-Caliber Gun and Projectiles A-8
Figure A.1-12: Rolling Airframe Missile and Air-to-Air Missile A-9
Figure A.1-13: Anti-Surface Missile Fired from MH-60 Helicopter A-9
Figure A.1-14: F/A-18 Bomb Release and Loading General Purpose Bombs A-10
Figure A.1-15: Subscale Bombs for Training A-10
Figure A.1-16: Deployment and Recovery of Air Warfare Targets A-11
Figure A.1-17: Deploying a “Killer Tomato™” Floating Target A-12
Figure A.1-18: Ship Deployable Surface Target and High-Speed Maneuverable Seaborne Target A-12
Figure A.1-19: Acoustic Countermeasures A-13
Figure A.1-20: Towed Mine Detection System A-14
Figure A.1-21: AN/AES-1 Airborne Laser Mine Detection System A-14

Figure A.1-22: Organic and Surface Influence Sweep A-15
Figure A.1-23: Airborne Mine Neutralization System A-15
Figure A.2-1: BQM-74 (Aerial Target) A-42
Figure A.2-2: LUU-2B/B Illuminating Flare (Aerial Target) A-43
Figure A.2-3: Tactical Air-Launched Decoy (Aerial Target) A-43
Figure A.2-4: "Killer Tomato" Stationary Floating Target A-131
Figure A.2-5: QST-35 Seaborne Powered Target (on Left) and High-Speed Maneuvering Surface Target (on Right) A-131

This page intentionally left blank.

A. NAVY ACTIVITY DESCRIPTIONS

The Navy has been conducting military readiness activities throughout the northwestern Atlantic Ocean, Gulf of Mexico, and inshore waters for decades. The tempo and types of training and testing activities have fluctuated within the Atlantic Fleet Training and Testing (AFTT) Study Area (Study Area) due to changing requirements, the introduction of new technologies, the dynamic nature of international events, advances in warfighting doctrine and procedures, and force structure changes. Such developments have influenced the frequency, duration, intensity, and location of required training and testing.

A.1 DESCRIPTION OF SONAR, MUNITIONS, TARGETS, AND OTHER SYSTEMS EMPLOYED IN ATLANTIC FLEET TRAINING AND TESTING EVENTS

The Navy uses a variety of sensors, platforms, weapons, and other devices, including ones used to ensure the safety of Sailors and Marines, to meet its mission. Training and testing with these systems may have the potential to introduce acoustic (sound) energy and expended materials into the environment. The environmental impact of these activities was analyzed in Chapter 3 (Affected Environment and Environmental Consequences) of this Environmental Impact Statement (EIS)/Overseas Environmental Impact Statement (OEIS). This appendix presents and organizes sonar systems, munitions, targets, and other systems in a manner intended to facilitate understanding of both the activities that use them and the analysis of their environmental effects, described in Chapter 3 (Affected Environment and Environmental Consequences) of this EIS/OEIS.

A.1.1 SONAR SYSTEMS AND OTHER ACOUSTIC SOURCES

Sonar. Sonar, originally an acronym for "Sound Navigation And Ranging," is a technique that uses underwater sound to navigate, communicate, or detect underwater objects (the term sonar is also used for the equipment used to generate and receive sound). There are two basic types of sonar: active and passive.

Active sonar emits sound waves that travel through the water, reflect off objects, and return to a receiver. Sonar is used to determine the distance to an underwater object by calculating the speed of sound in water and the time for the sound wave to travel to the object and back. For example, active sonar systems are used to track targets or to aid in vessel navigation by identifying known ocean floor features. Some whales, dolphins, and bats use echolocation, a similar technique, to identify their surroundings and to locate prey.

Passive sonar uses listening equipment, such as underwater microphones (hydrophones) and receiving sensors on ships, submarines, aircraft, or autonomous vehicles, to pick up underwater sounds. The advantage of passive sonar is that it places no sound in the water and, thus, does not reveal the location of the listening vessel. Passive sonar can indicate the presence, character, and direction of noise producing objects such as ships and submarines; however, passive sonar is increasingly ineffective as modern submarines become quieter. Passive sonar has no potential acoustic impact on the environment and, therefore, is not discussed further or analyzed within this EIS/OEIS.

All sounds, including sonar, are categorized by frequency. For this EIS/OEIS, active sonar is categorized into four frequency ranges: low-frequency,[1] mid-frequency, high-frequency, and very high-frequency.

- Low-frequency active sonar emits sounds at frequencies less than 1 kilohertz (kHz). Low-frequency active sonar is useful for detecting objects at great distances because low-frequency sounds do not dissipate as rapidly as higher-frequency sounds.
- Mid-frequency active sonar emits sounds at frequencies from 1 to 10 kHz. Mid-frequency active sonar is the Navy's primary tool for detecting and identifying submarines. Active sonar in this frequency range provides a valuable combination of range and target accuracy.
- High-frequency active sonar emits sounds at frequencies greater than 10 kHz, up to 100 kHz. High-frequency sounds dissipate rapidly and have a small effective range; however, high-frequency sounds provide higher resolution of objects and are useful at detecting and identifying smaller objects such as sea mines.
- Very high-frequency sources are those that operate above 100 kHz but below 200 kHz. Very high-frequency sounds provide even higher resolution of objects and are sometimes used for underwater communication.

Modern sonar technology includes a variety of sonar sensor and processing systems. In concept, the simplest active sonar emits sound waves, or "pings," sent out in multiple directions, and the sound waves then reflect off of the target object in multiple directions (Figure A.1-1).

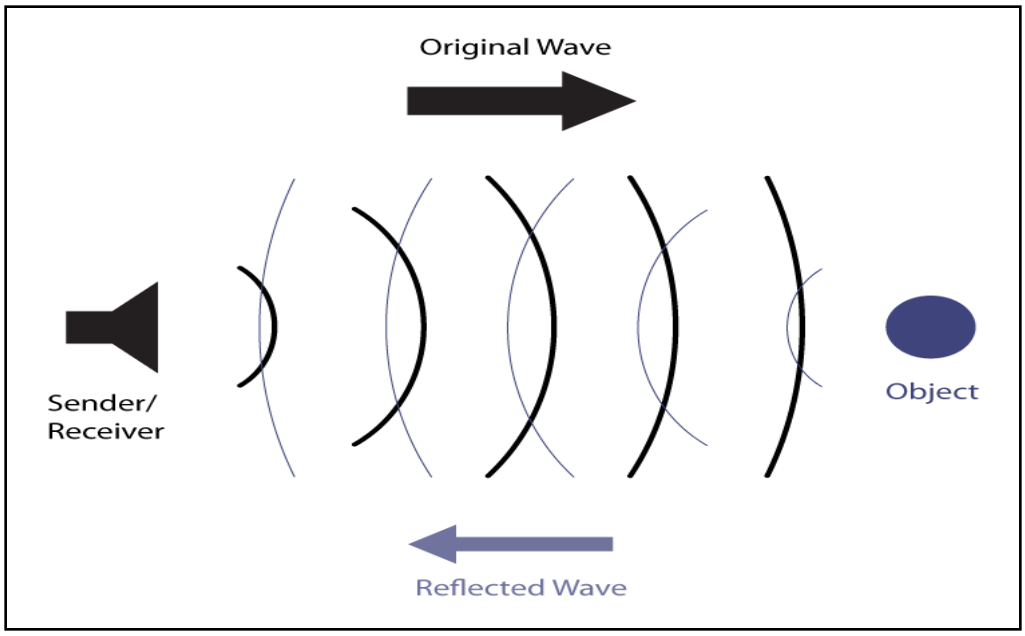


Figure A.1-1: Principle of an Active Sonar

[1] Surveillance Towed Array Sensor System (SURTASS) Low-Frequency Active sonar, which may be used in the Study Area, is not among the sources analyzed in this document. The potential environmental impacts from use of SURTASS Low-Frequency Active sonar are analyzed in separate analyses under the National Environmental Policy Act.

The sonar source calculates the time it takes for reflected sound waves to return; this calculation determines the distance to the target object. More sophisticated active sonars emit a ping and then rapidly scan or listen to the sound waves in a specific area. This provides both distance to the target and directional information. Even more advanced sonars use multiple receivers to listen to echoes from several directions simultaneously and provide efficient detection of both direction and distance. It should be noted that active sonar is rarely used continuously throughout the listed activities. In addition, when sonar is in use, the sonar "pings" occur at intervals, referred to as a duty cycle, and the signals themselves are very short in duration. For example, a sonar that emits a 1-second ping every 10 seconds has a 10 percent duty cycle.

The Navy utilizes sonar systems and other acoustic sensors in support of a variety of mission requirements. Primary uses include detection of and defense against submarines (anti-submarine warfare) and mines (mine warfare), safe navigation and effective communications, and oceanographic surveys. Specific examples of how sonar systems are used for Navy activities are discussed in the following sections.

Anti-Submarine Warfare. Systems used in anti-submarine warfare include sonars, torpedoes, and acoustic countermeasure devices. These systems are employed from a variety of platforms (surface ships, submarines, helicopters, and fixed-wing aircraft). Surface ships conducting anti-submarine warfare are typically equipped with hull-mounted sonar (passive and active) for the detection of submarines (or submarine targets during training and testing events). Helicopters use dipping sonar or sonobuoys (passive and active) to locate submarines (or targets). Fixed-wing aircraft deploy both active and passive expendable sonobuoys to assist in detecting and tracking submarines (or targets). Submarines are equipped with hull-mounted sonars to detect, localize, and track other submarines and surface ships. Submarines primarily use passive sonar; active sonar is used mostly for navigation. There are also unmanned vehicles currently being developed to deploy anti-submarine warfare systems.

Anti-submarine warfare activities often use mid-frequency (1 to 10 kHz) active sonar, though low-frequency and high-frequency active sonar systems are also used for specialized purposes. The Navy is currently developing and testing sonar systems that may utilize lower frequencies and longer duty cycles—albeit at lower source levels—than current systems. However, these new systems would only be operational if they significantly increase the Navy's ability to detect and identify quiet submarine threats.

Typical active sonar systems and acoustic sensors used during anti-submarine warfare sonar training and testing exercises include the following:

- **Surface Ship Sonar Systems:** A variety of surface ships operate hull-mounted or tethered mid-frequency active sonar during training exercises and testing activities (Figure A.1-2). Only cruisers and destroyers have surface ship sonar systems. The littoral combat ship and new frigate will have a tethered variable depth sonar system. Unmanned surface vessels can also include sonar systems, such as the variable depth sonar and mine hunting sonar.

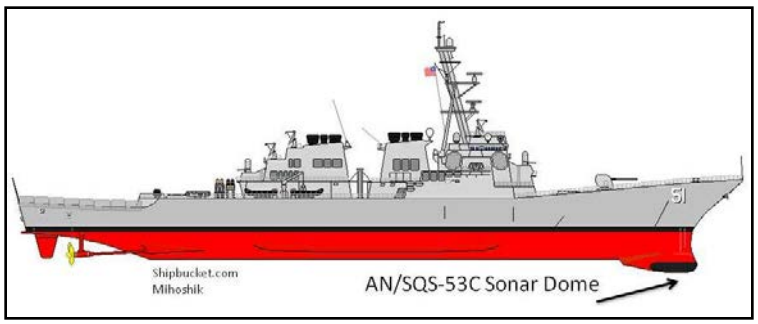


Figure A.1-2: Guided Missile Destroyer with an AN/SQS-53 Sonar

- **Submarine Sonar Systems:** Submarines are equipped with hull-mounted mid-frequency and high-frequency active sonar (Figure A.1-3) used to detect and target enemy submarines and surface ships. A submarine's mission relies on its stealth; therefore, a submarine uses its active sonar sparingly because each sound emission gives away the submarine's location.

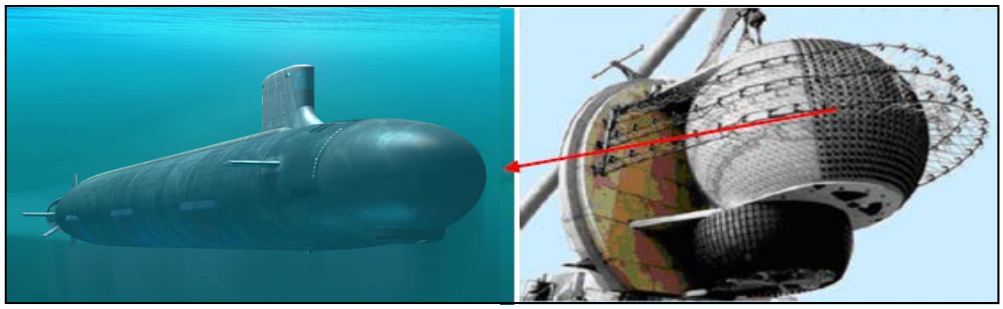


Figure A.1-3: Submarine AN/BQQ-10 Active Sonar Array

- **Aircraft Sonar Systems:** Aircraft sonar systems include sonobuoys and dipping sonars.
    - **Sonobuoys:** Active sonobuoys are expendable devices that contain a data transmitter and a hydrophone. The sounds collected by the sonobuoy are transmitted back to the operator (aboard ship or aircraft) for analysis. Sonobuoys are either active or passive and allow for short- and long-range detection of surface ships and submarines. These systems are deployed by ship, helicopter, and fixed-wing patrol aircraft (Figure A.1-4).

Figure A.1-4: Sonobuoy (e.g., AN/SSQ-62)

- **Dipping Sonars:** Dipping sonars are recoverable devices lowered into the water via cable from manned and unmanned helicopters (Figure A.1-5). The sonar detects underwater targets and determines the distance and movement of the target relative to the position of the helicopter.

Figure A.1-5: Helicopter Deploys Dipping Sonar

- **Exercise Torpedoes:** Some torpedoes used in training and testing activities may transmit active sonar signals. Surface ships, aircraft, and submarines primarily use torpedoes in anti-submarine warfare (Figure A.1-6). Recoverable, non-explosive torpedoes, categorized as either lightweight or heavyweight, are used during training and testing. Torpedoes operate autonomously, or in the case of heavyweight torpedoes, use a guidance system to operate the torpedo remotely through an attached wire (guidance wire). The autonomous guidance systems operate either passively (listening for sounds generated by the target) or actively (pinging to search for the target). Torpedo training in the Study Area is mostly simulated—solid masses that approximate the weight and shape of a torpedo are fired rather than fully functional torpedoes. Testing in the Study Area mostly uses fully functional exercise torpedoes.

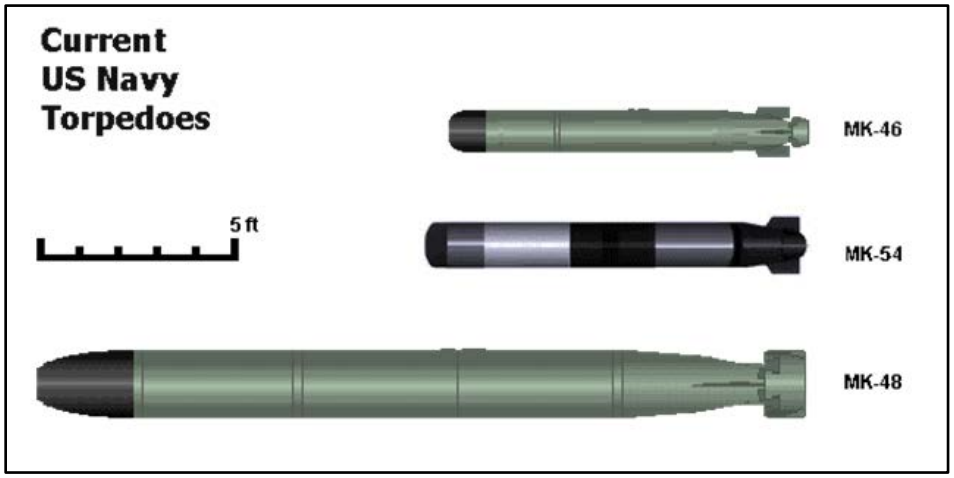


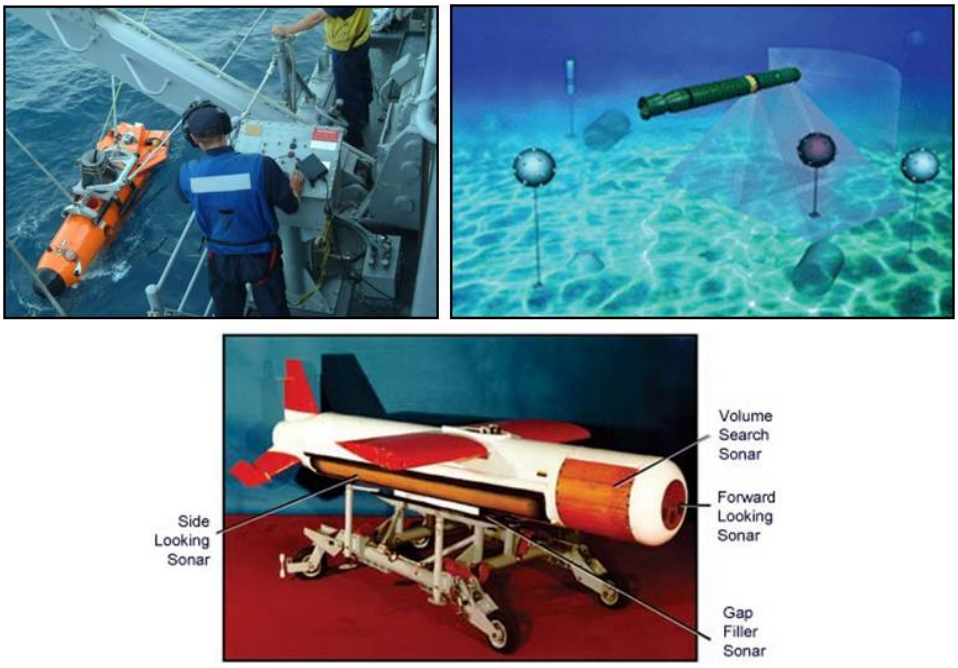
Figure A.1-6: Current United States Navy Torpedoes

- **Anti-Submarine Warfare Targets:** Anti-submarine warfare targets are autonomous undersea vehicles used to simulate target submarines (Figure A.1-7). The targets are equipped with one or

more of the following devices: (1) acoustic projectors emitting sounds to simulate submarine acoustic signatures, (2) echo repeaters to simulate the characteristics of the echo of a sonar signal reflected from a submarine, or (3) magnetic sources that mimic those of a submarine.

Figure A.1-7: Anti-Submarine Warfare Targets

Mine Warfare. Mine warfare training and testing activities use a variety of different sonar systems that are typically high-frequency (greater than 10 kHz) and very high-frequency (greater than 100 kHz). These sonar systems are used to detect, locate, and characterize moored and bottom mines (Figure A.1-8). The majority of mine warfare sonar sensors can be deployed by more than one platform (e.g., helicopter, unmanned underwater vehicle, or surface ship) and may be interchangeable among platforms. Surface ships and submarines use sonar to detect mines and objects, while minesweeping ships use a specialized variable-depth mine detection and classification high-frequency active sonar system to detect mines.



(Source: Graphic on right courtesy of Lockheed Martin)

Figure A.1-8: Mine Warfare Systems

Safety, Navigation, Communications, and Oceanographic Systems. Naval ships, submarines, and unmanned surface and subsurface vehicles rely on equipment and instrumentation that use active sonar

during both routine operations and training and testing events. Sonar systems are used to gauge water depth; detect and map objects, navigational hazards, and the ocean floor; and transmit communication signals.

Other Acoustic Systems. The Navy uses a variety of other acoustic sensors to protect ships anchored or at the pier, as well as shore facilities. These systems, both active and passive, detect potentially hostile swimmers, broadcast warnings to alert Navy divers of potential hazards, and gather information regarding ocean characteristics (ocean currents and wave measurements). They are generally stationary systems in Navy harbors and piers. Navy marine mammals (Atlantic bottlenose dolphins [*Tursiops truncatus*] and California sea lions [*Zalophus californianus*]) are also used to detect hostile swimmers around Navy facilities. A trained animal is deployed under behavioral control of a handler to find an intruding swimmer. Upon finding the "target" of the search, the animal returns to the boat and alerts the animal handlers, and the animals are given a localization marker or leg cuff that they attach to the intruder. Swimmers that have been marked with a leg cuff are reeled in by security support craft personnel via a line attached to the cuff. In addition, the Navy's research and acquisition community uses various sensors for tracking during testing activities and to collect data for test analysis.

A.1.2 MUNITIONS

Most munitions used during training and testing events fall into three basic categories: projectiles, missiles, and bombs. Munitions can be further defined by their net explosive weight, which is the actual weight in pounds of the explosive substance without the packaging, casings, bullets, etc. Net explosive weight is also the trinitrotoluene (TNT) equivalent of energetic material, which is the standard measure of strength of bombs and other explosives. For example, a 2,000-pound (lb.) bomb may have anywhere from 600 to 1,000 lb. of net explosive weight.

Projectiles. Projectiles are fired during gunnery exercises and testing events from a variety of weapons, ranging from pistols and rifles to large-caliber, turret-mounted guns on the decks of Navy ships. Projectiles can be either high-explosive munitions (e.g., certain cannon shells), or non-explosive practice munitions (e.g., rifle/pistol bullets). Explosive rounds can be fused to either explode on impact or in the air (i.e., just prior to impact). Projectiles are broken down into three basic categories in this EIS/OEIS:

- **Small-Caliber Projectiles:** These projectiles are up to and including 0.50 caliber. Small-caliber projectiles (e.g., bullets) are primarily fired from pistols, rifles, and machine guns (i.e., small arms) and mostly during training events for an individual Sailor to become and remain proficient (Figure A.1-9).

Figure A.1-9: Shipboard Small Arms Training

- **Medium-Caliber Projectiles:** These projectiles are larger than 0.50 caliber but smaller than 57 millimeter (mm) (approximately 2- to ¼-inch (in.) diameter). The most common size medium-caliber projectiles are 20 mm, 25 mm, and 40 mm. Medium-caliber projectiles are fired from

machine guns operated by one to two crewman and mounted on the deck of a ship, wing-mounted guns on aircraft, and fully automated guns mounted on ships for defense against missile attack (Figure A.1-10). Medium-caliber projectiles also include 40 mm grenades, which can be fired from hand-held grenade launchers or crew-served deck-mounted guns. Medium-caliber projectiles can be non-explosive practice munitions or high-explosive projectiles. High-explosive projectiles are usually fused to detonate on impact; however, advanced high-explosive projectiles can detonate based on time, distance, or proximity to a target.

Figure A.1-10: Shipboard Medium-Caliber Guns

- **Large-Caliber Projectiles:** These include projectiles 57 mm and larger. The largest projectile currently in service has a 5-in. (12.7-centimeter) diameter, but larger weapons are under development. The most widely used large-caliber projectiles are 57 mm and 5 in. (Figure A.1-11). The most common 5-in. projectile is approximately 26 in. long and weighs 70 lb. Large-caliber projectiles are fired exclusively from turret-mounted guns located on ship decks and can be used to fire on surface ships and boats, in defense against missiles and aircraft, and against land-based targets. Large-caliber projectiles can be non-explosive practice munitions or explosive munitions. High-explosive projectiles can detonate on impact or in the air.

Figure A.1-11: Shipboard Large-Caliber Gun and Projectiles

Missiles. Missiles are rocket or jet-propelled munitions used to attack ships, aircraft, and land-based targets, as well as defend ships against other missiles. Guidance systems and advanced fusing technology ensure that missiles reliably impact on or detonate near their intended target. Missiles are categorized according to their intended target, as described below, and can be further classified according to net explosive weight. Rockets are included within the category of missiles.

- **Air Missiles:** Air missiles are fired from ships and aircraft against enemy aircraft and incoming missiles (Figure A.1-12). Air missiles are configured to explode in the air near, or on impact with, their intended target. Missiles are the primary ship-based defense against incoming missiles.


Figure A.1-12: Rolling Airframe Missile and Air-to-Air Missile

- **Surface Missiles:** Surface missiles are fired from aircraft, ships, and submarines against surface ships (Figure A.1-13). Surface missiles are typically configured to detonate on impact or just above the intended target.

Figure A.1-13: Anti-Surface Missile Fired from MH-60 Helicopter

- **Anti-Radiation Missiles:** The AGM-88 High-Speed Anti-Radiation Missile, used to destroy enemy radar sites, is fired at a floating sea-borne target that replicates a land-based radar site.
- **Rockets:** Rockets are fired from helicopters against water and land-based targets. Rockets can either be laser guided or unguided, and while most contain inert warheads there are high-explosive variants that detonate on impact or flechette warheads that open at the conclusion of rocket motor burnout and contain approximately 1,180 60-grain flechettes.

Bombs. Bombs are unpowered munitions dropped from aircraft on land and water targets. The majority of bombs used during training and testing in the Study Area are non-explosive. However, explosive munitions are occasionally used for proficiency inspections and testing requirements. Bombs fall into two categories: general-purpose bombs and subscale practice bombs. Similar to missiles, bombs are further classified according to their net explosive weight.

- **General-Purpose Bombs:** General-purpose bombs consist of precision-guided and unguided full-scale bombs, ranging in size from 250 to 2,000 lb. (Figure A.1-14). Common bomb nomenclature

used includes: MK 80 series, which is the Navy's standard model; Guided Bomb Units and Joint Direct Attack Munitions, which are precision-guided (including laser guided) bombs; and the Joint Standoff Weapon, which is a long-range "glider" precision weapon. General-purpose bombs can be either non-explosive practice munitions or high explosive.

Figure A.1-14: F/A-18 Bomb Release and Loading General Purpose Bombs

- **Subscale Bombs:** Subscale bombs (Figure A.1-15) are non-explosive practice munitions containing a spotting (smoke) charge to aid in scoring the accuracy of hitting the target during training and testing activities. Common subscale bombs are 25 lb. and less and are steel-constructed. Laser guided training rounds are another variation of a subscale practice bomb. They weigh approximately 100 lb. and are cost-effective non-explosive weapons used in training aircrew in laser-guided weapons employment.

Figure A.1-15: Subscale Bombs for Training

Other Munitions. There are other munitions used in naval at-sea training and testing events that do not fit into one of the above categories and are discussed below:

- **Demolition Charges:** Divers place explosive charges in the marine environment during some training and testing activities. These activities may include the use of timed charges, in which the charge is placed, a timer is started, and the charge detonates at the set time. Munitions of up to 60-lb. blocks of composition 4 (C-4) plastic explosive, with the necessary detonators and cords, are used to support mine neutralization, demolition, and other warfare activities. The vast majority of underwater detonations involve explosive charges of 20 lb. or less in size. All demolition charges are further classified according to the net explosive weight of the charge.
- **Anti-Swimmer Grenades:** Maritime security forces use hand grenades to defend against enemy scuba divers.

- **Torpedoes:** Explosive torpedoes are required in some training and testing events. Torpedoes are described as either lightweight or heavyweight and are further categorized according to the net explosive weight.
- **Extended Echo Ranging Sonobuoys:** Extended Echo Ranging sonobuoys include mini sound-source seeker sonobuoys that use small explosive charges as the active sound source instead of electrically produced sounds. Extended Echo Ranging sonobuoys are only used in testing activities.

A.1.3 TARGETS

Training and testing require an assortment of realistic and challenging targets. Targets vary from items as simple and ordinary as an empty steel drum used for small-caliber weapons training from the deck of a ship, to sophisticated, unmanned aerial drones used in air defense training. For this EIS/OEIS, targets are organized by warfare area.

Air Warfare Targets: Air warfare targets, tow target systems, and aerial targets are used in training and testing events that involve detection, tracking, defending against, and attacking enemy missiles and aircraft. Aerial tow target systems include textile (nylon banner) and rigid (fiberglass shapes) towed targets used for gunnery events. Aerial targets include expendable ballistic targets and recoverable radio-controlled drones used for gunnery and missile exercises (Figure A.1-16). Parachute flares are used as air-to-air missile targets. Manned high-performance aircraft may be used as targets—to test ship and aircraft defensive systems and procedures—without the actual firing of munitions.

Figure A.1-16: Deployment and Recovery of Air Warfare Targets

Surface Warfare Targets: Floating, towed, and mobile targets are used as surface warfare targets during gunnery events. Targets include floating steel drums, inflatable shapes or target balloons (e.g., Killer Tomato™) (Figure A.1-17), and towed sleds. High-speed targets, such as jet skis and motorboats, are also used (Figure A.1-18).

Figure A.1-17: Deploying a "Killer Tomato™" Floating Target

Figure A.1-18: Ship Deployable Surface Target and High-Speed Maneuverable Seaborne Target

Anti-Submarine Warfare Targets: Anti-submarine warfare uses multiple types of targets, including the following:

- **Submarines:** Submarines may act as tracking and detection targets during training and testing events.
- **Motorized Autonomous Targets:** Motorized autonomous targets simulate the acoustic and magnetic characteristics of a submarine, providing realism for exercises when a submarine is not available. There are two types of mobile targets, one is designed for recovery and reuse, while the other is expendable.
- **Stationary Artificial Targets:** Stationary targets either resemble submarine hulls or are simulated systems with acoustic properties of enemy submarines. These targets either rest on the seafloor or are suspended at varying depths in the water column.

Mine Warfare Targets: Mine targets are used in training activities that involve the detection, location, and neutralization of mines in the water. There are a wide variety of mine targets that mimic floating, bottom, and moored mines. All mine targets are made out of inert material.

A.1.4 Defensive Countermeasures

Naval forces depend on effective defensive countermeasures to protect against missile and torpedo attack. Defensive countermeasures are devices designed to confuse, distract, and confound precision-guided munitions. Defensive countermeasures fall into five basic categories:

- **Chaff:** Chaff consists of reflective, aluminum-coated glass fibers used to obscure ships and aircraft from radar-guided systems. Chaff, which is stored in canisters, is either dispensed from aircraft or fired into the air from the decks of surface ships when an attack is imminent. The glass fibers create a radar cloud that masks the position of the ship or aircraft.
- **Flares:** Flares are pyrotechnic devices used to defend against heat-seeking missiles, where the missile seeks out the heat signature from the flare rather than the aircraft's engines. Similar to chaff, flares are also dispensed from aircraft and fired from ships.
- **Acoustic Countermeasures:** Acoustic countermeasures are used by surface ships and submarines to defend against torpedo attack (Figure A.1-19). Acoustic countermeasures are either released from ships and submarines or towed at a distance behind the ship.
- **Electromagnetic Countermeasures:** Electromagnetic countermeasures are used by surface ships and aircraft to defend against missile attacks. Electromagnetic countermeasures are also used in anti-submarine warfare activities.
- **Biodegradable Polymer:** Biodegradable polymer is a biodegradable vessel entanglement technology used to slow or stop specific maritime targets by entangling the propulsion mechanism.

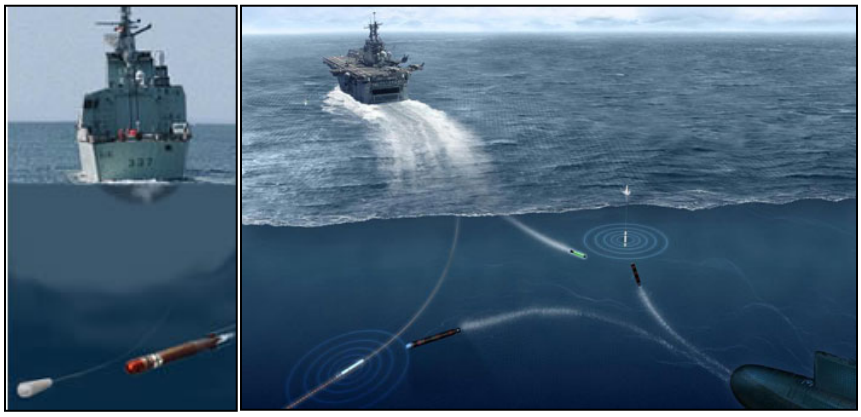


Figure A.1-19: Acoustic Countermeasures

A.1.5 Mine Warfare Systems

Mine warfare systems fall into two broad categories: mine detection and mine neutralization.

Mine Detection Systems. Mine detection systems are used to locate, classify, and map suspected mines. Once located, the mines can either be neutralized or avoided. These systems are specialized to either locate mines on the surface, in the water column, or on the sea floor.

- **Towed or Hull-Mounted Mine Detection Systems:** These detection systems use acoustic and laser or video sensors to locate and classify suspect mines. Helicopters, ships, and unmanned vehicles are used for towed systems, which can rapidly assess large areas (Figure A.1-20).

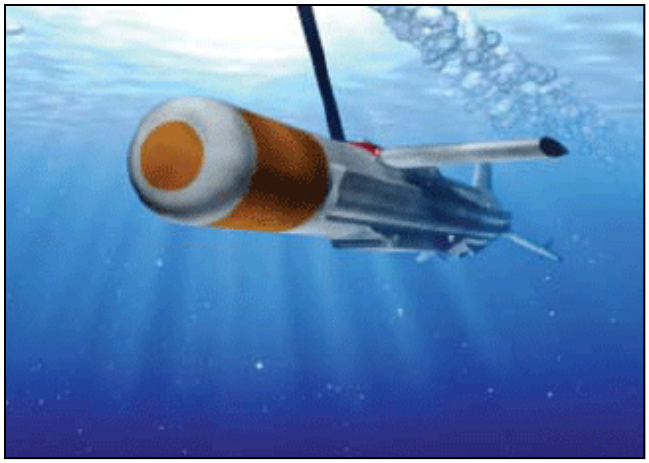


Figure A.1-20: Towed Mine Detection System

- **Airborne Laser Mine Detection Systems:** Airborne laser detection systems work in concert with neutralization systems. The detection system initially locates mines, and a neutralization system is then used to relocate and neutralize the mine (Figure A.1-21).

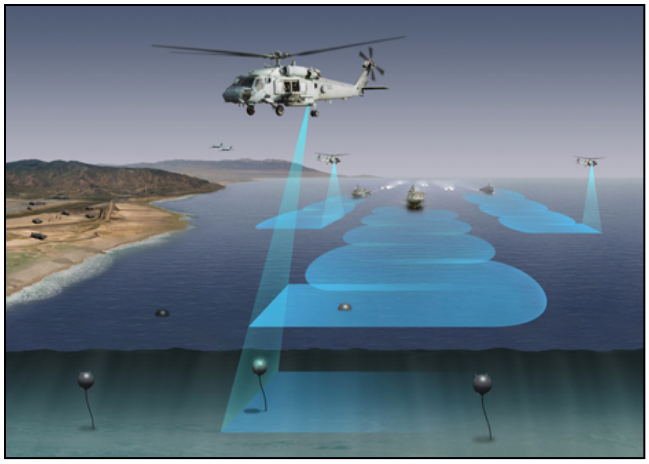


Figure A.1-21: AN/AES-1 Airborne Laser Mine Detection System

- **Unmanned/Remotely Operated Vehicles:** These vehicles use acoustic, video, or lasers, or combinations thereof, to locate and classify mines. Unmanned/remotely operated vehicles provide unique mine warfare capabilities in nearshore littoral areas, surf zones, ports, and channels.
- **Marine Mammal System:** Navy personnel and Navy marine mammals work together to detect specified underwater objects. The Navy deploys trained bottlenose dolphins and California sea lions as part of the marine mammal minehunting and object recovery system.

Mine Neutralization Systems. These systems disrupt, disable, or detonate mines to clear ports and shipping lanes, as well as littoral, surf, and beach areas in support of naval amphibious operations. Mine neutralization systems can clear individual mines or a large number of mines quickly.

- **Towed Influence Mine Sweep Systems:** These systems use towed equipment that mimics a particular ship's magnetic and acoustic signature, triggering the mine and causing it to explode (Figure A.1-22).

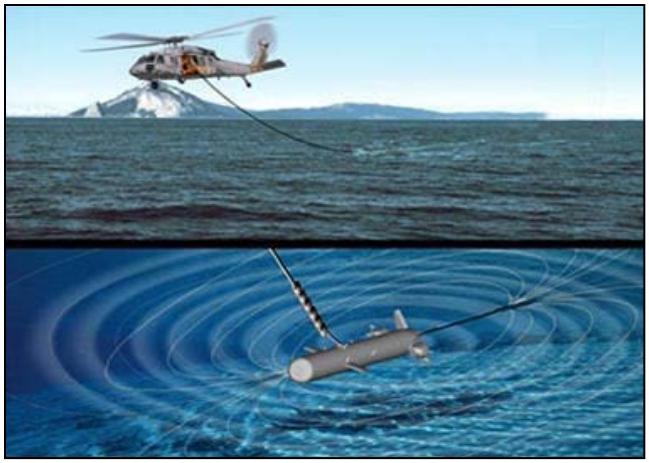


Figure A.1-22: Organic and Surface Influence Sweep

- **Towed Mechanical Mine Sweeping Systems:** These systems tow a sweep wire to snag the line that attaches a moored mine to its anchor and then uses a series of cables and cutters to sever those lines. Once these lines are cut, the mines float to the surface where explosive ordnance personnel can neutralize the mines.
- **Unmanned/Remotely Operated Mine Neutralization Systems:** Surface ship and helicopters operate these systems, which place explosive charges near or directly against mines to destroy the mine (Figure A.1-23).

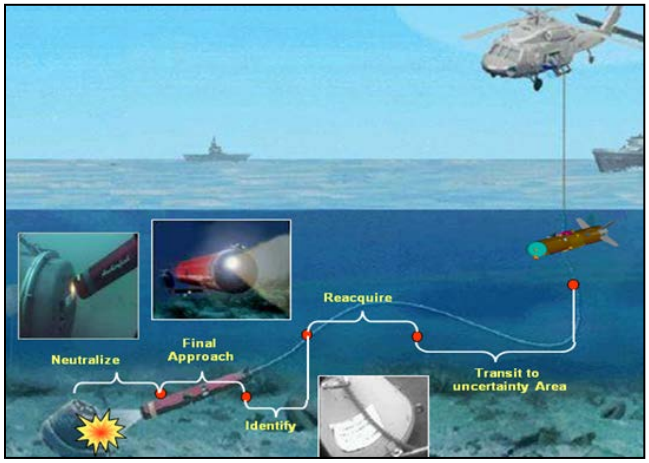


Figure A.1-23: Airborne Mine Neutralization System

- **Projectiles:** Small- and medium-caliber projectiles fired from surface ships or hovering helicopters are used to neutralize floating and near-surface mines.
- **Diver-Placed Explosive Charges:** Operating from small craft, divers place explosive charges, which may use time-delay fusing, near or on mines to destroy the mine or disrupt its ability to function.

A.1.6 Military Expended Materials

Navy training and testing events may introduce or expend various items, such as non-explosive munitions and targets, into the marine environment as a direct result of using these items for their intended purpose. In addition to the items described below, some accessory materials—related to the

carriage or release of these items—may be released. These materials, referred to as military expended materials, are not recovered and potentially result in environmental impacts. These impacts are analyzed in detail in Chapter 3 (Affected Environment and Environmental Consequences) of this EIS/OEIS. This section includes descriptions of a representative sample of military expended materials. A more comprehensive discussion can be found in Chapter 3 (Affected Environment and Environmental Consequences).

Military expended materials analyzed in this document include the following:

- **Sonobuoys:** Sonobuoys consist of decelerators/parachutes, wires, and the sonobuoys themselves.
- **Bathythermographs:** Bathythermographs as used by the Navy are similar to sonobuoys in that they consist of decelerators/parachutes, wires, and the buoy themselves. In the case of bathythermographs, the buoys are used to measure temperature information of the water column and transmit that information to the platform (usually a ship or aircraft) that deployed the bathythermograph.
- **Torpedo Launch Accessories:** Torpedoes are usually recovered; however, materials such as decelerators/parachutes used with air-dropped torpedoes, guidance wire used with submarine-launched torpedoes, and ballast weights are expended. Explosive-filled torpedoes expend torpedo fragments.
- **Projectiles and Bombs:** Non-explosive projectiles, non-explosive bombs, or fragments from explosive projectiles and bombs are expended during training and testing events. These items are primarily constructed of lead (most small-caliber projectiles) or steel (medium- and large-caliber projectiles and all bombs). Casings are expended as a result of firing either non-explosive or explosive projectiles.
- **Blank Ammunition:** Blank ammunition is used in some training activities when the sound or flash of gunfire adds to the realism of the training activity but safety of personnel or nearby civilians is critical. Blank ammunition contains gunpowder, but no projectile is sent downrange upon firing the weapon. Casings are expended as a result of firing blank ammunition.
- **Missiles and Rockets:** Non-explosive missiles and missile fragments from explosive missiles are expended during training and testing events. Propellant, and any explosive material involved, is consumed during firing/detonation. Rockets are similar to missiles and both non-explosive and fragments may be expended.
- **Countermeasures:** Countermeasures (acoustic, chaff, flares, and biodegradable polymer) are expended as a result of training or testing events, with the exception of towed acoustic countermeasures. Chaff activities also include an expended canister, end caps, and pistons. Flares expend only end caps and pistons.
- **Targets:** Some targets are designed to be expended; other targets, such as aerial drones and remote-controlled boats, are recovered for re-use. Targets struck with munitions will result in target fragments.

A.2 TRAINING ACTIVITIES

The Navy's training activities are organized generally into seven primary mission areas and a miscellaneous category ("Other Training") that includes those activities that do not fall within a primary mission area but are an essential part of Navy training. The locations listed are the areas where the training typically takes place, but they can occur through the AFTT Study Area shown on Figure 2.1-1

(Atlantic Fleet Training and Testing Study Area) in Chapter 2 (Description of Proposed Action and Alternatives). In addition, because the Navy conducts a number of activities within larger training exercises, descriptions of those larger exercises are also included here. It is important to note that these larger exercises are composed entirely of individual activities described in the primary mission areas.

A.2.1 MAJOR TRAINING EXERCISES

A major anti-submarine warfare training exercise comprises several "unit-level" range exercises conducted by several units operating together while commanded and controlled by a single commander. These exercises typically employ an exercise scenario developed to train and evaluate the strike group in naval tactical tasks. In a major training exercise, most of the operations and activities being directed and coordinated by the strike group commander are identical in nature to the operations conducted during individual, crew, and smaller-unit training events. In a major training exercise, however, these disparate training tasks are conducted in concert, rather than in isolation.

Major training exercises are listed below.

A.2.1.1 Composite Training Unit Exercise

Major Training Exercises – Large Integrated Anti-Submarine Warfare		
Composite Training Unit Exercise		
Short Description	Aircraft carrier and carrier air wing integrate with surface and submarine units in a challenging multi-threat operational environment that certifies them ready to deploy.	**Typical Duration** 21 days
Long Description	Intermediate level carrier strike exercise designed to create a cohesive strike group prior to deployment or Joint Task Force Exercise. Typically employs seven surface ships, fixed-wing aircraft and helicopters, two submarines, and various unmanned vehicles. Each strike group performs a rehearsal called Composite Training Unit Exercise before deployment. Prior to the Composite Training Unit Exercise, each ship and aircraft in the strike group trains in their specialty. The Composite Training Unit Exercise is an intermediate-level strike group exercise designed to forge the group into a cohesive fighting team. Composite Training Unit Exercise normally consists of an 18-day schedule of event-driven exercise, and a 3-day Final Battle Problem. The Composite Training Unit Exercise is an integration phase, at-sea, major training exercise. For the Carrier Strike Group, this exercise integrates the aircraft carrier and carrier air wing with surface and submarine units in a challenging operational environment. Special operations training may also be integrated with the exercise scenario. For Composite Training Unit Exercise only, the anti-submarine warfare activities were analyzed as a Composite Training Unit Exercise. Other warfare area training conducted during the Composite Training Unit Exercise is analyzed elsewhere as unit-level training (gunnery exercises, missile exercises, etc.).	
Typical Components	**Platforms:** Aircraft carriers, fixed-wing aircraft, rotary-wing aircraft, submarines, surface combatants **Targets:** Sub-surface targets **Systems being Trained/Tested:** Sonar systems	

<table>
<tr><th colspan="5">Major Training Exercises – Large Integrated Anti-Submarine Warfare</th></tr>
<tr><th colspan="5">Composite Training Unit Exercise</th></tr>
<tr><td>Standard Operating Procedures (Section 2.3.3)</td><td colspan="2">Vessel safety
Aircraft safety
Towed in-water device safety</td><td colspan="2">Typical Locations
Range Complexes/Testing Ranges:
Gulf of Mexico
Jacksonville
Navy Cherry Point
Virginia Capes
Inshore Waters/Pierside:
None</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td colspan="2">Acoustic:
Sonar and other transducers
Aircraft noise
Vessel noise

Explosive:
None</td><td colspan="2">Physical Disturbance and Strike:
Aircraft and aerial target strike
Vessels and in-water device strike
Military expended material

Ingestion:
Military expended materials – other than munitions

Energy:
In-air electromagnetic devices
In-water electromagnetic devices

Entanglement:
Wires and cables
Decelerators/parachutes</td></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="2">Air Quality:
Criteria air pollutants</td><td colspan="2">Sediments and Water Quality:
Metals
Chemicals other than explosives</td></tr>
<tr><td>Stressors to Human Resources</td><td colspan="4">None</td></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
Decelerator/parachute - Small

Non-Ingestible Material:
Acoustic countermeasures, expendable bathythermographs, expendable bathythermograph wires, sonobuoys (non-explosive), sonobuoy wires</td><td>Military Recoverable Material</td><td>Sub-surface targets (mobile)</td></tr>
<tr><td>Sonar and Other Transducer Bins</td><td colspan="4">Low-Frequency:
LF6

Mid-Frequency:
MF1 MF5
MF3 MF11
MF4 MF12

High-Frequency:
HF1

Anti-Submarine Warfare:
ASW1 ASW4
ASW2 ASW5
ASW3</td></tr>
<tr><td>In-Water Explosive Bins</td><td colspan="4">Analyzed in individual unit-level training events.</td></tr>
<tr><td>Procedural Mitigation Measures</td><td colspan="2">Acoustic Stressors: (Section 5.3.2)
Active sonar</td><td colspan="2">Physical Disturbance and Strike: (Section 5.3.4)
Vessel movement
Towed in-water devices</td></tr>
</table>

Major Training Exercises – Large Integrated Anti-Submarine Warfare	
Composite Training Unit Exercise	
Assumptions Used for Analysis	For Composite Training Unit Exercise, only the anti-submarine warfare activities were analyzed as a Composite Training Unit Exercise. Other warfare area training conducted during the Composite Training Unit Exercise was analyzed as unit-level training (gunnery exercise, missile exercise, etc.). Stressors to human resources were not analyzed for this activity since it occurs greater than 12 NM from shore. Additional activities utilizing sources not listed in the Sonar and Other Transducer Bins section above may occur during this exercise. All acoustic sources that may be used during training and testing activities have been accounted for in the modeling and analysis presented in this EIS/OEIS.

A.2.1.2 Fleet Exercise/Sustainment Exercise

Included in the Fleet Response Training Plan is a requirement to conduct post-deployment training, and maintenance. This ensures that the components of a strike group maintain an acceptable level of readiness after returning from deployment. A sustainment exercise is an exercise designed to challenge the strike group in all warfare areas. Marine mammal systems may be used during the exercise. This exercise is similar to a Composite Training Unit Exercise but is of shorter duration.

<table>
<tr><th colspan="6">Major Training Exercises – Medium Integrated Anti-Submarine Warfare</th></tr>
<tr><th colspan="6">Fleet Exercise/Sustainment Exercise</th></tr>
<tr><td>Short Description</td><td colspan="3">Aircraft carrier and carrier air wing integrates with surface and submarine units in a challenging multi-threat operational environment to maintain ability to deploy.</td><td>Typical Duration</td><td>Up to 10 days</td></tr>
<tr><td>Long Description</td><td colspan="5">Fleet Exercises and Sustainment Exercises are similar in scope to Composite Training Unit Exercises but shorter in duration and use fewer active sonar hours. Fleet Exercises are integrated joint and coalition training exercises designed to maintain proficiency across maritime warfare disciplines. Sustainment Exercises are conducted to ensure that Carrier Strike Group maintains an acceptable level of readiness after returning from deployment in order to maintain a surge capability. Marine mammal systems may be used during the exercise.
Use of other munitions and explosives in the Fleet Exercises and Sustainment Exercises is included in unit-level events.</td></tr>
<tr><td>Typical Components</td><td colspan="5">Platforms: Aircraft carriers, fixed-wing aircraft, rotary-wing aircraft, submarines, surface combatants
Targets: Sub-surface targets
Systems being Trained/Tested: Sonar systems</td></tr>
<tr><td>Standard Operating Procedures (Section 2.3.3)</td><td colspan="2">Vessel safety
Aircraft safety
Towed in-water device safety</td><td colspan="3">Typical Locations
Range Complexes/Testing Ranges:
Jacksonville
Navy Cherry Point
Virginia Capes
Inshore Waters/Pierside:
None</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td colspan="2">Acoustic:
Sonar and other transducers
Aircraft noise
Vessel noise

Explosives:
None</td><td colspan="2">Physical Disturbance and Strike:
Aircraft and aerial target strike
Vessels and in-water device strike
Military expended material

Ingestion:
Military expended materials – other than munitions</td><td>Energy:
In-air electromagnetic devices
In-water electromagnetic devices

Entanglement:
Wires and cables
Decelerators/parachutes</td></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="2">Air Quality:
Criteria air pollutants</td><td colspan="3">Sediments and Water Quality:
Metals
Chemicals other than explosives</td></tr>
<tr><td>Stressors to Human Resources</td><td colspan="5">None</td></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
Decelerator/parachute - Small

Non-Ingestible Material:
Acoustic countermeasures, sonobuoys (non-explosive), sonobuoy wires</td><td>Military Recoverable Material</td><td colspan="2">Sub-surface targets (mobile)</td></tr>
</table>

Major Training Exercises – Medium Integrated Anti-Submarine Warfare	
Fleet Exercise/Sustainment Exercise	
Sonar and Other Transducer Bins	**Low-Frequency:** LF6 **Mid-Frequency:** MF1 MF5 MF3 MF11 MF4 MF12 **Anti-Submarine Warfare:** ASW1 ASW4 ASW2 ASW3 **High-Frequency:** HF1
In-Water Explosive Bins	Analyzed in individual unit-level training events.
Procedural Mitigation Measures	**Acoustic Stressors:** *(Section 5.3.2)* Active sonar **Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement Towed in-water devices
Assumptions Used for Analysis	Only the anti-submarine warfare activities were analyzed as a Fleet Exercise/Sustainment Exercise. Other warfare area training conducted during the Fleet Exercise/Sustainment Exercise was analyzed as unit-level training (gunnery exercise, missile exercise, etc.). Stressors to human resources were not analyzed for this activity since it occurs greater than 12 NM from shore. Additional activities utilizing sources not listed in the Sonar and Other Transducer Bins section above may occur during this exercise. All acoustic sources that may be used during training and testing activities have been accounted for in the modeling and analysis presented in this EIS/OEIS.

A.2.2 INTEGRATED/COORDINATED TRAINING

Integrated or coordinated anti-submarine warfare training exercises are similar to major training exercises in that they are composed of several basic, unit-level exercises, training conducted by an individual unit, but are generally on a smaller scale, are of shorter duration, and use fewer hours of active sonar than a major training exercise.

A.2.2.1 Navy Undersea Warfare Training Assessment Course

<table>
<tr><th colspan="6">Small Integrated Anti-Submarine Warfare Training</th></tr>
<tr><th colspan="6">Navy Undersea Warfare Training Assessment Course</th></tr>
<tr><td>Short Description</td><td colspan="3">Multiple ships, aircraft, and submarines integrate the use of their sensors, including sonobuoys, to search for, detect, classify, localize, and track a threat submarine.</td><td>Typical Duration
2-5 days</td><td></td></tr>
<tr><td>Long Description</td><td colspan="5">The Navy Undersea Warfare Training Assessment Course is a tailored course of instruction designed to improve Sea Combat Commander and strike group integrated anti-submarine warfare warfighting skill sets. Navy Undersea Warfare Training Assessment Course is a coordinated training scenario that typically involves five surface ships, two to three embarked helicopters, a submarine, and one maritime patrol aircraft searching for, locating, and attacking one submarine. The scenario consists of two 12-hour exercises that occur five times per year. The submarine may practice simulated attacks against the ships while being tracked. Hull-mounted, towed array, and dipping sonar is employed by ships and helicopters. The submarine also periodically operates its sonar.</td></tr>
<tr><td>Typical Components</td><td colspan="5">Platforms: Fixed-wing aircraft, rotary-wing aircraft, submarines, surface combatants
Targets: Sub-surface targets
Systems being Trained/Tested: Sonar systems</td></tr>
<tr><td>Standard Operating Procedures (Section 2.3.3)</td><td colspan="2">Vessel safety
Aircraft safety
Towed in-water device safety</td><td colspan="3">Typical Locations
Range Complexes/Testing Ranges:
Jacksonville
Navy Cherry Point
Virginia Capes
Inshore Waters/Pierside:
None</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td>Acoustic:
Sonar and other transducers
Aircraft noise
Vessel noise

Explosives:
None</td><td colspan="2">Physical Disturbance and Strike:
Aircraft and aerial target strike
Vessels and in-water device strike
Military expended material strike

Ingestion:
Military expended materials – other than munitions</td><td colspan="2">Energy:
In-air electromagnetic devices

Entanglement:
Wires and cables
Decelerators/parachutes</td></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="2">Air Quality:
Criteria air pollutants</td><td colspan="3">Sediments and Water Quality:
Metals
Chemicals other than explosives</td></tr>
<tr><td>Stressors to Human Resources</td><td colspan="5">None</td></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
Decelerator/parachute - Small

Non-Ingestible Material:
Sub-surface targets (mobile), sonobuoys (non-explosive), sonobuoy wires</td><td>Military Recoverable Material</td><td colspan="2">Sub-surface targets (mobile)</td></tr>
</table>

Small Integrated Anti-Submarine Warfare Training				
Navy Undersea Warfare Training Assessment Course				
Sonar and Other Transducer Bins	**Mid-Frequency:** MF1 MF3 MF4	 MF5 MF12	**High-Frequency:** HF1 **Low-Frequency:** LF6	**Anti-Submarine Warfare:** ASW1 ASW3 ASW4
In-Water Explosive Bins	Analyzed in individual unit-level training events.			
Procedural Mitigation Measures	**Acoustic Stressors:** *(Section 5.3.2)* Active sonar		**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement Towed in-water devices	
Assumptions Used for Analysis	Two MK-39 Expendable Mobile Anti-Submarine Warfare Training Targets may be used in place of an actual submarine target. Air deployed sonobuoys will have a decelerator/parachute. Stressors to human resources were not analyzed for this activity since it occurs greater than 12 NM from shore. Additional activities utilizing sources not listed in the Sonar and Other Transducer Bins section above may occur during this exercise. All acoustic sources that may be used during training and testing activities have been accounted for in the modeling and analysis presented in this EIS/OEIS.			

A.2.2.2 Surface Warfare Advanced Tactical Training

<table>
<tr><th colspan="6">Small Integrated Anti-Submarine Warfare Training</th></tr>
<tr><th colspan="6">Surface Warfare Advanced Tactical Training</th></tr>
<tr><td>Short Description</td><td colspan="3">Multiple ships and aircraft coordinate the use of sensors, including sonobuoys, to search, detect, and track a threat submarine. Surface Warfare Advanced Tactical Training exercises are not dedicated anti-submarine warfare exercises and involve multiple warfare areas.</td><td colspan="2">Typical Duration
Up to 15 days</td></tr>
<tr><td>Long Description</td><td colspan="5">Surface Warfare Advanced Tactical Training (SWATT) is an intermediate training exercise designed primarily to increase operator proficiency and exercise combined force responses to surface warfare, anti-submarine warfare, air warfare and electromagnetic spectrum operations.
Surface Warfare Advanced Tactical Training is conducted after a carrier strike group's first Group Sail, and before Composite Training Unit Exercise, and consists of multiple surface warfare, anti-submarine and air warfare live fire events. Multiple ships and aircraft search for, locate, and track one submarine. Occurs once per carrier strike group training cycle.
Use of other munitions and explosives in SWATT are included in unit-level events.</td></tr>
<tr><td>Typical Components</td><td colspan="5">Platforms: Surface combatants, fixed-wing aircraft, rotary-wing aircraft, unmanned vehicles, submarines
Targets: Sub-surface targets
Systems being Trained/Tested: Sonar systems</td></tr>
<tr><td>Standard Operating Procedures (Section 2.3.3)</td><td colspan="2">Vessel safety
Aircraft safety
Towed in-water device safety</td><td colspan="3">Typical Locations
Range Complexes/Testing Ranges:
Jacksonville
Navy Cherry Point
Virginia Capes
Inshore Waters/Pierside:
None</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td>Acoustic:
Sonar and other transducers
Aircraft noise
Vessel noise

Explosives:
None</td><td colspan="2">Physical Disturbance and Strike:
Vessels and in-water device strike
Military expended material strike

Ingestion:
Military expended materials – other than munitions</td><td colspan="2">Energy:
In-air electromagnetic devices
In-water electromagnetic devices

Entanglement:
Wires and cables
Decelerators/parachutes</td></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="2">Air Quality:
Criteria air pollutants</td><td colspan="3">Sediments and Water Quality:
Metals
Chemicals other than explosives</td></tr>
<tr><td>Stressors to Human Resources</td><td colspan="5">None</td></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
Target fragments, decelerators/parachutes - small

Non-Ingestible Material:
Sonobuoys (non-explosive), sonobuoy wires, acoustic countermeasures, sub-surface targets (mobile)</td><td>Military Recoverable Material</td><td colspan="2">Sub-surface targets (mobile)</td></tr>
</table>

Small Integrated Anti-Submarine Warfare Training			
Surface Warfare Advanced Tactical Training			
Sonar and Other Transducer Bins	**Mid-Frequency:** MF1 MF5MF1K MF6 MF3 MF12 MF4	**Anti-Submarine Warfare:** ASW2 ASW4 ASW3	**High-Frequency:** HF1 **Acoustic Modems:** M3
In-Water Explosive Bins	Analyzed in individual unit-level training events.		
Procedural Mitigation Measures	**Acoustic Stressors:** *(Section 5.3.2)* Active sonar	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement Towed in-water devices	
Assumptions Used for Analysis	Only the anti-submarine warfare activities were analyzed as a SWATT. Other warfare area training conducted during SWATT was analyzed as unit-level training (gunnery exercises, missile exercises, etc.). Stressors to human resources were not analyzed for this activity since it occurs greater than 12 NM from shore. Additional activities utilizing sources not listed in the Sonar and Other Transducer Bins section above may occur during this exercise. All acoustic sources that may be used during training and testing activities have been accounted for in the modeling and analysis presented in this EIS/OEIS.		

A.2.2.3 Anti-Submarine Warfare Tactical Development Exercise

Medium Coordinated Anti-Submarine Warfare Training			
Anti-Submarine Warfare Tactical Development Exercise			
Short Description	Multiple ships, aircraft, and submarines coordinate their efforts to search for, detect, and track submarines with the use of all sensors. Anti-Submarine Warfare Tactical Development Exercise is a dedicated anti-submarine warfare exercise.	**Typical Duration**	5-7 days
Long Description	Multiple ships, aircraft, and submarines coordinate their efforts to search for, detect, and track submarines with the use of all sensors. Anti-Submarine Warfare Tactical Development Exercise is a fleet training exercise involving surface ships, submarines, and aircraft. Active and passive sonar and sonobuoys are used to conduct anti-submarine warfare training exercises. The purpose of the exercise is to assess fleet anti-submarine warfare performance and capability among various units operating together in a specific threat environment.		
Typical Components	**Platforms:** Fixed-wing aircraft, rotary-wing aircraft, surface combatants, submarines **Targets:** Sub-surface targets **Systems being Trained/Tested:** Sonar systems, sonobuoys, acoustic countermeasures		
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety Aircraft safety Towed in-water device safety	**Typical Locations** **Range Complexes/Testing Ranges:** Jacksonville Navy Cherry Point Virginia Capes	**Inshore Waters/Pierside:** None
Stressors to Biological Resources and Habitats	**Acoustic:** Sonar and other transducers Aircraft noise Vessel noise **Explosives:** None	**Physical Disturbance and Strike:** Aircraft and aerial target strike Vessels and in-water device strike Military expended material **Ingestion:** Military expended materials – other than munitions	**Energy:** In-air electromagnetic devices In-water electromagnetic devices **Entanglement:** Wires and cables Decelerators/parachutes
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** Metals	Chemicals other than explosives
Stressors to Human Resources	None		
Military Expended Material	**Ingestible Material:** Target fragments, decelerators/parachutes - small **Non-Ingestible Material:** Sonobuoys (non-explosive), sonobuoy wires, acoustic countermeasures	**Military Recoverable Material**	Sub-surface targets (mobile)
Sonar and Other Transducer Bins	**Low-Frequency:** LF6 **Mid-Frequency:** MF1 MF5 MF3 MF11 MF4 MF12	**High-Frequency:** HF1 **Anti-Submarine Warfare:** ASW1 ASW4 ASW3	**Acoustic Modems:** M3

Medium Coordinated Anti-Submarine Warfare Training		
Anti-Submarine Warfare Tactical Development Exercise		
In-Water Explosive Bins	Analyzed in individual unit-level training events.	
Procedural Mitigation Measures	**Acoustic Stressors:** *(Section 5.3.2)* Active sonar	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement Towed in-water devices
Assumptions Used for Analysis	Only the anti-submarine warfare activities were analyzed as an Anti-Submarine Warfare Tactical Development Exercise. Other warfare area training conducted during the exercise was analyzed as unit-level training. Stressors to human resources were not analyzed for this activity since it occurs greater than 12 NM from shore. Additional activities utilizing sources not listed in the Sonar and Other Transducer Bins section above may occur during this exercise. All acoustic sources that may be used during training and testing activities have been accounted for in the modeling and analysis presented in this EIS/OEIS.	

A.2.2.4 Amphibious Ready Group Marine Expeditionary Unit Exercise

Small Coordinated Anti-Submarine Warfare Training				
Amphibious Ready Group Marine Expeditionary Unit Exercise				
Short Description	Navy and Marine Corps forces conduct advanced training at sea in preparation for deployment.	**Typical Duration**	5-7 days	
Long Description	Amphibious ships and embarked Marine Expeditionary Units train to a multitude of scenarios to test the capabilities of the amphibious force. Operations include ship to shore movement with tiltrotor aircraft and Landing Craft Air Cushion vessels. Marine Corps forces conduct more advanced amphibious operations to include small boat raids; visit, board, search, and seizure training; helicopter and mechanized amphibious raids; and non-combatant evacuation operations. This exercise generally occurs during an Expeditionary Strike Group Composite Training Unit Exercise. All military expended materials, explosives, and use of other munitions in Amphibious Ready Group Marine Expeditionary Unite Exercise are included in unit-level events.			
Typical Components	**Platforms:** Amphibious warfare ships, fixed-wing aircraft, rotary-wing aircraft, small boats, surface combatants, tiltrotor aircraft **Targets:** None **Systems Being Trained/Tested:** Sonar systems			
Standard Operating Procedures *(Section 2.3.3)*	Vessel Aircraft safety Towed in-water device safety	**Typical Locations**		
		Range Complexes/Testing Ranges: Navy Cherry Point	**Inshore Waters/Pierside:** None	
Stressors to Biological Resources and Habitats	**Acoustic:** Sonar and other transducers Aircraft noise Vessel noise **Explosives:** None	**Physical Disturbance and Strike:** Aircraft and aerial target strike Vessels and in-water device strike Military expended material **Ingestion:** Military expended materials – other than munitions	**Energy:** In-air electromagnetic devices In-water electromagnetic devices **Entanglement:** Wires and cables Decelerators/parachutes	
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** Metals	Chemicals other than explosives	
Stressors to Human Resources	None			
Military Expended Material	**Ingestible Material:** Decelerator/parachute -Small **Non-Ingestible Material:** Sonobuoys, acoustic countermeasures	**Military Recoverable Material**	None	
Sonar and Other Transducer Bins	**Low-Frequency:** LF6 **Mid-Frequency:** MF1 MF11 MF3 MF12	**High-Frequency:** HF1 **Anti-Submarine Warfare:** ASW1		
In-Water Explosive Bins	Analyzed in individual unit-level training events.			

Small Coordinated Anti-Submarine Warfare Training		
Amphibious Ready Group Marine Expeditionary Unit Exercise		
Procedural Mitigation Measures	**Acoustic Stressors:** *(Section 5.3.2)* Active sonar	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement Towed in-water devices
Assumptions Used for Analysis	Only the anti-submarine warfare activities were analyzed as Amphibious Ready Group Marine Expeditionary Unit training. Other warfare area training conducted during the exercise was analyzed as unit-level training. Sonar is not used during every exercise. Stressors to human resources were not analyzed for this activity since it occurs greater than 12 NM from shore. Additional activities utilizing sources not listed in the Sonar and Other Transducer Bins section above may occur during this exercise. All acoustic sources that may be used during training and testing activities have been accounted for in the modeling and analysis presented in this EIS/OEIS.	

A.2.2.5 Group Sail

Small Coordinated Anti-Submarine Warfare				
Group Sail				
Short Description	Surface ships and helicopters integrate to search for, detect, and track threat submarines. Group Sails are not dedicated anti-submarine warfare exercises and involve multiple warfare areas.	**Typical Duration**	2-3 days	
Long Description	Multiple ships and helicopters integrate the use of their sensors, including sonobuoys, to search for, detect, classify, localize, and track threat submarines. While Group Sail is not a dedicated anti-submarine warfare exercise and involves multiple warfare areas, only the anti-submarine warfare activities were analyzed as a Group Sail. Other warfare area training conducted during a Group Sail is analyzed elsewhere as unit-level training. Group Sail is an intermediate training exercise primarily intended to introduce coordinated operations after unit-level training and prior to integrated training. This exercise stresses planning, coordination, and communications during multiple warfare training scenarios. Two or more ships and up to two helicopters search for, locate, and attack one submarine. Typically, one ship and helicopter are actively prosecuting while the other ship and helicopter are repositioning. Simultaneously, the submarine may practice simulated attacks against the ships. Multiple acoustic sources may be active at one time.			
Typical Components	**Platforms:** Fixed-wing aircraft, rotary-wing aircraft, surface combatants, submarines **Targets:** Sub-surface targets **Systems being Trained/Tested:** Sonar systems, sonobuoys, acoustic countermeasures			
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety Aircraft safety	**Typical Locations**		
		Range Complexes/Testing Ranges: Jacksonville Navy Cherry Point Virginia Capes	**Inshore Waters/Pierside:** None	
Stressors to Biological Resources and Habitats	**Acoustic:** Sonar and other transducers Aircraft noise Vessel noise **Explosives:** None	**Physical Disturbance and Strike:** Aircraft and aerial target strike Vessels and in-water device strike Military expended material **Ingestion:** Military expended materials – other than munitions	**Energy:** In-water electromagnetic devices In-air electromagnetic devices **Entanglement:** Wires and cables Decelerators/parachutes	
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** Metals	Chemicals other than explosives	
Stressors to Human Resources	None			
Military Expended Material	**Ingestible Material:** Decelerators/parachutes - Small **Non-Ingestible Material:** Acoustic countermeasures, sonobuoys (non-explosive), sonobuoy wires, expendable bathythermographs, expendable bathythermograph wires, sub-surface targets (mobile)	**Military Recoverable Material**	Sub-surface targets (mobile)	

Small Coordinated Anti-Submarine Warfare					
Group Sail					
Sonar and Other Transducer Bins	**Mid-Frequency:**		**Anti-Submarine Warfare:**		**High-Frequency:**
	MF1	MF5	ASW2	ASW4	HF1
	MF3	MF11	ASW3		
	MF4	MF12			
In-Water Explosive Bins	Analyzed in individual unit-level training events.				
Procedural Mitigation Measures	**Acoustic Stressors:** *(Section 5.3.2)* Active sonar		**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement		
Assumptions Used for Analysis	While the preference will be to train against an actual submarine or MK 30 recoverable target, assume only MK 39 expendable targets will be used. One MK 39 Expendable Mobile Anti-Submarine Warfare Training Target may be used in place of an actual submarine target. Only the anti-submarine warfare activities were analyzed as Group Sail training. Other warfare area training conducted during the exercise was analyzed as unit-level training. Additional activities utilizing sources not listed in the Sonar and Other Transducer Bins section above may occur during this exercise. All acoustic sources that may be used during training and testing activities have been accounted for in the modeling and analysis presented in this EIS/OEIS.				

A.2.3 AIR WARFARE TRAINING

Air warfare is the primary mission area that addresses combat operations by air and surface forces against hostile aircraft. Navy ships contain an array of modern anti-aircraft weapon systems, including naval guns linked to radar-directed fire-control systems, surface-to-air missile systems, and radar-controlled cannon for close-in point defense. Strike/fighter aircraft carry anti-aircraft weapons, including air-to-air missiles and aircraft cannon. Air warfare training encompasses events and exercises to train ship and aircraft crews in employment of these weapons systems against simulated threat aircraft or targets. Air warfare training includes surface-to-air gunnery, surface-to-air and air-to-air missile exercises, and aircraft force-on-force combat maneuvers.

A.2.3.1 Air Combat Maneuver

<table>
<tr><td colspan="6">Air Warfare</td></tr>
<tr><td colspan="6">Air Combat Maneuver</td></tr>
<tr><td>Short Description</td><td colspan="3">Fixed-wing aircrews aggressively maneuver against threat aircraft to gain tactical advantage.</td><td colspan="2">Typical Duration
1-2 hours</td></tr>
<tr><td>Long Description</td><td colspan="5">Basic flight maneuvers in which fixed-wing aircrew engage in offensive and defensive maneuvering against each other. During air combat maneuver engagements, no munitions are fired, however countermeasures such as chaff and flares may be used. These maneuvers typically involve two aircraft; however, based upon the training requirement, air combat maneuver exercises may involve over a dozen aircraft.</td></tr>
<tr><td>Typical Components</td><td colspan="5">Platforms: Fixed-wing aircraft
Targets: Air targets
Systems being Trained/Tested: None</td></tr>
<tr><td>Standard Operating Procedures (Section 2.3.3)</td><td colspan="2">Aircraft safety</td><td colspan="3">Typical Locations
Range Complexes/Testing Ranges:
Jacksonville
Key West
Navy Cherry Point
Virginia Capes
Inshore Waters/Pierside:
None</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td colspan="2">Acoustic:
Aircraft noise

Explosives:
None</td><td colspan="2">Physical Disturbance and Strike:
Aircraft and aerial target strike

Ingestion:
None</td><td>Energy:
In-air electromagnetic devices

Entanglement:
None</td></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="3">Air Quality:
Criteria air pollutants</td><td colspan="2">Sediments and Water Quality:
None</td></tr>
<tr><td>Stressors to Human Resources</td><td>Cultural Resources:
Physical disturbance and strike</td><td colspan="2">Socioeconomic Resources:
Accessibility
Airborne acoustics
Physical disturbance and strike</td><td colspan="2">Public Health and Safety:
Physical interactions
In-air energy</td></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
None

Non-Ingestible Material:
None</td><td>Military Recoverable Material</td><td colspan="2">None</td></tr>
</table>

Air Warfare	
Air Combat Maneuver	
Sonar and Other Transducer Bins	None
In-Water Explosive Bins	None
Procedural Mitigation Measures	None
Assumptions Used for Analysis	No munitions are fired. Flares and chaff may be used. All flares and chaff are accounted for in flare exercise and chaff exercise.

A.2.3.2 Air Defense Exercise

Air Warfare			
Air Defense Exercise			
Short Description	Aircrew and ship crews conduct defensive measures against threat aircraft or simulated missiles.	**Typical Duration**	1-4 hours
Long Description	Fixed-wing aircrew and ship personnel perform measures designed to defend against attacking threat aircraft or missiles or reduce the effectiveness of such attack. This exercise involves full detection through engagement sequence. Aircraft operate at varying altitudes and speeds. This exercise may include air intercept control exercises where aircraft controllers on ships, in fixed-wing aircraft or at land based locations use search radars to track and direct friendly aircraft to intercept the threat aircraft, and detect to engage exercises where personnel on ships use search radars to detect, classify, and track enemy aircraft or missiles up to the point of engagement.		
Typical Components	**Platforms:** Fixed-wing aircraft, surface combatants **Targets:** Air targets **Systems being Trained/Tested:** None		
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety Aircraft safety	**Typical Locations** **Range Complexes/Testing Ranges:** Gulf of Mexico Jacksonville Navy Cherry Point Virginia Capes	**Inshore Waters/Pierside:** None
Stressors to Biological Resources and Habitats	**Acoustic:** Aircraft noise Vessel noise **Explosives:** None	**Physical Disturbance and Strike:** Aircraft and aerial target strike Vessel and in-water device strike **Ingestion:** None	**Energy:** In-air electromagnetic devices **Entanglement:** None
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** None	
Stressors to Human Resources	**Cultural Resources:** Physical disturbance and strike	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-air energy
Military Expended Material	**Ingestible Material:** None **Non-Ingestible Material:** None	**Military Recoverable Material**	None
Sonar and Other Transducer Bins	None		
In-Water Explosive Bins	None		
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement		
Assumptions Used for Analysis	No munitions are fired.		

A.2.3.3 Gunnery Exercise Air-to-Air Medium-Caliber

Air Warfare				
Gunnery Exercise Air-to-Air Medium-Caliber				
Short Description	Fixed-wing aircrews fire medium-caliber guns at air targets.	**Typical Duration** 1-2 hours		
Long Description	Fixed-wing aircrews maneuver aircraft in a gunnery pattern to achieve a weapons firing solution with integrated medium-caliber guns. Typically involves two or more fixed-wing aircraft and a target banner towed by a contract aircraft (e.g., Lear jet). The target banner is recovered after the exercise.			
Typical Components	**Platforms:** Fixed-wing aircraft **Targets:** Air targets **Systems being Trained/Tested:** Medium-caliber gun systems			
Standard Operating Procedures *(Section 2.3.3)*	Aircraft safety Weapons firing safety	**Typical Locations** **Range Complexes/Testing Ranges:** Jacksonville Key West Navy Cherry Point Virginia Capes	**Inshore Waters/Pierside:** None	
Stressors to Biological Resources and Habitats	**Acoustic:** Aircraft noise Weapons noise **Explosives:** None	**Physical Disturbance and Strike:** Aircraft and aerial target strike Military expended material strike **Ingestion:** Military expended materials – munitions	**Energy:** In-air electromagnetic devices **Entanglement:** None	
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** Metals		
Stressors to Human Resources	**Cultural Resources:** Physical disturbance and strike	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-air energy	
Military Expended Material	**Ingestible Material:** Medium-caliber projectiles (non-explosive), medium-caliber casings **Non-Ingestible Material:** None	**Military Recoverable Material**	Towed air targets	
Sonar and Other Transducer Bins	None			
In-Water Explosive Bins	None			
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement			

Air Warfare	
Gunnery Exercise Air-to-Air Medium-Caliber	
Assumptions Used for Analysis	This activity is conducted at an altitude of 15,000 ft. and above, during the daytime, and approximately 40 NM from shore. A towed air target is a banner target and will be recovered. Only non-explosive munitions used.

A.2.3.4 Gunnery Exercise Surface-to-Air Large-Caliber

Air Warfare			
Gunnery Exercise Surface-to-Air Large-Caliber			
Short Description	Surface ship crews fire large-caliber guns at air targets.	**Typical Duration**	1-2 hours
Long Description	Surface ship crews defend against threat aircraft or missiles with large-caliber guns to disable or destroy the threat. An exercise involves one ship and a simulated threat aircraft or missile that is detected by the ship's radar. Large-caliber guns fire non-explosive projectiles at the threat before it reaches the ship. The target is towed by a contract air services jet.		
Typical Components	**Platforms:** Aircraft carriers, amphibious warfare ships, fixed-wing aircraft, surface combatants **Targets:** Air targets **Systems being Trained/Tested:** Large-caliber gun systems		
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety Aircraft safety Weapons firing safety	**Typical Locations** **Range Complexes/Testing Ranges:** Jacksonville Virginia Capes	**Inshore Waters/Pierside:** None
Stressors to Biological Resources and Habitats	**Acoustic:** Aircraft noise Vessel noise Weapons noise **Explosives:** None	**Physical Disturbance and Strike:** Aircraft and aerial target strike Vessels and in-water device strike Military expended material **Ingestion:** Military expended material – other than munitions	**Energy:** In-air electromagnetic devices **Entanglement:** None
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** Metals	
Stressors to Human Resources	None		
Military Expended Material	**Ingestible Material:** Air Target (Decoy) - fragments **Non-Ingestible Material:** Large-caliber projectiles (non-explosive), large-caliber casings	**Military Recoverable Material**	None
Sonar and Other Transducer Bins	None		
In-Water Explosive Bins	None		
Procedural Mitigation Measures	**Acoustic Stressors:** *(Section 5.3.2)* Weapons firing noise	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement	

Air Warfare	
Gunnery Exercise Surface-to-Air Large-Caliber	
Assumptions Used for Analysis	The target is a fiberglass finned target that is towed approximately 3 NM behind the towing aircraft. All projectiles are assumed to be non-explosive. Stressors to human resources were not analyzed for this activity since it occurs greater than 12 NM from shore.

A.2.3.5 Gunnery Exercise Surface-to-Air Medium-Caliber

Air Warfare				
Gunnery Exercise Surface-to-Air Medium-Caliber				
Short Description	Surface ship crews fire medium-caliber guns at air targets.	**Typical Duration**	1-2 hours	
Long Description	Surface ship crews defend against threat aircraft or missiles with medium-caliber guns to disable or destroy the threat. An exercise involves one ship and a simulated threat aircraft or anti-ship missile that is detected by the ship's radar. Medium-caliber guns fire non-explosive projectiles to disable or destroy the threat before it reaches the ship. The target is towed by a contract air services jet.			
Typical Components	**Platforms:** Aircraft carriers, amphibious warfare ships, surface combatants, fixed-wing aircraft **Targets:** Air targets **Systems being Trained/Tested:** Medium-caliber gun systems			
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety Aircraft safety Weapons firing safety	**Typical Locations**		
		Range Complexes/Testing Ranges: Jacksonville Navy Cherry Point Virginia Capes Other AFTT Areas	**Inshore Waters/Pierside:** None	
Stressors to Biological Resources and Habitats	**Acoustic:** Aircraft noise Vessel noise Weapons noise **Explosives:** None	**Physical Disturbance and Strike:** Aircraft and aerial target strike Vessels and in-water device strike Military expended material **Ingestion:** Military expended materials – munitions Military expended materials – other than munitions	**Energy:** In-air electromagnetic devices **Entanglement:** None	
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** Metals Other materials		
Stressors to Human Resources	None			
Military Expended Material	**Ingestible Material:** Medium-caliber projectiles (non-explosive), medium-caliber casings, air target (decoy) fragments **Non-Ingestible Material:** None	**Military Recoverable Material**	None	
Sonar and Other Transducer Bins	None			
In-Water Explosive Bins	None			

Air Warfare	
Gunnery Exercise Surface-to-Air Medium-Caliber	
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement
Assumptions Used for Analysis	The target is a fiberglass finned target that is towed approximately 3 NM behind the towing aircraft. Stressors to human resources were not analyzed for this activity since it occurs greater than 12 NM from shore.

A.2.3.6 Missile Exercise Air-to-Air

Air Warfare			
Missile Exercise Air-to-Air			
Short Description	Fixed-wing aircrews fire air-to-air missiles at air targets	**Typical Duration**	1-2 hours
Long Description	An exercise involves two or more fixed-wing aircraft and a target. Missiles are either explosive warheads or non-explosive practice munitions. The target is an unmanned aerial target drone, a tactical air-launched decoy, or a parachute suspended illumination flare. Target drones deploy parachutes and are recovered by small boat or rotary-wing aircraft; tactical air-launched decoys and illumination flares are expended and not recovered. These exercises typically occur at high altitudes.		
Typical Components	**Platforms:** Fixed-wing aircraft, rotary-wing aircraft, small boats **Targets:** Air targets, flares **Systems being Trained/Tested:** Missile and rocket systems		
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety Aircraft safety Weapons firing safety	**Typical Locations**	
		Range Complexes/Testing Ranges: Gulf of Mexico Jacksonville Key West Navy Cherry Point Virginia Capes	**Inshore Waters/Pierside:** None
Stressors to Biological Resources and Habitats	**Acoustic:** Aircraft noise Vessel noise Weapons noise **Explosives:** In-air explosives	**Physical Disturbance and Strike:** Aircraft and aerial target strike Military expended material Vessel & in-water device strike **Ingestion:** Military expended materials – munitions Military expended materials – other than munitions	**Energy:** In-air electromagnetic devices **Entanglement:** Decelerators/ parachutes
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants		**Sediments and Water Quality:** Explosives and explosive byproducts Chemicals other than explosives Metals Other materials
Stressors to Human Resources	None		

<table>
<tr><th colspan="4">Air Warfare</th></tr>
<tr><th colspan="4">Missile Exercise Air-to-Air</th></tr>
<tr><td>Military Expended Material</td><td>Ingestible Material:
Missiles (explosive) and air target (decoy) and (drone) fragments

Non-Ingestible Material:
Illumination flares, missiles (non-explosive), decelerators/parachutes – medium, large and extra-large</td><td>Military Recoverable Material</td><td>Air target (drone)</td></tr>
<tr><td>Sonar and Other Transducer Bins</td><td colspan="3">None</td></tr>
<tr><td>In-Water Explosive Bins</td><td colspan="3">None</td></tr>
<tr><td>Procedural Mitigation Measures</td><td colspan="3">Physical Disturbance and Strike: (Section 5.3.4)
Vessel movement</td></tr>
<tr><td>Assumptions Used for Analysis</td><td colspan="3">For analysis, all missiles are assumed to be explosive, although non-explosive practice munitions may be used. All missiles explode at high altitude.
All propellant and explosives are consumed.
Stressors to human resources were not analyzed for this activity since it occurs greater than 12 NM from shore.</td></tr>
</table>

Figure A.2-1: BQM-74 (Aerial Target)

Figure A.2-2: LUU-2B/B Illuminating Flare (Aerial Target)

Figure A.2-3: Tactical Air-Launched Decoy (Aerial Target)

A.2.3.7 Missile Exercise – Man-Portable Air Defense System

Air Warfare			
Missile Exercise – Man-Portable Air Defense System			
Short Description	Personnel employ a shoulder fired surface to air missile at air targets.	**Typical Duration**	Varies
Long Description	Personnel employ the Man-Portable Air Defense Systems, a shoulder fired surface to air missile, against threat missiles or aircraft. An exercise involves personnel firing the Man-Portable Air Defense System at remote piloted or ballistic aerial targets. Activity is typically conducted by combat forces firing from shore locations at targets over the water. Small boats are used to ensure range safety.		
Typical Components	**Platforms:** Small boats **Targets:** Air targets **Systems being Trained/Tested:** Man-Portable Defense Systems		
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety Weapons firing safety Unmanned aerial, surface and subsurface vehicle safety	**Typical Locations** **Range Complexes/Testing Ranges:** Navy Cherry Point	**Inshore Waters/Pierside:** None
Stressors to Biological Resources and Habitats	**Acoustic:** Aircraft noise Weapons noise Vessel noise **Explosives:** In-air explosives	**Physical Disturbance and Strike:** Aircraft and aerial target strike Vessels and in-water device strike Military expended material **Ingestion:** Military expended material – munitions Military expended material – other than munitions	**Energy:** None **Entanglement:** None
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** Explosives and explosive byproducts Chemicals other than explosives Other materials Metals	
Stressors to Human Resources	**Cultural Resources:** Physical disturbance and strikes	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strikes	**Public Health and Safety:** Physical interactions
Military Expended Material	**Ingestible Material:** Missile (explosive) fragments, air target (drone) fragments **Non-Ingestible Material:** None	**Military Recoverable Material**	None
Sonar and Other Transducer Bins	None		
In-Water Explosive Bins	None		

Air Warfare	
Missile Exercise – Man-Portable Air Defense System	
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Non-explosive missiles and rockets Vessel movement
Assumptions Used for Analysis	For analysis, all missiles are assumed to be explosive, although non-explosive practice munitions may be used. All missiles explode in-air at low altitude. All propellant and explosives are consumed.

A.2.3.8 Missile Exercise Surface-to-Air

Air Warfare				
Missile Exercise Surface-to-Air				
Short Description	Surface ship crews fire surface-to-air missiles at air targets.	**Typical Duration** 1-2 hours		
Long Description	Surface ship crews defend against threat missiles and aircraft with ship launched surface-to-air missiles. The exercise involves a simulated threat aircraft, anti-ship missile, or land attack missile, which is detected by the ship's radar. Ship launched surface-to-air missiles are fired (high-explosive) to disable or destroy the threat. The target typically is a remote controlled drone. Target drones deploy parachutes and are recovered by small boat or rotary-wing aircraft; when used, tactical air-launched decoys are not recovered.			
Typical Components	**Platforms:** Aircraft carriers, amphibious warfare ships, surface combatants **Targets:** Air targets **Systems being Trained/Tested:** Surface-to-air missile systems			
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety Aircraft safety Weapons firing safety	**Typical Locations**		
		Range Complexes/Testing Ranges: Gulf of Mexico Jacksonville Navy Cherry Point Northeast Virginia Capes	**Inshore Waters/Pierside:** None	
Stressors to Biological Resources and Habitats	**Acoustic:** Aircraft noise Vessel noise Weapons noise **Explosives:** In-air explosives	**Physical Disturbance and Strike:** Aircraft and aerial target strike Vessel and in-water device strike Military expended material **Ingestion:** Military expended material – munitions Military expended material – other than munitions	**Energy:** In-air electromagnetic devices **Entanglement:** Decelerators/parachutes	
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** Explosives and explosive byproducts Chemicals other than explosives Other materials Metals		
Stressors to Human Resources	None			
Military Expended Material	**Ingestible Material:** Missile (explosive) fragments, air target (drone) and (decoy) fragments **Non-Ingestible Material:** Decelerators/parachutes - large	**Military Recoverable Material**	Air target (drone)	
Sonar and Other Transducer Bins	None			

Air Warfare	
Missile Exercise Surface-to-Air	
Explosive Bins	None
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement
Assumptions Used for Analysis	Assumes that all surface-to-air missiles are high-explosive. Missile explodes well above the water's surface. All explosive and propellant are consumed. Stressors to human resources were not analyzed for this activity since it occurs greater than 12 NM from shore.

A.2.4 AMPHIBIOUS WARFARE TRAINING

Amphibious warfare is a type of naval warfare involving the utilization of naval firepower, logistics, and Marine Corps landing forces to project military power ashore. Amphibious warfare encompasses a broad spectrum of activities involving maneuver from the sea to objectives ashore, ranging from reconnaissance or raid missions involving a small unit to large-scale amphibious operations involving over 1,000 Marines and Sailors and multiple ships and aircraft embarked in a strike group.

Amphibious warfare training includes tasks at increasing levels of complexity, from individual, crew, and small unit events to large task force exercises. Individual and crew training include the operation of amphibious vehicles and naval gunfire support training. Small-unit training activities include shore assaults, boat raids, airfield or port seizures, and reconnaissance. Larger-scale amphibious exercises involve ship-to-shore maneuver, shore bombardment and other naval fire support, and air strike and close air support training.

A.2.4.1 Amphibious Assault

Amphibious Warfare			
Amphibious Assault			
Short Description	Large unit forces move ashore from amphibious ships at sea for the immediate execution of inland objectives.	**Typical Duration**	Up to 2 weeks
Long Description	Large unit forces move ashore from amphibious ships at sea for the immediate execution of inland objectives. Amphibious assault is conducted for the purposes of prosecuting further combat operations, obtaining a site for an advanced naval or airbase, or denying the enemy use of an area. Unit-level training exercises involve one or more amphibious ships, and their associated watercraft and aircraft, to move personnel and equipment from ship to shore without the command and control and supporting elements involved in a full scale exercise. The goal is to practice loading, unloading, and movement and to develop the timing required for a full-scale exercise.		
Typical Components	**Platforms:** Amphibious warfare ships, fixed-wing aircraft, rotary-wing aircraft, small boats, tiltrotor aircraft **Targets:** None **Systems being Trained/Tested:** None		
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety Aircraft safety	**Typical Locations**	
		Range Complexes/Testing Ranges: Navy Cherry Point	**Inshore Waters/Pierside:** None
Stressors to Biological Resources and Habitats	**Acoustic:** Aircraft noise Vessel noise	**Physical Disturbance and Strike:** Aircraft and aerial target strike Vessel and in-water device strike	**Energy:** In-air electromagnetic devices
	Explosives: None	**Ingestion:** None	**Entanglement:** None
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** None	
Stressors to Human Resources	**Cultural Resources:** Physical disturbance and strikes	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strikes	**Public Health and Safety:** Physical interactions In-air energy

Amphibious Warfare			
Amphibious Assault			
Military Expended Material	**Ingestible Material:** None **Non-Ingestible Material:** None	**Military Recoverable Material**	None
Sonar and Other Transducer Bins	None		
In-Water Explosive Bins	None		
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement		
Assumptions Used for Analysis	Typical exercise: 1-3 amphibious ships (e.g., LHA or LHD, LPD, LSD); 2-8 landing craft (landing craft, air cushion; landing craft, utility); 4-14 amphibious assault vehicles; up to 22 aircraft (e.g., MH-53, H-46/MV-22, AH-1, UH-1, AV-8); a Marine Expeditionary Unit (2,200 Marines).		

A.2.4.2 Amphibious Marine Expeditionary Unit Integration Exercise

<table>
<tr><th colspan="6">Amphibious Warfare</th></tr>
<tr><th colspan="6">Amphibious Marine Expeditionary Unit Integration Exercise</th></tr>
<tr><td>Short Description</td><td colspan="3">Navy and Marine Corps forces conduct integration training at sea in preparation for deployment.</td><td>Typical Duration</td><td>Up to 3 weeks</td></tr>
<tr><td>Long Description</td><td colspan="5">Amphibious ships and Marine Expeditionary Unit integrate for the first time at sea to practice amphibious tactics, techniques, and procedures. Navy and Marine Corps forces conduct basic amphibious operations to include small boat raids; visit, board, search, and seizure training; helicopter and mechanized amphibious raids.</td></tr>
<tr><td>Typical Components</td><td colspan="5">Platforms: Amphibious warfare ships, fixed-wing aircraft, rotary-wing aircraft, small boats, tiltrotor aircraft
Targets: None
Systems being Trained/Tested: None</td></tr>
<tr><td>Standard Operating Procedures
(Section 2.3.3)</td><td colspan="2">Vessel safety
Aircraft safety</td><td colspan="3">Typical Locations
Range Complexes/Testing Ranges:
Navy Cherry Point
Inshore Waters/Pierside:
None</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td colspan="2">Acoustic:
Aircraft noise
Vessel noise

Explosives:
None</td><td colspan="2">Physical Disturbance and Strike:
Aircraft and aerial target strike
Vessel and in-water device strike

Ingestion:
None</td><td>Energy:
In-air electromagnetic devices

Entanglement:
None</td></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="2">Air Quality:
Criteria air pollutants</td><td colspan="3">Sediments and Water Quality:
None</td></tr>
<tr><td>Stressors to Human Resources</td><td colspan="2">Cultural Resources:
Physical disturbance and strike</td><td colspan="2">Socioeconomic Resources:
Accessibility
Airborne acoustics
Physical disturbance and strike</td><td>Public Health and Safety:
Physical interactions
In-air energy</td></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
None

Non-Ingestible Material:
None</td><td>Military Recoverable Material</td><td colspan="2">None</td></tr>
<tr><td>Sonar and Other Transducer Bins</td><td colspan="5">None</td></tr>
<tr><td>In-Water Explosive Bins</td><td colspan="5">None</td></tr>
<tr><td>Procedural Mitigation Measures</td><td colspan="5">Physical Disturbance and Strike: (Section 5.3.4)
Vessel movement</td></tr>
<tr><td>Assumptions Used for Analysis</td><td colspan="5">Weapons firing during this exercise is discussed under descriptions of appropriate unit-level exercises (e.g., surface-to-surface and air-to-surface small-caliber gunnery exercises).</td></tr>
</table>

A.2.4.3 Amphibious Raid

<table>
<tr><th colspan="6">Amphibious Warfare</th></tr>
<tr><th colspan="6">Amphibious Raid</th></tr>
<tr><td>Short Description</td><td colspan="3">Small unit forces move from amphibious ships at sea for a specific short-term mission. These are quick operations with as few personnel as possible.</td><td>Typical Duration
4-8 hours</td><td></td></tr>
<tr><td>Long Description</td><td colspan="5">Small unit forces swiftly move from amphibious vessels at sea into hostile territory for a specific mission, including a planned withdrawal. Raids are conducted to inflict loss or damage, secure information, create a diversion, confuse the enemy, or capture or evacuate individuals or material. Amphibious raid forces are kept as small as possible to maximize stealth and speed of the operation.

An event may employ assault amphibian vehicle units, small boats, small unit live-fire and non-live-fire operations. Surveillance or reconnaissance unmanned surface and aerial vehicles may be used during this exercise.</td></tr>
<tr><td>Typical Components</td><td colspan="5">Platforms: Amphibious warfare ships, small boats, unmanned aerial systems
Targets: None
Systems being Trained/Tested: None</td></tr>
<tr><td>Standard Operating Procedures (Section 2.3.3)</td><td colspan="2">Vessel safety
Unmanned aerial, surface, and subsurface vehicle safety</td><td colspan="3">Typical Locations
Range Complexes/Testing Ranges:
Jacksonville
Navy Cherry Point
Inshore Waters/Pierside:
None</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td colspan="5">Acoustic:
Aircraft noise
Vessel noise

Explosives:
None

Physical Disturbance and Strike:
Aircraft and aerial target strike
Vessel and in-water device strike

Ingestion:
None

Energy:
In-air electromagnetic devices

Entanglement:
None</td></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="5">Air Quality:
Criteria air pollutants

Sediments and Water Quality:
None</td></tr>
<tr><td>Stressors to Human Resources</td><td colspan="5">Cultural Resources:
Physical disturbance and strike

Socioeconomic Resources:
Accessibility
Airborne acoustics
Physical disturbance and strike

Public Health and Safety:
Physical interactions
In-air energy</td></tr>
<tr><td>Military Expended Material</td><td colspan="3">Ingestible Material:
None

Non-Ingestible Material:
None</td><td>Military Recoverable Material</td><td>None</td></tr>
<tr><td>Sonar and Other Transducer Bins</td><td colspan="5">None</td></tr>
<tr><td>In-Water Explosive Bins</td><td colspan="5">None</td></tr>
</table>

Amphibious Warfare	
Amphibious Raid	
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement
Assumptions Used for Analysis	Weapons firing during this exercise is discussed in appropriate unit-level training descriptions (e.g., surface-to-surface and air-to-surface small-caliber gunnery exercises).

A.2.4.4 Amphibious Vehicle Maneuvers

Amphibious Warfare			
Amphibious Vehicle Maneuvers			
Short Description	Small boat crews practice the employment of amphibious vehicles.	**Typical Duration**	1-4 hours
Long Description	Navy personnel train to learn handling characteristics of a variety of amphibious craft, to include Landing Craft Air Cushion vehicles, amphibious assault vehicles, and Lighter Amphibious Resupply Cargo vehicles. Training includes the driving of vehicles into the water, basic in-water vehicle maneuvers, and the driving of vehicles back to shore.		
Typical Components	**Platforms:** Amphibious vehicles, small boats **Targets:** None **Systems being Trained/Tested:** None		
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety	**Typical Locations** **Range Complexes/Testing Ranges:** Virginia Capes Jacksonville	**Inshore Waters/Pierside:** Lower Chesapeake Bay St. Johns River
Stressors to Biological Resources and Habitats	**Acoustic:** Vessel noise **Explosives:** None	**Physical Disturbance and Strike:** Vessel and in-water device strike **Ingestion:** None	**Energy:** None **Entanglement:** None
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** None	
Stressors to Human Resources	**Cultural Resources:** Physical disturbance and strike	**Socioeconomic Resources:** Accessibility Physical disturbance and strike	**Public Health and Safety:** Physical interactions
Military Expended Material	**Ingestible Material:** None **Non-Ingestible Material:** None	**Military Recoverable Material**	None
Sonar and Other Transducer Bins	None		
In-Water Explosive Bins	None		
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement		
Assumptions Used for Analysis	None		

A.2.4.5 Humanitarian Assistance Operations

<table>
<tr><th colspan="6">Amphibious Warfare</th></tr>
<tr><th colspan="6">Humanitarian Assistance Operations</th></tr>
<tr><td>Short Description</td><td colspan="3">Military units evacuate noncombatants from hostile or unsafe areas or provide humanitarian assistance in times of disaster.</td><td colspan="2">Typical Duration
12 hours</td></tr>
<tr><td>Long Description</td><td colspan="5">Military units evacuate noncombatants from hostile or unsafe areas to safe havens or to provide humanitarian assistance in times of disaster. Non-Combatant Evacuation Operation is conducted by military units (generally Marine Corps) usually operating in conjunction with Navy ships and aircraft. Non-combatants are evacuated when their lives are endangered by war, civil unrest, or natural disaster. Military units train for evacuations in hostile environments that require the use of force, though usually there is no opposition to evacuation from the host country. Helicopters and landing crafts could be expected to participate in this operation during day or night.</td></tr>
<tr><td>Typical Components</td><td colspan="5">Platforms: Amphibious warfare ships, rotary-wing aircraft, tiltrotor aircraft, small boats
Targets: None
Systems being Trained/Tested: None</td></tr>
<tr><td>Standard Operating Procedures
(Section 2.3.3)</td><td colspan="2">Vessel safety
Aircraft safety</td><td colspan="3">Typical Locations
Range Complexes/Testing Ranges:
Navy Cherry Point
Inshore Waters/Pierside:
None</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td colspan="2">Acoustic:
Aircraft noise
Vessel noise

Explosives:
None</td><td colspan="2">Physical Disturbance and Strike:
Aircraft and aerial target strike
Vessel and in-water device strike

Ingestion:
None</td><td>Energy:
In-air electromagnetic devices

Entanglement:
None</td></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="2">Air Quality:
Criteria air pollutants</td><td colspan="3">Sediments and Water Quality:
None</td></tr>
<tr><td>Stressors to Human Resources</td><td>Cultural Resources:
Physical disturbance and strike</td><td colspan="2">Socioeconomic Resources:
Accessibility
Airborne acoustics
Physical disturbance and strike</td><td colspan="2">Public Health and Safety:
Physical interactions
In-air energy</td></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
None

Non-Ingestible Material:
None</td><td>Military Recoverable Material</td><td colspan="2">None</td></tr>
<tr><td>Sonar and Other Transducer Bins</td><td colspan="5">None</td></tr>
<tr><td>In-Water Explosive Bins</td><td colspan="5">None</td></tr>
<tr><td>Procedural Mitigation Measures</td><td colspan="5">Physical Disturbance and Strike: (Section 5.3.4)
Vessel movement</td></tr>
<tr><td>Assumptions Used for Analysis</td><td colspan="5">None</td></tr>
</table>

A.2.4.6 Marine Expeditionary Unit Certification Exercise

<table>
<tr><th colspan="6">Amphibious Warfare</th></tr>
<tr><th colspan="6">Marine Expeditionary Unit Certification Exercise</th></tr>
<tr><td>Short Description</td><td colspan="3">Amphibious Ready Group exercises are conducted to validate the Marine Expeditionary Unit's readiness for deployment and include small boat raids; visit, board, search, and seizure training; helicopter and mechanized amphibious raids; and non-combatant evacuation operations.</td><td colspan="2">Typical Duration
Up to 3 weeks</td></tr>
<tr><td>Long Description</td><td colspan="5">Marine Corps amphibious forces move from amphibious ships at sea, by watercraft or aircraft, and introduce a landing force, establish a beachhead, and occupy the area or move further inland for an extended period.

The amphibious assault conducted by a Marine Expeditionary Unit involves employment of the advance force, combat, combat support, and combat service support units in close coordination with the expeditionary strike group and carrier strike group. The landing is conducted in waves and is focused on concentrating forces quickly in order to establish the beachhead. A typical exercise involves two reinforced companies from the battalion landing team coming ashore via landing crafts and amphibious assault vehicles. Follow-on waves include fire support assets, armored units, and service support elements.</td></tr>
<tr><td>Typical Components</td><td colspan="5">Platforms: Amphibious warfare ships, fixed-wing aircraft, rotary-wing aircraft, small boats, tiltrotor aircraft
Targets: None
Systems being Trained/Tested: None</td></tr>
<tr><td>Standard Operating Procedures (Section 2.3.3)</td><td colspan="2">Vessel safety
Aircraft safety</td><td colspan="3">Typical Locations
Range Complexes/Testing Ranges:
Navy Cherry Point
Inshore Waters/Pierside:
None</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td colspan="2">Acoustic:
Aircraft noise
Vessel noise

Explosives:
None</td><td colspan="2">Physical Disturbance and Strike:
Aircraft and aerial target strike
Vessel and in-water device strike

Ingestion:
None</td><td>Energy:
In-air electromagnetic devices

Entanglement:
None</td></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="3">Air Quality:
Criteria air pollutants</td><td colspan="2">Sediment and Water Quality:
None</td></tr>
<tr><td>Stressors to Human Resources</td><td>Cultural Resources:
Physical disturbance and strike</td><td colspan="2">Socioeconomic Resources:
Accessibility
Airborne acoustics
Physical disturbance and strike</td><td colspan="2">Public Health and Safety:
Physical interactions
In-air energy</td></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
None

Non-Ingestible Material:
None</td><td>Military Recoverable Material</td><td colspan="2">None</td></tr>
<tr><td>Sonar and Other Transducer Bins</td><td colspan="5">None</td></tr>
</table>

Amphibious Warfare	
Marine Expeditionary Unit Certification Exercise	
In-Water Explosive Bins	None
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement
Assumptions Used for Analysis	Weapons firing during this exercise is discussed in appropriate unit-level exercise descriptions (e.g., surface-to-surface and air-to-surface small-caliber gunnery exercises).

A.2.4.7 Naval Surface Fire Support Exercise – At Sea

<table>
<tr><td colspan="6">Amphibious Warfare</td></tr>
<tr><td colspan="6">Naval Surface Fire Support Exercise – At Sea</td></tr>
<tr><td>Short Description</td><td colspan="3">Surface ship crews fire large-caliber guns at a passive acoustic hydrophone scoring system.</td><td>Typical Duration</td><td>1-2 hours of firing, 8 hours total</td></tr>
<tr><td>Long Description</td><td colspan="5">Surface ship crews use large-caliber guns to support forces ashore; however, the land target is simulated at sea. Rounds are scored by passive acoustic buoys located at or near the target area.

The portable scoring system is composed of buoys (Integrated Maritime Portable Acoustic Scoring and Simulation System) set in a pre-designed pattern at specific intervals, which are retrieved after the exercise. A scoring system provides a realistic presentation, such as a land mass with topography, to the vessel's combat system. This virtual land target area overlays the hydrophone array. The vessel fires its munitions into the target area and the acoustic noise resulting from the impact of the round landing in the water is detected by the hydrophones. The scoring system triangulates the exact point of impact of the round, allowing the exercise to be conducted as if the vessel were firing at an actual land target. Surface ship crews use large-caliber (main battery) guns to support forces ashore.</td></tr>
<tr><td>Typical Components</td><td colspan="5">Platforms: Surface combatants
Targets: Surface targets
Systems being Trained/Tested: Large-caliber gun systems</td></tr>
<tr><td>Standard Operating Procedures (Section 2.3.3)</td><td colspan="2">Vessel safety
Weapons firing safety</td><td colspan="3">Typical Locations
Range Complexes/Testing Ranges:
Jacksonville
Navy Cherry Point
Virginia Capes
Inshore Waters/Pierside:
None</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td>Acoustic:
Vessel noise
Weapons noise

Explosives:
None</td><td>Physical Disturbance and Strike:
Vessel and in-water device strike
Military expended material

Ingestion:
None</td><td colspan="3">Energy:
In-air electromagnetic devices

Entanglement:
None</td></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="2">Air Quality:
Criteria air pollutants</td><td colspan="3">Sediments and Water Quality:
Metals</td></tr>
<tr><td>Stressors to Human Resources</td><td colspan="5">None</td></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
None

Non-Ingestible Material:
Large-caliber projectiles, large-caliber casings</td><td>Military Recoverable Material</td><td colspan="2">Surface target (stationary)</td></tr>
<tr><td>Sonar and Other Transducer Bins</td><td colspan="5">None</td></tr>
<tr><td>In-Water Explosive Bins</td><td colspan="5">None</td></tr>
</table>

Amphibious Warfare		
Naval Surface Fire Support Exercise – At Sea		
Procedural Mitigation Measures	**Acoustic Stressors:** *(Section 5.3.2)* Weapons firing noise	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement Small-, medium-, and large-caliber non-explosive practice munitions
Assumptions Used for Analysis	Stressors to human resources were not analyzed for this activity since it occurs greater than 12 NM from shore.	

A.2.4.8 Naval Surface Fire Support Exercise – Land-Based Target

Amphibious Warfare			
Naval Surface Fire Support Exercise – Land-Based Target			
Short Description	Surface ship crews fire large-caliber guns at land-based targets in support of forces ashore.	**Typical Duration**	1-2 hours
Long Description	Surface ship crews use large-caliber guns to support forces ashore. One or more ships position themselves from three to six NM from the target area and a land-based spotter relays type and exact location of the target. After observing the fall of the shot, the spotter relays any adjustments needed to reach the target. Once the rounds are on target, the spotter requests a sufficient number to effectively destroy the target. This exercise occurs on land ranges where explosive and non-explosive practice munitions are authorized and is often supported by target shapes such as tanks, trucks, trains, or aircraft on the ground.		
Typical Components	**Platforms:** Surface combatants **Targets:** Land targets **Systems being Trained/Tested:** Large-caliber gun systems		
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety Weapons firing safety	**Typical Locations** **Range Complexes/Testing Ranges:** Navy Cherry Point	**Inshore Waters/Pierside:** None
Stressors to Biological Resources and Habitats	**Acoustic:** Vessel noise Weapons noise **Explosives:** None	**Physical Disturbance and Strike:** Vessel and in-water device strike Military expended material **Ingestion:** None	**Energy:** In-air electromagnetic devices **Entanglement:** None
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** Metals	
Stressors to Human Resources	**Cultural Resources:** Physical disturbance and strike	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-air energy
Military Expended Material	**Ingestible Material:** None **Non-Ingestible Material:** Large-caliber projectiles (casings only)	**Military Recoverable Material**	None
Sonar and Other Transducer Bins	None		
In-Water Explosive Bins	None		
Procedural Mitigation Measures	**Acoustic Stressors:** *(Section 5.3.2)* Weapons firing noise	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement	

Amphibious Warfare	
Naval Surface Fire Support Exercise – Land-Based Target	
Assumptions Used for Analysis	Projectile impact is on land and is not further analyzed. No land based impacts are included in this document. Firing point from sea is Area 15B. Impact occurs at G-10 Impact Area, Camp Lejeune.

A.2.5 ANTI-SUBMARINE WARFARE TRAINING

Anti-submarine warfare involves helicopter and maritime patrol aircraft, ships, and submarines. These units operate alone or in combination to locate, track, and neutralize submarines. Controlling the undersea battlespace is a unique naval capability and a vital aspect of sea control. Undersea battlespace dominance requires proficiency in anti-submarine warfare. Every deploying strike group and individual surface combatant must possess this capability.

Various types of active and passive sonar are used by the Navy to determine water depth, and identify, track, and target submarines. Passive sonar "listens" for sound waves by using underwater microphones, called hydrophones, which receive, amplify, and process underwater sounds. No sound is introduced into the water when using passive sonar. Passive sonar can indicate the presence, character, and movement of submarines. However, passive sonar provides only a bearing (direction) to a sound-emitting source; it does not provide an accurate range (distance) to the source. Active sonar is needed to locate objects because active sonar provides both bearing and range to the detected contact (such as an enemy submarine).

The Navy's anti-submarine warfare training plan, including the use of active sonar in at-sea training scenarios, includes multiple levels of training. Individual-level anti-submarine warfare training addresses basic skills such as detection and classification of contacts; distinguishing discrete acoustic signatures including those of ships, submarines, and marine life; and identifying the characteristics, functions, and effects of controlled jamming and evasion devices.

More advanced, integrated anti-submarine warfare training exercises involving active sonar are conducted in coordinated, at-sea operations during training exercises involving submarines, ships, aircraft, and helicopters. This training integrates the full anti-submarine warfare continuum, from detecting and tracking a submarine to attacking a target using either exercise torpedoes or simulated weapons. Training events include detection and tracking exercises against "enemy" submarine contacts, torpedo employment exercises against the target, and exercising command and control tasks in a multi-dimensional battlespace.

A.2.5.1 Torpedo Exercise – Helicopter

<table>
<tr><th colspan="5">Anti-Submarine Warfare</th></tr>
<tr><th colspan="5">Anti-Submarine Warfare Torpedo Exercise – Helicopter</th></tr>
<tr><td>Short Description</td><td colspan="2">Helicopter crews search for, track, and detect submarines. Recoverable air launched torpedoes are employed against submarine targets.</td><td colspan="2">Typical Duration
2-5 hours</td></tr>
<tr><td>Long Description</td><td colspan="4">Helicopters using sonobuoys and dipping sonar search for, detect, classify, localize, and track a simulated threat submarine with the goal of determining a firing solution that could be used to launch a torpedo and destroy the submarine. Sonobuoys (both passive and active) are typically employed by a helicopter operating at altitudes below 3,000 ft. Dipping sonar (both passive and active) is employed from an altitude of about 50 ft. after the search area has been narrowed based on the sonobuoy search. The anti-submarine warfare target used for this exercise may be a MK-39 Expendable Mobile Anti-Submarine Warfare Training Target, a MK-30 target, or a live submarine. This exercise may involve a single aircraft, or occur during a coordinated larger exercise involving multiple aircraft and ships, including a major range event. Unmanned aerial systems, such as the MQ-8 Fire Scout, may also be used. The exercise torpedo is recovered by a special recovery helicopter or small craft. The preferred range for this exercise is an instrumented underwater range, but it may be conducted in other range complexes depending on training requirements and available assets.</td></tr>
<tr><td>Typical Components</td><td colspan="4">Platforms: Rotary-wing aircraft, unmanned aerial systems, small boats
Targets: Sub-surface targets
Systems being Trained/Tested: Sonar systems, sonobuoys, torpedo systems</td></tr>
<tr><td>Standard Operating Procedures (Section 2.3.3)</td><td>Vessel safety
Aircraft safety
Unmanned aerial, surface, and subsurface vehicle safety</td><td colspan="3">Typical Locations
Range Complexes/Testing Ranges:
Jacksonville
Virginia Capes
Inshore Waters/Pierside:
None</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td>Acoustic:
Sonar and other transducers
Aircraft noise
Vessel noise

Explosives:
None</td><td colspan="2">Physical Disturbance and Strike:
Aircraft and aerial target strike
Vessel and in-water device strike
Military expended material

Ingestion:
Military expended materials – other than munitions</td><td>Energy:
In-air electromagnetic devices

Entanglement:
Wires and cables
Decelerators/parachutes</td></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="2">Air Quality:
Criteria air pollutants</td><td colspan="2">Sediments and Water Quality:
Metals
Chemicals other than explosives
Other materials</td></tr>
<tr><td>Stressors to Human Resources</td><td colspan="4">None</td></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
Decelerators/parachutes- small

Non-Ingestible Material:
Lightweight torpedo accessories, sonobuoys (non-explosive), sonobuoy wires, marine markers, sub-surface targets (mobile)</td><td>Military Recoverable Material</td><td>Sub-surface targets (mobile), lightweight torpedoes (non-explosive)</td></tr>
</table>

Anti-Submarine Warfare			
Anti-Submarine Warfare Torpedo Exercise – Helicopter			
Sonar and Other Transducer Bins	**Mid-Frequency:** MF4 MF5	**Torpedoes:** TORP1	
In-Water Explosive Bins	None		
Procedural Mitigation Measures	**Acoustic Stressors:** *(Section 5.3.2)* Active sonar	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement	
Assumptions Used for Analysis	Stressors to human resources were not analyzed for this activity since it occurs greater than 12 NM from shore.		

A.2.5.2 Torpedo Exercise – Maritime Patrol Aircraft

Anti-Submarine Warfare			
Anti-Submarine Warfare Torpedo Exercise – Maritime Patrol Aircraft			
Short Description	Maritime patrol aircraft crews search for, track, and detect submarines. Recoverable air launched torpedoes are employed against submarine targets.	**Typical Duration**	2-8 hours
Long Description	Fixed-wing maritime patrol aircraft employ sonobuoys to search for, detect, classify, localize, and track a simulated threat submarine with the goal of determining a firing solution that could be used to launch a torpedo and destroy the submarine. Sonobuoys (both passive and active) are typically employed by a maritime patrol aircraft operating at altitudes below 3,000 ft. Both sonobuoys and torpedoes (using the High Altitude Anti-Submarine Warfare Weapon Capability kit) may be delivered at high altitudes to remain clear of high threat areas. Sonobuoys are deployed in specific patterns based on the expected threat submarine and specific water conditions. Depending on these two factors, these patterns will cover many different size areas. For certain sonobuoys, tactical parameters of use may be classified. The anti-submarine warfare target used for this exercise may be a MK-39 Expendable Mobile Anti-Submarine Warfare Training Target, a MK-30 target, or a live submarine. This exercise may involve a single aircraft, or be undertaken in the context of a coordinated larger exercise involving multiple aircraft and vessels, including a major range event. The exercise torpedo is recovered by helicopter or small boat. The preferred range for this exercise is an instrumented underwater range, but it may be conducted in other OPAREAs depending on training requirements and available assets.		
Typical Components	**Platforms:** Fixed-wing aircraft, rotary-wing aircraft, small boats **Targets:** Sub-surface targets **Systems being Trained/Tested:** Sonobuoys, torpedoes		
Standard Operating Procedures *(Section 2.3.3)*	Aircraft safety Vessel safety	**Typical Locations**	
		Range Complexes/Testing Ranges: Jacksonville Virginia Capes	**Inshore Waters/Pierside:** None
Stressors to Biological Resources and Habitats	**Acoustic:** Sonar and other transducers Aircraft noise Vessel noise **Explosives:** None	**Physical Disturbance and Strike:** Aircraft and aerial target strike Military expended material Vessel and in-water device strike **Ingestion:** Military expended materials – other than munitions	**Energy:** In-air electromagnetic devices **Entanglement:** Wires and cables Decelerators/parachutes
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** Metals Other materials	Chemicals other than explosives
Stressors to Human Resources	None		

<table>
<tr><th colspan="4">Anti-Submarine Warfare</th></tr>
<tr><th colspan="4">Anti-Submarine Warfare Torpedo Exercise – Maritime Patrol Aircraft</th></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
Decelerators/parachutes – small and medium

Non-Ingestible Material:
Lightweight torpedo accessories, sonobuoys (non-explosive), expended bathythermograph, expended bathythermograph wire, sonobuoy wires, sub-surface targets (mobile)</td><td>Military Recoverable Material</td><td>Sub-surface targets (mobile), lightweight torpedoes (non-explosive)</td></tr>
<tr><td>Sonar and Other Transducer Bins</td><td colspan="3">Mid-Frequency:
MF5

Torpedoes:
TORP1</td></tr>
<tr><td>In-Water Explosive Bins</td><td colspan="3">None</td></tr>
<tr><td>Procedural Mitigation Measures</td><td colspan="2">Acoustic Stressors: (Section 5.3.2)
Active sonar</td><td colspan="2">Physical Disturbance and Strike: (Section 5.3.4)
Vessel movement</td></tr>
<tr><td>Assumptions Used for Analysis</td><td colspan="3">Submarine may provide service as the target.
If target is air-dropped, one parachute per target.
Stressors to human resources were not analyzed for this activity since it occurs greater than 12 NM from shore.</td></tr>
</table>

A.2.5.3 Torpedo Exercise – Ship

Anti-Submarine Warfare			
Anti-Submarine Warfare Torpedo Exercise – Ship			
Short Description	Surface ship crews search for, track, and detect submarines. Exercise torpedoes are used during this exercise.	**Typical Duration**	2-5 hours
Long Description	Surface ships search for, detect, and track threat submarines to determine a firing position to launch a torpedo and attack the submarine. A surface ship operates at slow speeds while employing hull-mounted or towed array sonar. Passive or active sonar is employed depending on the type of threat submarine, the tactical situation, and environmental conditions. The anti-submarine warfare target used for this exercise is a MK-39 Expendable Mobile Anti-Submarine Warfare Training Target, MK-30 Target, or live submarine. This exercise may involve a single ship, or be undertaken in the context of a coordinated larger exercise involving multiple aircraft, ships, and submarines, including a major range event. The exercise torpedo is recovered by helicopter or small craft. The preferred range for this exercise is an instrumented underwater range, but it may be conducted in other range complexes depending on training requirements and available assets.		
Typical Components	**Platforms:** Rotary-wing aircraft, small boats, surface combatants **Targets:** Sub-surface targets **Systems being Trained/Tested:** Sonar systems, acoustic countermeasures, torpedoes		
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety Aircraft safety Towed in-water device safety	**Typical Locations** **Range Complexes/Testing Ranges:** Jacksonville Virginia Capes	**Inshore Waters/Pierside:** None
Stressors to Biological Resources and Habitats	**Acoustic:** Sonar and other transducers Aircraft noise Vessel noise **Explosives:** None	**Physical Disturbance and Strike:** Aircraft and aerial target strike Vessel and in-water device strike Military expended material **Ingestion:** Military expended materials – other than munitions	**Energy:** In-air electromagnetic devices **Entanglement:** Wires and cables
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** Metals Chemicals other than explosives Other materials	
Stressors to Human Resources	None		
Military Expended Material	**Ingestible Material:** Decelerators/parachutes - small **Non-Ingestible Material:** Sonobuoys (non-explosive), sonobuoy wires, expendable bathythermographs, expendable bathythermograph wires, lightweight torpedo accessories, sub-surface targets (mobile)	**Military Recoverable Material**	Sub-surface targets (mobile), lightweight torpedoes (non-explosive)

Anti-Submarine Warfare		
Anti-Submarine Warfare Torpedo Exercise – Ship		
Sonar and Other Transducer Bins	**Mid-Frequency:** MF1	**Anti-Submarine Warfare:** ASW3 **Torpedoes:** TORP1
In-Water Explosive Bins	None	
Procedural Mitigation Measures	**Acoustic Stressors:** *(Section 5.3.2)* Active sonar **Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement Towed in-water devices	
Assumptions Used for Analysis	Submarines may provide service as the target. Torpedoes are recovered. Stressors to human resources were not analyzed for this activity since it occurs greater than 12 NM from shore.	

A.2.5.4 Torpedo Exercise – Submarine

<table>
<tr><th colspan="5">Anti-Submarine Warfare</th></tr>
<tr><th colspan="5">Anti-Submarine Warfare Torpedo Exercise – Submarine</th></tr>
<tr><td>Short Description</td><td colspan="2">Submarine crews search for, track, and detect submarines. Exercise torpedoes are used during this exercise.</td><td colspan="2">Typical Duration
8 hours</td></tr>
<tr><td>Long Description</td><td colspan="4">Submarine crews search for, detect and track a threat submarine to develop firing position to launch a torpedo. A single submerged submarine operates at slow speeds and various depths while using its hull mounted or towed array sonar to track a threat submarine. Passive sonar is used almost exclusively. Non-explosive exercise torpedoes can be fired and active sonar can be used during this training exercise.

This exercise may involve a single submarine, or be undertaken in the context of a coordinated larger exercise involving multiple aircraft, ships, and submarines, including a major range event. The exercise torpedo is recovered by helicopter or small craft. The preferred range for this exercise is an instrumented underwater range, but it may be conducted in other range complexes depending on training requirements and available assets.</td></tr>
<tr><td>Typical Components</td><td colspan="4">Platforms: Rotary-wing aircraft, small boats, submarines
Targets: Sub-surface targets
Systems being Trained/Tested: Sonar systems, acoustic countermeasures, torpedoes</td></tr>
<tr><td>Standard Operating Procedures (Section 2.3.3)</td><td>Vessel safety
Aircraft safety
Towed in-water device safety</td><td colspan="3">Typical Locations
Range Complexes/Testing Ranges:
Jacksonville
Northeast
Virginia Capes
Inshore Waters/Pierside:
None</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td colspan="4">Acoustic:
Sonar and other transducers
Aircraft noise
Vessel noise

Explosives:
None

Physical Disturbance and Strike:
Vessel and in-water device strike
Military expended material
Aircraft and aerial target strike

Ingestion:
None

Energy:
None

Entanglement:
Wires and cables</td></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="4">Air Quality:
Criteria pollutants

Sediments and Water Quality:
Metals</td></tr>
<tr><td>Stressors to Human Resources</td><td colspan="4">None</td></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
None

Non-Ingestible Material:
Guidance wires, heavyweight torpedo accessories, expended bathythermograph, expended bathythermograph wires, acoustic countermeasures</td><td>Military Recoverable Material</td><td>Sub-surface targets (mobile), heavyweight torpedoes (non-explosive)</td></tr>
</table>

Anti-Submarine Warfare		
Anti-Submarine Warfare Torpedo Exercise – Submarine		
Sonar and Other Transducer Bins	**Mid-Frequency:** MF3 **High-Frequency:** HF1	**Anti-Submarine Warfare:** ASW4 **Torpedoes:** TORP2
In-Water Explosive Bins	None	
Procedural Mitigation Measures	**Acoustic Stressors:** *(Section 5.3.2)* Active sonar	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement Towed in-water devices
Assumptions Used for Analysis	Torpedoes are recovered. Guidance wire has a low tensile strength and breaks easily. Weights and flex tubing sink rapidly. Stressors to human resources were not analyzed for this activity since it occurs greater than 12 NM from shore.	

A.2.5.5 Tracking Exercise – Helicopter

<table>
<tr><th colspan="6">Anti-Submarine Warfare</th></tr>
<tr><th colspan="6">Anti-Submarine Warfare Tracking Exercise – Helicopter</th></tr>
<tr><td>Short Description</td><td colspan="3">Helicopter crews search for, track, and detect submarines.</td><td>Typical Duration
2-4 hours</td><td></td></tr>
<tr><td>Long Description</td><td colspan="5">Helicopters using sonobuoys and dipping sonar search for, detect, classify, localize, and track a simulated threat submarine with the goal of determining a firing solution that could be used to launch a torpedo and destroy the submarine.

Sonobuoys (both passive and active) are typically employed by a helicopter operating at altitudes below 3,000 ft. Dipping sonar (both passive and active) is employed from an altitude of about 50 ft. after the search area has been narrowed based on the sonobuoy search.

The anti-submarine warfare target used for this exercise may be a MK-39 Expendable Mobile Anti-submarine Warfare Training Target, a MK-30 target, or a live submarine. This exercise may involve a single aircraft, or occur during a coordinated larger exercise involving multiple aircraft and ships, including a major range event. Unmanned aerial systems, such as the MQ-8 Fire Scout, may also be used. The preferred range for this exercise is an instrumented range, but it may be conducted in other range complexes depending on training requirements and available assets.</td></tr>
<tr><td>Typical Components</td><td colspan="5">Platforms: Rotary-wing aircraft, unmanned aerial systems
Targets: Sub-surface targets
Systems being Trained/Tested: Sonar systems, sonobuoys</td></tr>
<tr><td>Standard Operating Procedures (Section 2.3.3)</td><td colspan="2">Vessel safety
Aircraft safety
Unmanned aerial, surface, and subsurface vehicle safety</td><td colspan="3">Typical Locations
Range Complexes/Testing Ranges:
Jacksonville
Navy Cherry Point
Virginia Capes
Other AFTT Areas
Inshore Waters/Pierside:
None</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td colspan="2">Acoustic:
Sonar and other transducers
Aircraft noise
Vessel noise

Explosives:
None</td><td colspan="2">Physical Disturbance and Strike:
Aircraft and aerial target strike
Vessel and in-water device strike
Military expended material

Ingestion:
Military expended materials – other than munitions</td><td>Energy:
In-air electromagnetic devices

Entanglement:
Decelerators/parachutes
Wires and cables</td></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="2">Air Quality:
Criteria air pollutants</td><td colspan="3">Sediments and Water Quality:
Metals Chemicals other than explosives
Other materials</td></tr>
<tr><td>Stressors to Human Resources</td><td colspan="5">None</td></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
Decelerators/parachutes - small

Non-Ingestible Material:
Sonobuoys (non-explosive), sonobuoy wires, sub-surface targets (mobile), marine marker</td><td>Military Recoverable Material</td><td colspan="2">Sub-surface targets (mobile)</td></tr>
</table>

Anti-Submarine Warfare		
Anti-Submarine Warfare Tracking Exercise – Helicopter		
Sonar and Other Transducer Bins	**Mid-Frequency:** MF4 MF5	
In-Water Explosive Bins	None	
Procedural Mitigation Measures	**Acoustic Stressors:** *(Section 5.3.2)* Active sonar	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement
Assumptions Used for Analysis	Tracking exercise can occur in all locations. Submarines may provide service as the target. Stressors to human resources were not analyzed for this activity since it occurs greater than 12 NM from shore.	

A.2.5.6 Tracking Exercise – Maritime Patrol Aircraft

<table>
<tr><th colspan="5">Anti-Submarine Warfare</th></tr>
<tr><th colspan="5">Anti-Submarine Warfare Tracking Exercise – Maritime Patrol Aircraft</th></tr>
<tr><td>Short Description</td><td colspan="2">Maritime patrol aircraft crews search for, track, and detect submarines.</td><td>Typical Duration
2-8 hours</td><td></td></tr>
<tr><td>Long Description</td><td colspan="4">Fixed-wing maritime patrol aircraft employ sonobuoys to search for, detect, classify, localize, and track a simulated threat submarine with the goal of determining a firing solution that could be used to launch a torpedo and destroy the submarine.

Sonobuoys (both passive and active) are typically employed by a maritime patrol aircraft operating at altitudes below 3,000 ft. However, sonobuoys may be released at higher altitudes. Sonobuoys are deployed in specific patterns based on the expected threat submarine and specific water conditions. Depending on these two factors, these patterns will cover many different size areas. For certain sonobuoys, tactical parameters of use may be classified. The anti-submarine warfare target used for this exercise may be a MK-39 Expendable Mobile Anti-Submarine Warfare Training Target, a MK-30 target, or a live submarine. This exercise may involve a single aircraft, or be undertaken in the context of a coordinated larger exercise involving multiple aircraft and vessels, including a major range event.</td></tr>
<tr><td>Typical Components</td><td colspan="4">Platforms: Fixed-wing aircraft
Targets: Sub-surface targets
Systems being Trained/Tested: Sonobuoys, acoustic countermeasures</td></tr>
<tr><td>Standard Operating Procedures
(Section 2.3.3)</td><td colspan="2">Vessel safety
Aircraft safety
Weapons firing safety
Unmanned aerial, surface, and subsurface vehicle safety</td><td colspan="2">Typical Locations
Range Complexes/Testing Ranges:
Jacksonville
Navy Cherry Point
Northeast
Virginia Capes
Inshore Waters/Pierside:
None</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td>Acoustic:
Sonar and other transducers
Aircraft noise
Vessel noise

Explosives:
None</td><td colspan="2">Physical Disturbance and Strike:
Aircraft and aerial target strike
Vessel and in-water device strike
Military expended material

Ingestion:
Military expended materials – other than munitions</td><td>Energy:
In-air electromagnetic devices

Entanglement:
Decelerators/parachutes
Wires and cables</td></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="2">Air Quality:
Criteria air pollutants</td><td colspan="2">Sediments and Water Quality:
Metals Chemicals other than explosives
Other materials</td></tr>
<tr><td>Stressors to Human Resources</td><td colspan="4">None</td></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
Decelerators/parachutes - small

Non-Ingestible Material:
Sonobuoys (non-explosive), sonobuoy wires, expended bathythermograph, expended bathythermograph wire, sub-surface targets (mobile)</td><td>Military Recoverable Material</td><td>Sub-surface targets (mobile)</td></tr>
</table>

Anti-Submarine Warfare		
Anti-Submarine Warfare Tracking Exercise – Maritime Patrol Aircraft		
Sonar and Other Transducer Bins	**Mid-Frequency:** MF5	**Anti-Submarine Warfare:** ASW2 ASW5
In-Water Explosive Bins	None	
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement	
Assumptions Used for Analysis	Tracking exercise can occur in all locations. Submarine may provide service as the target. If target is air-dropped, one parachute per target. Stressors to human resources were not analyzed for this activity since it occurs greater than 12 NM from shore.	

A.2.5.7 Tracking Exercise – Submarine

Anti-Submarine Warfare			
Anti-Submarine Warfare Tracking Exercise – Submarine			
Short Description	Submarine crews search for, track, and detect submarines.	**Typical Duration**	8 hours
Long Description	Submarine crews search for, detect, and track a threat submarine to develop firing position to launch a torpedo. A single submerged submarine operates at slow speeds and various depths while using its hull mounted sonar to track a threat submarine. Passive sonar is used almost exclusively. The target for this exercise is either an MK 39 expendable mobile anti-submarine warfare training target, MK 30 recoverable training target, or live submarine. This exercise may involve a single submarine, or be undertaken in the context of a coordinated larger exercise involving multiple aircraft, ships, and submarines, including a major range event.		
Typical Components	**Platforms:** Submarines **Targets:** Sub-surface targets **Systems being Trained/Tested:** Sonar systems, acoustic countermeasures		
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety	**Typical Locations**	
		Range Complexes/Testing Ranges: Gulf of Mexico Jacksonville Navy Cherry Point Northeast Virginia Capes Other AFTT Areas	**Inshore Waters/Pierside:** None
Stressors to Biological Resources and Habitats	**Acoustic:** Sonar and other transducers Vessel noise **Explosives:** None	**Physical Disturbance and Strike:** Vessel and in-water device strike Military expended material **Ingestion:** None	**Energy:** None **Entanglement:** Wires and cables
Stressors to Physical Resources	**Air Quality:** None	**Sediments and Water Quality:** Metals	
Stressors to Human Resources	None		
Military Expended Material	**Ingestible Material:** None **Non-Ingestible Material:** Sub-surface targets (mobile), expended bathythermograph, expended bathythermograph wire, acoustic countermeasures	**Military Recoverable Material**	Sub-surface targets (mobile)
Sonar and Other Transducer Bins	**Mid-Frequency:** MF3 **High-Frequency:** HF1	**Anti-Submarine Warfare:** ASW4	

Anti-Submarine Warfare		
Anti-Submarine Warfare Tracking Exercise – Submarine		
In-Water Explosive Bins	None	
Procedural Mitigation Measures	**Acoustic Stressors:** *(Section 5.3.2)* Active sonar	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement
Assumptions Used for Analysis	Stressors to human resources were not analyzed for this activity since it occurs greater than 12 NM from shore. For biological resource analysis, vessel noise and vessel strike are only analyzed for the periods while the submarines are surfaced, typically brief in nature. Mitigation measures related to vessel movement are only considered during the period of surfacing as well.	

A.2.5.8 Tracking Exercise – Ship

<table>
<tr><th colspan="6">Anti-Submarine Warfare</th></tr>
<tr><th colspan="6">Anti-Submarine Warfare Tracking Exercise – Ship</th></tr>
<tr><td>Short Description</td><td colspan="3">Surface ship crews search for, track, and detect submarines.</td><td>Typical Duration</td><td>2-4 hours</td></tr>
<tr><td>Long Description</td><td colspan="5">Surface ships search for, detect, and track threat submarines to determine a firing position to launch a torpedo and attack the submarine.

A surface ship operates at slow speeds while employing sonobuoys, hull-mounted sonars, or towed array sonar. Passive or active sonar is employed depending on the type of threat submarine, the tactical situation, and environmental conditions. The target for this exercise is either a MK-39 Expendable Mobile Anti-Submarine Warfare Training Target, MK-30 Recoverable Training Target, or live submarine.

This exercise may involve a single ship, or be undertaken in the context of a coordinated larger exercise involving multiple aircraft, ships, and submarines, including a major range event.</td></tr>
<tr><td>Typical Components</td><td colspan="5">Platforms: Surface combatants
Targets: Sub-surface targets
Systems being Trained/Tested: Sonar systems, acoustic countermeasures</td></tr>
<tr><td>Standard Operating Procedures
(Section 2.3.3)</td><td colspan="2">Vessel safety
Towed in-water device safety</td><td colspan="3">Typical Locations
Range Complexes/Testing Ranges:
Gulf of Mexico
Jacksonville
Navy Cherry Point
Northeast
Virginia Capes
Other AFTT Areas
Inshore Waters/Pierside:
None</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td colspan="2">Acoustic:
Sonar and other transducers
Vessel noise

Explosives:
None</td><td colspan="2">Physical Disturbance and Strike:
Vessel and in-water device strike
Military expended material

Ingestion:
No</td><td>Energy:
In-air electromagnetic devices

Entanglement:
Wires and cables
Decelerators/parachutes</td></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="2">Air Quality:
Criteria air pollutants</td><td colspan="3">Sediments and Water Quality:
Metals
Chemicals other than explosives
Other materials</td></tr>
<tr><td>Stressors to Human Resources</td><td colspan="5">None</td></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
Decelerators/parachutes – small

Non-Ingestible Material:
Sub-surface targets (mobile), expendable bathythermographs, expendable bathythermograph wires. sonobuoy (non-explosive), sonobuoy wires</td><td>Military Recoverable Material</td><td colspan="2">Sub-surface targets (mobile)</td></tr>
</table>

Anti-Submarine Warfare		
Anti-Submarine Warfare Tracking Exercise – Ship		
Sonar and Other Transducer Bins	**Mid-Frequency:** MF1 MF11 MF12	**Anti-Submarine Warfare:** ASW1 ASW3
In-Water Explosive Bins	None	
Procedural Mitigation Measures	**Acoustic Stressors:** *(Section 5.3.2)* Active sonar	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement Towed in-water devices
Assumptions Used for Analysis	A submarine may provide service as the target. Stressors to human resources were not analyzed for this activity since it occurs greater than 12 NM from shore.	

A.2.6 ELECTRONIC WARFARE

Electronic warfare is the mission area of naval warfare that aims to control use of the electromagnetic spectrum and to deny its use by an adversary. Typical electronic warfare activities include threat avoidance training, signals analysis for intelligence purposes, and use of airborne and surface electronic jamming devices to defeat tracking systems.

A.2.6.1 Counter Targeting Chaff Exercise – Aircraft

<table>
<tr><td colspan="5">Electronic Warfare</td></tr>
<tr><td colspan="5">Counter Targeting Chaff Exercise – Aircraft</td></tr>
<tr><td>Short Description</td><td colspan="2">Fixed-wing aircraft and helicopter aircrews deploy chaff to disrupt threat targeting and missile guidance radars.</td><td colspan="2">Typical Duration
1-2 hours</td></tr>
<tr><td>Long Description</td><td colspan="4">Fixed-wing aircraft and helicopter aircrews deploy chaff to disrupt threat targeting and missile guidance radars.

Fixed-wing aircraft and helicopter aircrews detect electronic targeting signals from threat radars or missiles, dispense chaff, and immediately maneuver to defeat the threat. The chaff cloud deceives the inbound missile and the aircraft clears away from the threat.

Chaff is a radar reflector material made of thin, narrow, metallic strips cut in various lengths to elicit frequency responses, which deceive enemy radars. Chaff is employed to create a target that will lure enemy radar and weapons system away from the actual friendly platform.</td></tr>
<tr><td>Typical Components</td><td colspan="4">Platforms: Fixed-wing aircraft, rotary-wing aircraft
Targets: None
Systems being Trained/Tested: None</td></tr>
<tr><td>Standard Operating Procedures (Section 2.3.3)</td><td>Aircraft safety</td><td colspan="3">Typical Locations
Range Complexes/Testing Ranges:
Gulf of Mexico
Jacksonville
Key West
Navy Cherry Point
Virginia Capes
Inshore Waters/Pierside:
None</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td colspan="4">Acoustic:
Aircraft noise

Explosives:
None

Physical Disturbance and Strike:
Aircraft and aerial target strike
Military expended material

Ingestion:
Military expended materials – other than munitions

Energy:
In-air electromagnetic devices

Entanglement:
None</td></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="4">Air Quality:
Criteria air pollutants

Sediments and Water Quality:
Metals Other materials</td></tr>
<tr><td>Stressors to Human Resources</td><td colspan="4">None</td></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
Per chaff: one chaff-air cartridge, one plastic endcap, chaff fibers

Non-Ingestible Material:
None</td><td>Military Recoverable Material</td><td>None</td></tr>
</table>

Electronic Warfare	
Counter Targeting Chaff Exercise – Aircraft	
Sonar and Other Transducer Bins	None
In-Water Explosive Bins	None
Procedural Mitigation Measures	None
Assumptions Used for Analysis	Chaff is usually expended while conducting other training activities, such as air combat maneuvering. Stressors to human resources were not analyzed for this activity since it occurs greater than 12 NM from shore.

A.2.6.2 Counter Targeting Chaff Exercise – Ship

Electronic Warfare				
Counter Targeting Chaff Exercise – Ship				
Short Description	Surface ship crews deploy chaff to disrupt threat targeting and missile guidance radars.	**Typical Duration**	1-2 hours	
Long Description	Surface ship crews deploy chaff to disrupt threat targeting and missile guidance radars to defend against an attack. Surface ship crews detect electronic targeting signals from threat radars or missiles, dispense chaff, and immediately maneuver to defeat the threat. The chaff cloud deceives the inbound missile and the vessel clears away from the threat. The typical exercise duration is approximately 1.5 hours. Chaff is a radar reflector material made of thin, narrow, metallic strips cut in various lengths to elicit frequency responses, which deceive enemy radars. Chaff is employed create a target that will lure enemy radar and weapons system away from the actual friendly platform. Ships may also train with advanced countermeasure systems, such as the MK 53 Decoy Launching System (Nulka).			
Typical Components	**Platforms:** Surface combatants, amphibious warfare ships **Targets:** Air target **Systems being Trained/Tested:** None			
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety	**Typical Locations** **Range Complexes/Testing Ranges:** Gulf of Mexico Jacksonville Navy Cherry Point Virginia Capes	**Inshore Waters/Pierside:** None	
Stressors to Biological Resources and Habitats	**Acoustic:** Vessel noise Weapons noise **Explosives:** None	**Physical Disturbance and Strike:** Vessel and in-water device strike Military expended material **Ingestion:** Military expended materials – other than munitions	**Energy:** In-air electromagnetic devices **Entanglement:** None	
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** Metals Other materials		
Stressors to Human Resources	None			
Military Expended Material	**Ingestible Material:** Chaff-ship fibers **Non-Ingestible Material:** Chaff-ship cartridges, air target (decoy)	**Military Recoverable Material**	None	
Sonar and Other Transducer Bins	None			

Electronic Warfare	
Counter Targeting Chaff Exercise – Ship	
In-Water Explosive Bins	None
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement
Assumptions Used for Analysis	Stressors to human resources were not analyzed for this activity since it occurs greater than 12 NM from shore.

A.2.6.3 Counter Targeting Flare Exercise

<table>
<tr><td colspan="6">Electronic Warfare</td></tr>
<tr><td colspan="6">Counter Targeting – Flare Exercise</td></tr>
<tr><td>Short Description</td><td colspan="3">Fixed-wing aircraft and helicopter aircrews deploy flares to disrupt threat infrared missile guidance systems.</td><td>Typical Duration
1-2 hours</td><td></td></tr>
<tr><td>Long Description</td><td colspan="5">Fixed-wing aircraft and helicopter aircrews deploy flares to disrupt threat infrared missile guidance systems.

Aircraft detect electronic targeting signals from threat radars or missiles or a threat missile plume when launched and dispense flares and immediately maneuver to defeat the threat. This exercise trains aircraft personnel in the use of defensive flares designed to confuse infrared sensors or infrared homing missiles, thereby causing the sensor or missile to lock onto the flares instead of the real aircraft. Typically an aircraft will expend five flares in an exercise while operating above 3,000 ft. Flare exercises are often conducted with chaff exercises, rather than as a stand-alone exercise.</td></tr>
<tr><td>Typical Components</td><td colspan="5">Platforms: Fixed-wing aircraft, rotary-wing aircraft
Targets: None
Systems being Trained/Tested: None</td></tr>
<tr><td>Standard Operating Procedures (Section 2.3.3)</td><td>Aircraft safety</td><td colspan="4">Typical Locations
Range Complexes/Testing Ranges:
Gulf of Mexico
Jacksonville
Key West
Navy Cherry Point
Virginia Capes
Inshore Waters/Pierside:
None</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td colspan="5">Acoustic:
Aircraft noise

Explosives:
None

Physical Disturbance and Strike:
Aircraft and aerial target strike
Military expended material

Ingestion:
Military expended materials – other than munitions

Energy:
In-air electromagnetic devices

Entanglement:
None</td></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="5">Air Quality:
Criteria air pollutants

Sediments and Water Quality:
Other materials
Chemicals other than explosives</td></tr>
<tr><td>Stressors to Human Resources</td><td colspan="5">None</td></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
Per flare: one casing, one compression pad or one plastic piston, one plastic endcap, one O-ring

Non-Ingestible Material:
None</td><td>Military Recoverable Material</td><td colspan="2">None</td></tr>
<tr><td>Sonar and Other Transducer Bins</td><td colspan="5">None</td></tr>
</table>

Electronic Warfare	
Counter Targeting – Flare Exercise	
In-Water Explosive Bins	None
Procedural Mitigation Measures	None
Assumptions Used for Analysis	Approximately five flares per aircraft are expended per exercise. All combustible material in flares is assumed to be consumed before contact of the casing with the water. Stressors to human resources were not analyzed for this activity since it occurs greater than 12 NM from shore.

A.2.6.4 Electronic Warfare Operations

Electronic Warfare				
Electronic Warfare Operations				
Short Description	Aircraft and surface ship crews control portions of the electromagnetic spectrum used by enemy systems to degrade or deny the enemy's ability to take defensive actions.	**Typical Duration** 1-2 hours		
Long Description	Aircraft and surface ship crews control the electromagnetic spectrum used by enemy systems to degrade or deny the enemy's ability to take defensive actions. Electronic Warfare Operations can be active or passive, offensive or defensive. Fixed-wing aircraft employ active jamming and deception against enemy search radars to mask the friendly inbound strike aircraft mission. Surface ships detect and evaluate enemy electronic signals from enemy aircraft or missile radars, evaluate courses of action concerning the use of passive or active countermeasures, then use ship maneuvers and either chaff, flares, active electronic countermeasures, or a combination of them to defeat the threat.			
Typical Components	**Platforms:** Fixed-wing aircraft, surface combatants **Targets:** Air targets, electronic warfare targets **Systems being Trained/Tested:** Radar systems			
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety Aircraft safety	**Typical Locations** **Range Complexes/Testing Ranges:** Jacksonville Navy Cherry Point Virginia Capes	**Inshore Waters/Pierside:** None	
Stressors to Biological Resources and Habitats	**Acoustic:** Aircraft noise Vessel noise **Explosives:** None	**Physical Disturbance and Strike:** Aircraft and aerial target strike Vessel and in-water device strike **Ingestion:** None	**Energy:** In-water electromagnetic devices **Entanglement:** None	
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** None		
Stressors to Human Resources	**Cultural Resources:** None	**Socioeconomic Resources:** Accessibility	**Public Health and Safety:** Physical interactions In-air energy	
Military Expended Material	**Ingestible Material:** None **Non-Ingestible Material:** None	**Military Recoverable Material**	None	
Sonar and Other Transducer Bins	None			
In-Water Explosive Bins	None			
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement			

Electronic Warfare	
Electronic Warfare Operations	
Assumptions Used for Analysis	All chaff and flares involved in this exercise are covered under chaff exercises and flare exercises, respectively.

A.2.6.5 High-Speed Anti-Radiation Missile Exercise (Air-to-Surface)

Electronic Warfare				
High Speed Anti-Radiation Missile Exercise (Air-to-Surface)				
Short Description	Aircrews launch a High-Speed Anti-Radiation Missile against threat radar sites.	**Typical Duration**	1-2 hours	
Long Description	Aircrews detect radar signals from a simulated threat radar site and launch a High-Speed Anti-Radiation Missile (high-explosive) to destroy or disable the threat radar site. One or more fighter jets approach the threat radar site from high altitude. Once the target is located with onboard sensors, the aircrew launches a High-Speed Anti-Radiation Missile at the electronic signal. At-sea exercises involve training against a target vessel or a specially configured target barge that has a tower with an electronic emitter that the missile will seek after being fired from the launch aircraft.			
Typical Components	**Platforms:** Fixed-wing aircraft, support craft **Targets:** Barge with an electronic emitter **Systems being Trained/Tested:** Missile systems			
Standard Operating Procedures *(Section 2.3.3)*	Aircraft safety Vessel safety	**Typical Locations**		
		Range Complexes/Testing Ranges: Jacksonville Navy Cherry Point Virginia Capes	**Inshore Waters/Pierside:** None	
Stressors to Biological Resources and Habitats	**Acoustic:** Aircraft noise Vessel noise Weapons noise **Explosives:** In-air explosives	**Physical Disturbance and Strike:** Aircraft and aerial target strike Vessel and in-water device Military expended material **Ingestion:** Military expended materials – munitions Military expended materials – other than munitions	**Energy:** In-air electromagnetic devices **Entanglement:** None	
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** Chemicals other than explosives Metals Other materials		
Stressors to Human Resources	None			
Military Expended Material	**Ingestible Material:** Missile (explosive) fragments, target fragments **Non-Ingestible Material:** Anchor- other	**Military Recoverable Material**	None	
Sonar and Other Transducer Bins	None			
In-Water Explosive Bins	None			

Electronic Warfare		
High Speed Anti-Radiation Missile Exercise (Air-to-Surface)		
Procedural Mitigation Measures	**Explosive Stressors:** (*Section 5.3.3)* Explosive missiles and rockets	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement
Assumptions Used for Analysis	All chaff and flares involved in this exercise are covered under chaff exercises and flare exercises, respectively. Stressors to human resources were not analyzed for this activity since it occurs greater than 12 NM from shore.	

A.2.7 EXPEDITIONARY WARFARE

A.2.7.1 Dive and Salvage Operations

Expeditionary Warfare				
Dive and Salvage Operations				
Short Description	Navy divers perform dive operations and salvage training.	**Typical Duration**	12 hours	
Long Description	Navy divers will conduct a variety of salvage training to include debeaching operations, underwater repairs to ships, underwater survey operations, and other underwater training as required.			
Typical Components	**Platforms:** Support craft, unmanned underwater vehicles **Targets:** None **Systems being Trained/Tested:** Submersible training aids			
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety Unmanned aerial, surface, and subsurface vehicle safety	**Typical Locations**		
		Range Complexes/Testing Ranges: Gulf of Mexico Jacksonville Key West Navy Cherry Point Virginia Capes	**Inshore Waters/Pierside:** Naval Station Norfolk, Virginia Lower Chesapeake Bay Naval Station Mayport James River and tributaries	
Stressors to Biological Resources and Habitats	**Acoustic:** Vessel noise **Explosives:** None	**Physical Disturbance and Strike:** Vessel and in-water device strike Seafloor devices **Ingestion:** None	**Energy:** None **Entanglement:** None	
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** None		
Stressors to Human Resources	**Cultural Resources:** Physical disturbance and strike	**Socioeconomic Resources:** Accessibility Physical disturbance and strike	**Public Health and Safety:** Physical interactions	
Military Expended Material	**Ingestible Material:** None **Non-Ingestible Material:** None	**Military Recoverable Material**	None	
Sonar and Other Transducer Bins	None			
In-Water Explosive Bins	None			
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement			
Assumptions Used for Analysis	The practice salvage platform can be sunk and then refloated and removed.			

A.2.7.2 Maritime Security Operations – Anti-Swimmer Grenades

Expeditionary Warfare			
Maritime Security Operations – Anti-Swimmer Grenades			
Short Description	Small boat crews engage in force protection activities by using anti-swimmer grenades to defend against hostile divers.	**Typical Duration**	1 hour
Long Description	Boat crews train to maneuver small boats in specific search patterns while surveying the area for evidence of scuba activity. Crews train in the safe handling and use of anti-swimmer grenades to counter the diver threat.		
Typical Components	**Platforms:** Small boats **Targets:** None **Systems being Trained/Tested:** Grenades		
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety	**Typical Locations** **Range Complexes/Testing Ranges:** Gulf of Mexico Jacksonville Navy Cherry Point Northeast Virginia Capes	**Inshore Waters/Pierside:** None
Stressors to Biological Resources and Habitats	**Acoustic:** Vessel noise Weapons noise **Explosives:** In-water explosives	**Physical Disturbance and Strike:** Vessel and in-water device strike Military expended material **Ingestion:** Military expended materials – munitions	**Energy:** None **Entanglement:** None
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** Explosives Metals Chemicals other than explosives	
Stressors to Human Resources	**Cultural Resources:** Physical disturbance and strike Explosives	**Socioeconomic Resources:** Accessibility Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-water energy
Military Expended Material	**Ingestible Material:** Grenade fragments **Non-Ingestible Material:** None	**Military Recoverable Material**	None
Sonar and Other Transducer Bins	None		
In-Water Explosive Bins	E2		
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement	**Explosive Stressors:** *(Section 5.3.3)* Maritime security operations – anti-swimmer grenades	

Expeditionary Warfare	
Maritime Security Operations – Anti-Swimmer Grenades	
Assumptions Used for Analysis	Exercises would usually be conducted in established underwater detonation areas.

A.2.7.3 Personnel Insertion/Extraction – Air

<table>
<tr><th colspan="6">Expeditionary Warfare</th></tr>
<tr><th colspan="6">Personnel Insertion/Extraction – Air</th></tr>
<tr><td>Short Description</td><td colspan="3">Personnel are inserted into and extracted from an objective area by fixed-wing aircraft or helicopters.</td><td>Typical Duration
2-4 hours</td><td></td></tr>
<tr><td>Long Description</td><td colspan="5">Personnel are inserted into a water objective via fixed-wing aircraft using parachutes or by helicopters via ropes or jumping into the water. They will conduct an infiltration to an objective (harbor, beach, moored vessel, etc.) and conduct a variety of tasks. The insertion/extraction activities are confined to in-water training. Upon completion of training objectives, personnel are extracted by helicopters or small boats.</td></tr>
<tr><td>Typical Components</td><td colspan="5">Platforms: Fixed-wing aircraft, rotary-wing aircraft, small boats
Targets: None
Systems being Trained/Tested: None</td></tr>
<tr><td>Standard Operating Procedures (Section 2.3.3)</td><td colspan="2">Vessel safety
Aircraft safety</td><td colspan="3">Typical Locations
Range Complexes/Testing Ranges:
Jacksonville
Key West
Virginia Capes
Inshore Waters/Pierside:
Naval Station Mayport, Florida
St. Andrew Bay
North Bay
Lower Chesapeake Bay
James River and tributaries
York River</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td colspan="2">Acoustic:
Aircraft noise
Vessel noise

Explosives:
None</td><td colspan="2">Physical Disturbance and Strike:
Aircraft and aerial target strike
Vessel and in-water device strike
Military expended material

Ingestion:
None</td><td>Energy:
None

Entanglement:
None</td></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="2">Air Quality:
Criteria air pollutants</td><td colspan="3">Sediments and Water Quality:
Metals
Chemicals other than explosives</td></tr>
<tr><td>Stressors to Human Resources</td><td colspan="2">Cultural Resources:
Physical disturbance and strike</td><td colspan="2">Socioeconomic Resources:
Accessibility
Physical disturbance and strike</td><td>Public Health and Safety:
Physical interactions</td></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
None

Non-Ingestible Material:
Marine markers</td><td>Military Recoverable Material</td><td colspan="2">None</td></tr>
<tr><td>Sonar and Other Transducer Bins</td><td colspan="5">None</td></tr>
<tr><td>In-Water Explosive Bins</td><td colspan="5">None</td></tr>
<tr><td>Procedural Mitigation Measures</td><td colspan="5">Physical Disturbance and Strike: (Section 5.3.4)
Vessel movement</td></tr>
</table>

Expeditionary Warfare	
Personnel Insertion/Extraction – Air	
Assumptions Used for Analysis	Exercises are typically conducted in waters near land.

A.2.7.4 Personnel Insertion/Extraction – Surface and Subsurface

Expeditionary Warfare			
Personnel Insertion/Extraction – Surface and Subsurface			
Short Description	Personnel are inserted into and extracted from an objective area by small boats or subsurface platforms.	**Typical Duration**	2-4 hours
Long Description	Utilizing both small surface and subsurface platforms, personnel are inserted in the water. They will conduct an infiltration to an objective (harbor, beach, moored vessel, etc.) and conduct a variety of tasks. The insertion/extraction activities are confined to in-water training.		
Typical Components	**Platforms:** Small boats, manned underwater vehicles **Targets:** None **Systems being Trained/Tested:** None		
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety	**Typical Locations** **Range Complexes/Testing Ranges:** Gulf of Mexico Jacksonville Key West Navy Cherry Point Northeast Virginia Capes	**Inshore Waters/Pierside:** Lower Chesapeake Bay James River and tributaries York River
Stressors to Biological Resources and Habitats	**Acoustic:** Vessel noise Weapons noise **Explosives:** None	**Physical Disturbance and Strike:** Vessel and in-water device strike Seafloor devices Military expended material **Ingestion:** Military expended materials - munitions	**Energy:** None **Entanglement:** None
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** Metals	
Stressors to Human Resources	**Cultural Resources:** Physical disturbance and strike	**Socioeconomic Resources:** Accessibility Physical disturbance and strike Airborne acoustics	**Public Health and Safety:** Physical interactions
Military Expended Material	**Ingestible Material:** Small caliber (casing only) **Non-Ingestible Material:** None	**Military Recoverable Material**	None
Sonar and Other Transducer Bins	None		
In-Water Explosive Bins	None		
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement		
Assumptions Used for Analysis	Exercises are typically conducted in waters near land.		

A.2.7.5 Personnel Insertion/Extraction – Swimmer/Diver

Expeditionary Warfare			
Personnel Insertion/Extraction Training – Swimmer/Diver			
Short Description	Divers and swimmer infiltrate harbors, beaches, or moored vessels and conduct a variety of tasks.	**Typical Duration**	Up to 12 hours
Long Description	Divers and swimmer infiltrate harbors, beaches, or moored vessels and conduct a variety of tasks. Activity may include Navy personnel learning advanced self-contained underwater breathing apparatus (SCUBA) diving to include: tactics, techniques, and procedures and emergency procedures. Small boats are used for safety.		
Typical Components	**Platforms:** Small boats **Targets:** None **Systems being Trained/Tested:** None		
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety	**Typical Locations**	
		Range Complexes/Testing Ranges: Key West Virginia Capes	**Inshore Waters/Pierside:** Lower Chesapeake Bay
Stressors to Biological Resources and Habitats	**Acoustic:** Vessel noise	**Physical Disturbance and Strike:** Vessel and in-water device strike	**Energy:** None
	Explosives: None	**Ingestion:** None	**Entanglement:** None
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** None	
Stressors to Human Resources	**Cultural Resources:** None	**Socioeconomic Resources:** Accessibility Physical disturbance and strike	**Public Health and Safety:** Physical interactions
Military Expended Material	**Ingestible Material:** None **Non-Ingestible Material:** None	**Military Recoverable Material**	None
Sonar and Other Transducer Bins	None		
In-Water Explosive Bins	None		
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement		
Assumptions Used for Analysis	None		

A.2.7.6 Underwater Construction Team Training

Expeditionary Warfare				
Underwater Construction Team Training				
Short Description	Navy divers conduct underwater repair and construction.		**Typical Duration**	Up to 12 days
Long Description	Navy divers will perform cutting, welding, assembly, and installation of deep-water structures, mooring systems, underwater instrumentation, and other systems as needed.			
Typical Components	**Platforms:** Small boats **Targets:** None **Systems being Trained/Tested:** None			
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety	**Typical Locations**		
		Range Complexes/Testing Ranges: Gulf of Mexico Jacksonville Key West Virginia Capes	**Inshore Waters/Pierside:** Various harbors	
Stressors to Biological Resources and Habitats	**Acoustic:** Vessel noise **Explosives:** None	**Physical Disturbance and Strike:** Vessel and in-water device strike Seafloor devices **Ingestion:** None	**Energy:** None **Entanglement:** None	
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** None		
Stressors to Human Resources	**Cultural Resources:** None	**Socioeconomic Resources:** Accessibility Physical disturbance and strike	**Public Health and Safety:** Physical interactions	
Military Expended Material	**Ingestible Material:** None **Non-Ingestible Material:** None	**Military Recoverable Material**	Bottom placed instruments	
Sonar and Other Transducer Bins	None			
In-Water Explosive Bins	None			
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement			
Assumptions Used for Analysis	None			

A.2.8 MINE WARFARE

Mine warfare is the naval warfare area involving the detection, avoidance, and neutralization of mines to protect Navy ships and submarines and offensive mine laying in naval operations. A naval mine is a self-contained explosive device placed in water to destroy ships or submarines. Naval mines are deposited and left in place until triggered by the approach of an enemy ship or are destroyed or removed. Naval mines can be laid by purpose-built minelayers, other ships, submarines, or airplanes. Mine warfare training includes mine countermeasures exercises and mine-laying exercises.

A.2.8.1 Airborne Mine Countermeasure – Mine Detection

Mine Warfare			
Airborne Mine Countermeasures – Mine Detection			
Short Description	Helicopter aircrews detect mines using towed or laser mine detection systems.	**Typical Duration**	2 hours
Long Description	Helicopter aircrews use towed and airborne devices to detect, locate, and classify potential mines. Towed devices employ active acoustic sources, such as high-frequency and side scanning sonar. These devices are similar in function to systems used to map the seafloor or locate submerged structures/items. Airborne devices utilize laser systems to locate mines located below the surface. Devices used include the AN/AQS-20/A, towed mine-hunting sonar used to detect and classify bottom and floating/moored mines in deep and shallow water, and the Airborne Laser Mine Detection System, developed to detect and classify floating and near-surface, moored mines.		
Typical Components	**Platforms:** Rotary-wing aircraft **Targets:** Mine shapes **Systems being Trained/Tested:** Mine detection systems		
Standard Operating Procedures *(Section 2.3.3)*	Aircraft safety Towed in-water device safety	**Typical Locations**	
		Range Complexes/Testing Ranges: Gulf of Mexico Jacksonville Navy Cherry Point Virginia Capes Naval Surface Warfare Center, Panama City Division	**Inshore Waters/Pierside:** None
Stressors to Biological Resources and Habitats	**Acoustic:** Sonar and other transducers Aircraft noise **Explosives:** None	**Physical Disturbance and Strike:** Aircraft and aerial target strike Vessel and in-water device strike Seafloor devices **Ingestion:** None	**Energy:** In-water electromagnetic devices **Entanglement:** None
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** None	
Stressors to Human Resources	**Cultural Resources:** Physical disturbance and strike	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-air energy In-water energy

<table>
<tr><th colspan="4">Mine Warfare</th></tr>
<tr><th colspan="4">Airborne Mine Countermeasures – Mine Detection</th></tr>
<tr><td>Military Expended Material</td><td>Ingestible Material:
None

Non-Ingestible Material:
None</td><td>Military Recoverable Material</td><td>Mine shapes (non-explosive)</td></tr>
<tr><td>Sonar and Other Transducer Bins</td><td colspan="3">High-Frequency:
HF4</td></tr>
<tr><td>In-Water Explosive Bins</td><td colspan="3">None</td></tr>
<tr><td>Procedural Mitigation Measures</td><td colspan="2">Acoustic Stressors: (Section 5.3.2)
Active sonar</td><td>Physical Disturbance and Strike: (Section 5.3.4)
Towed in-water devices</td></tr>
<tr><td>Assumptions Used for Analysis</td><td colspan="3">Sonar mine detection systems towed from helicopters.
Airborne laser systems used to detect mine shapes.
Laser systems are similar to commercial Light Detection And Ranging (LIDAR) systems. The in-air energy stressor was used in analysis of potential impacts on human resources.
Mine shapes may be deployed via ship and will be recovered.</td></tr>
</table>

A.2.8.2 Airborne Mine Countermeasure – Towed Mine Neutralization

<table>
<tr><th colspan="6">Mine Warfare</th></tr>
<tr><th colspan="6">Airborne Mine Countermeasures – Towed Mine Neutralization</th></tr>
<tr><td>Short Description</td><td colspan="3">Helicopter aircrews tow systems through the water that are designed to disable or trigger mines.</td><td>Typical Duration</td><td>1.5-4 hours</td></tr>
<tr><td>Long Description</td><td colspan="5">Helicopter vehicle operators use towed devices to trigger mines that are designed to detonate when they detect ships/submarines by engine/propeller sounds or magnetic (steel construction) signature. Towed devices can also employ cable cutters to detach floating moored mines. Training may be conducted with non-explosive training mine shapes.

Devices used include the following: MK 105 sled, which creates a magnetic field used to trigger mines and can be used in conjunction with the MK 103 cable cutter system and the MK 104 acoustic countermeasure, and AN/SPU-1/W (Magnetic Orange Pipe), a magnetic pipe that is used to trigger magnetically influenced mines.</td></tr>
<tr><td>Typical Components</td><td colspan="5">Platforms: Rotary-wing aircraft
Targets: Mine shapes
Systems being Trained/Tested: Towed mine neutralization systems</td></tr>
<tr><td>Standard Operating Procedures (Section 2.3.3)</td><td colspan="2">Aircraft safety
Towed in-water device safety</td><td colspan="3">Typical Locations
Range Complexes/Testing Ranges:
Gulf of Mexico
Jacksonville
Navy Cherry Point
Virginia Capes
Inshore Waters/Pierside:
None</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td colspan="2">Acoustic:
Aircraft noise

Explosives:
None</td><td colspan="2">Physical Disturbance and Strike:
Aircraft and aerial target strike
Vessel and in-water device strike
Seafloor devices

Ingestion:
None</td><td>Energy:
In-water electromagnetic devices

Entanglement:
None</td></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="2">Air Quality:
Criteria air pollutants</td><td colspan="3">Sediments and Water Quality:
None</td></tr>
<tr><td>Stressors to Human Resources</td><td>Cultural Resources:
Physical disturbance and strike</td><td colspan="2">Socioeconomic Resources:
Accessibility
Physical disturbance and strike</td><td colspan="2">Public Health and Safety:
Physical interactions
In-water energy</td></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
None

Non-Ingestible Material:
None</td><td>Military Recoverable Material</td><td colspan="2">Mine shapes (non-explosive)</td></tr>
<tr><td>Sonar and Other Transducer Bins</td><td colspan="5">None</td></tr>
<tr><td>In-Water Explosive Bins</td><td colspan="5">None</td></tr>
</table>

Mine Warfare	
Airborne Mine Countermeasures – Towed Mine Neutralization	
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Towed in-water devices
Assumptions Used for Analysis	Mechanical sweeping (cable cutting), acoustic and magnetic influence sweeping devices are towed from helicopters. Cable cutters utilize an insignificant charge (similar to a shotgun shell). Acoustic sweeps generate ship-type noise via a mechanical system. Towing systems though minefields (or without mines, to train to deploy, tow, and recover) may involve instrumented mines. Mine shapes are recovered.

A.2.8.3 Civilian Port Defense – Homeland Security Anti-Terrorism/Force Protection Exercise

<table>
<tr><th colspan="4">Mine Warfare</th></tr>
<tr><th colspan="4">Civilian Port Defense – Homeland Security Anti-Terrorism/Force Protection Exercises</th></tr>
<tr><td>Short Description</td><td colspan="2">Maritime security personnel train to protect civilian ports and harbors against enemy efforts to interfere with access to those ports.</td><td>Typical Duration
Multiple days</td></tr>
<tr><td>Long Description</td><td colspan="3">Naval forces provide mine warfare capabilities to support Department of Homeland Security sponsored exercises. The three pillars of mine warfare, airborne (helicopter), surface (surface ships), and undersea (divers, marine mammals, and unmanned vehicles) mine countermeasures will be brought to bear in order to ensure strategic U.S. ports remain free of mine threats. Various mine warfare sensors, which utilize active acoustics, will be employed in the detection, classification, and neutralization of mines. Along with traditional mine warfare techniques, such as helicopter towed mine countermeasures, new technologies (unmanned vehicles) will be utilized. Marine mammal systems may be used during this exercise.

Exercise locations and scenarios will vary according to Department of Homeland Security strategic goals and evolving world events.</td></tr>
<tr><td>Typical Components</td><td colspan="3">Platforms: Moored platforms, rotary-wing aircraft, support craft, surface combatants, unmanned underwater vehicles
Targets: Mine shapes
Systems being Trained/Tested: Mine detection systems, towed mine neutralization systems, airborne mine neutralization systems</td></tr>
<tr><td>Standard Operating Procedures (Section 2.3.3)</td><td>Vessel safety
Aircraft safety
Unmanned aerial, surface, and subsurface vehicle safety
Towed in-water device safety</td><td colspan="2">Typical Locations
Range Complexes/Testing Ranges:
Virginia Capes

Inshore Waters/Pierside:
Beaumont, Texas
Boston, Massachusetts
Corpus Christi, Texas
Delaware Bay, Delaware
Earle, New Jersey
Hampton Roads, Virginia
Kings Bay, Georgia
Morehead City, North Carolina
Naval Station Mayport, Florida
Port Canaveral, Florida
Savannah, Georgia
Tampa, Florida
Wilmington, North Carolina</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td>Acoustic:
Sonar and other transducers
Aircraft noise
Vessel noise
Weapons noise

Explosives:
In-water explosives</td><td>Physical Disturbance and Strike:
Aircraft and aerial target strike
Vessel and in-water device strike
Seafloor devices
Military expended material

Ingestion:
Military expended materials – munitions
Military expended materials – other than munitions</td><td>Energy:
In-water electromagnetic devices

Entanglement:
Wires and cables</td></tr>
</table>

Mine Warfare				
Civilian Port Defense – Homeland Security Anti-Terrorism/Force Protection Exercises				
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants		**Sediments and Water Quality:** Metals Explosives and explosive byproducts Chemicals other than explosives Other materials	
Stressors to Human Resources	**Cultural Resources:** Physical disturbance and strike Explosives	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-air energy In-water energy	
Military Expended Material	**Ingestible Material:** Mine neutralizer fragments **Non-Ingestible Material:** Fiber optic cable, fiber optic can	**Military Recoverable Material**	Mine shapes (non-explosive)	
Sonar and Other Transducer Bins	**High-Frequency:** HF4	**Synthetic Aperture Sonars:** SAS2		
In-Water Explosive Bins	E2 E4			
Procedural Mitigation Measures	**Acoustic Stressors:** *(Section 5.3.2)* Active sonar **Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement Towed in-water devices		**Explosive Stressors:** *(Section 5.3.3)* Explosive mine neutralization activities involving Navy divers	
Assumptions Used for Analysis	Non-permanent mine shapes will be laid in various places on the bottom and will be retrieved. Shapes are varied, from about 1 m circular to about 2.5 m long by 1 m wide. They will be recovered using normal assets, with diver involvement. Explosives may be used if required for scheduled mine neutralization exercises. While goal is to conduct once per year, alternating east/west coast, assume that an east coast exercise will occur every other year with a total of three per five year period.			

A.2.8.4 Coordinated Unit-Level Helicopter Airborne Mine Countermeasures Exercise

Mine Warfare				
Coordinated Unit-Level Helicopter Airborne Mine Countermeasures Exercise				
Short Description	A detachment of helicopters aircrews train as a unit in the use of airborne mine countermeasures, such as towed mine detection and neutralization systems.	**Typical Duration** Multiple days		
Long Description	Naval aircrews train, as a squadron, in the use of various airborne mine countermeasures. Systems employed include towed mine detection systems, mechanical (cable cutting) mine sweeps, magnetic and acoustic mine sweeps, and other airborne systems and sensors. Mine shapes will be used. If necessary, permanently placed mine shapes will be supplemented with approximately 24 additional, temporarily placed mine shapes. Training mine shapes could be bottom placed, moored, or floating.			
Typical Components	**Platforms:** Rotary-wing aircraft **Targets:** Mine shapes **Systems being Trained/Tested:** Mine detection systems, towed mine neutralization systems			
Standard Operating Procedures *(Section 2.3.3)*	Aircraft safety Towed in-water device safety	**Typical Locations** **Range Complexes/Testing Ranges:** Gulf of Mexico Jacksonville Navy Cherry Point Virginia Capes	**Inshore Waters/Pierside:** None	
Stressors to Biological Resources and Habitats	**Acoustic:** Sonar and other transducers Aircraft noise **Explosives:** None	**Physical Disturbance and Strike:** Military expended materials Aircraft and aerial target strike Vessel and in-water device strike Seafloor devices **Ingestion:** None	**Energy:** In-water electromagnetic devices **Entanglement:** None	
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** Metals Other materials		
Stressors to Human Resources	**Cultural Resources:** Physical disturbance and strike	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-air energy In-water energy	
Military Expended Material	**Ingestible Material:** None **Non-Ingestible Material:** Mine shapes (non-explosive)	**Military Recoverable Material**	Mine shapes (non-explosive)	
Sonar and Other Transducer Bins	**High-Frequency:** HF4			
In-Water Explosive Bins	None			

Mine Warfare		
Coordinated Unit-Level Helicopter Airborne Mine Countermeasures Exercise		
Procedural Mitigation Measures	**Acoustic Stressors:** *(Section 5.3.2)* Active sonar	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement Towed in-water devices
Assumptions Used for Analysis	Multiple helicopters conduct airborne mine countermeasure training using an assortment of mine warfare gear similar to unit-level events, except that a squadron trains together. Assume up to 24 temporary mine shapes will be deployed to support each of these exercises.	

A.2.8.5 Mine Countermeasures – Ship Sonar

<table>
<tr><th colspan="5">Mine Warfare</th></tr>
<tr><th colspan="5">Mine Countermeasure – Ship Sonar</th></tr>
<tr><td>Short Description</td><td colspan="2">Ship crews detect and avoid mines while navigating restricted areas or channels using active sonar.</td><td>Typical Duration</td><td>1.5-4 hours</td></tr>
<tr><td>Long Description</td><td colspan="4">Surface ship crews detect and avoid mines or other underwater hazardous objects while navigating restricted areas or channels using active sonar. A Littoral Combat Ship utilizes unmanned surface vehicles and remotely operated vehicles to tow mine detection (hunting) equipment. Systems will operate from a shallow zone greater than 40 ft. to deep water. Exercises could be embedded within major training exercises.</td></tr>
<tr><td>Typical Components</td><td colspan="4">Platforms: Surface combatants, unmanned surface vehicles
Targets: Mine shapes
Systems being Trained/Tested: Sonar systems</td></tr>
<tr><td>Standard Operating Procedures (Section 2.3.3)</td><td colspan="2">Vessel safety
Unmanned aerial, surface, and subsurface vehicle safety
Towed in-water device safety</td><td colspan="2">Typical Locations
Range Complexes/Testing Ranges:
Gulf of Mexico
Jacksonville
Virginia Capes
Inshore Waters/Pierside:
None</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td colspan="2">Acoustic:
Sonar and other transducers
Vessel noise

Explosives:
None</td><td colspan="2">Physical Disturbance and Strike:
Vessel and in-water device strike
Seafloor devices

Ingestion:
None</td><td>Energy:
In-air electromagnetic devices
In-water electromagnetic devices

Entanglement:
None</td></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="2">Air Quality:
Criteria air pollutants</td><td colspan="3">Sediments and Water Quality:
None</td></tr>
<tr><td>Stressors to Human Resources</td><td>Cultural Resources:
Physical disturbance and strike
Explosives</td><td colspan="2">Socioeconomic Resources:
Accessibility
Physical disturbance and strike
Airborne acoustics</td><td>Public Health and Safety:
Physical interactions
In-air energy
In-water energy</td></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
None

Non-Ingestible Material:
None</td><td>Military Recoverable Material</td><td>Mine shapes (non-explosive)</td></tr>
<tr><td>Sonar and Other Transducer Bins</td><td colspan="4">High-Frequency:
HF4</td></tr>
<tr><td>In-Water Explosive Bins</td><td colspan="4">None</td></tr>
<tr><td>Procedural Mitigation Measures</td><td colspan="2">Acoustic Stressors: (Section 5.3.2)
Active sonar</td><td colspan="2">Physical Disturbance and Strike: (Section 5.3.4)
Vessel movement
Towed in-water devices</td></tr>
</table>

Mine Warfare	
Mine Countermeasure – Ship Sonar	
Assumptions Used for Analysis	No explosives are used. It is assumed that the system will be operated in areas free of obstructions and will be towed well above the seafloor. Towed systems are always operated in a manner to avoid entanglement and damage. Exercises take place in water depths of 40 ft. and greater. Existing placed mine shapes to be used. There is the potential for temporary placement of mine shapes.

A.2.8.6 Mine Countermeasures – Mine Neutralization – Remotely Operated Vehicle

Mine Warfare			
Mine Countermeasures – Mine Neutralization – Remotely Operated Vehicles			
Short Description	Ship, small boat, and helicopter crews locate and disable mines using remotely operated underwater vehicles.	**Typical Duration**	1.5-4 hours
Long Description	Ship, small boat, and helicopter crews utilize remotely operated vehicles to neutralize potential mines. Remotely operated vehicles will use sonar and optical systems to locate and target mine shapes. Explosive mine neutralizers may be used during live fire events.		
Typical Components	**Platforms:** Rotary-wing aircraft, small boats, surface combatants **Targets:** Mine shapes **Systems being Trained/Tested:** Airborne mine neutralization systems, in-water explosives		
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety Aircraft safety Towed in-water device safety	**Typical Locations** **Range Complexes/Testing Ranges:** Gulf of Mexico Jacksonville Navy Cherry Point Virginia Capes	**Inshore Waters/Pierside:** None
Stressors to Biological Resources and Habitats	**Acoustic:** Aircraft noise Vessel noise Sonar and other transducers **Explosives:** In-water explosives	**Physical Disturbance and Strike:** Aircraft and aerial target strike Vessel and in-water device strike Military expended material Seafloor devices **Ingestion:** Military expended materials – munitions Military expended materials – other than munitions	**Energy:** In-air electromagnetic devices In-water electromagnetic devices **Entanglement:** Wires and cables
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** Explosives and explosive byproducts Metals Chemicals other than explosives Other materials	
Stressors to Human Resources	**Cultural Resources:** Physical disturbance and strike Explosives	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-air energy In-water energy
Military Expended Material	**Ingestible Material:** Mine neutralizer fragments **Non-Ingestible Material:** Fiber optic cables, fiber optic cans	**Military Recoverable Material**	Mine shapes (non-explosive)
Sonar and Other Transducer Bins	**High-Frequency:** HF4		

Mine Warfare		
Mine Countermeasures – Mine Neutralization – Remotely Operated Vehicles		
In-Water Explosive Bins	E4	
Procedural Mitigation Measures	**Acoustic Stressors:** *(Section 5.3.2)* Active sonar **Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement Towed in-water devices	**Explosive Stressors:** *(Section 5.3.3)* Explosive mine countermeasure and neutralization activities
Assumptions Used for Analysis	None	

A.2.8.7 Mine Laying

Mine Warfare			
Mine Laying			
Short Description	Fixed-wing aircraft drop non-explosive mine shapes.	**Typical Duration**	1 hour
Long Description	Fixed-wing aircraft lay offensive or defensive mines for a tactical advantage for friendly forces. Fixed-wing aircraft lay a precise minefield pattern for specific tactical situations. The aircrew typically makes multiple passes in the same flight pattern, and drop one or more training shapes per pass (four shapes total). Training shapes are non-explosive.		
Typical Components	**Platforms:** Fixed-wing aircraft **Targets:** None **Systems being Trained/Tested:** None		
Standard Operating Procedures *(Section 2.3.3)*	Aircraft safety	**Typical Locations** **Range Complexes/Testing Ranges:** Jacksonville Navy Cherry Point Virginia Capes	**Inshore Waters/Pierside:** None
Stressors to Biological Resources and Habitats	**Acoustic:** Aircraft noise **Explosives:** None	**Physical Disturbance and Strike:** Aircraft and aerial target strike Military expended materials Seafloor devices **Ingestion:** None	**Energy:** In-air electromagnetic devices **Entanglement:** None
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** Metals	
Stressors to Human Resources	**Cultural Resources:** None	**Socioeconomic Resources:** None	**Public Health and Safety:** None
Military Expended Material	**Ingestible Material:** None **Non-Ingestible Material:** Mine shapes (non-explosive)	**Military Recoverable Material**	None
Sonar and Other Transducer Bins	None		
In-Water Explosive Bins	None		
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Non-explosive bombs and mine shapes		

Mine Warfare	
Mine Laying	
Assumptions Used for Analysis	Mine laying is similar to non-explosive bombing exercises. These exercises primarily occur during major training exercises. Mine laying will typically take place in waters less than 100 ft. in depth. Assume 12 mine shapes are used per exercise. Stressors to human resources were not analyzed for this activity since it occurs greater than 12 NM from shore.

A.2.8.8 Mine Neutralization – Explosive Ordnance Disposal

<table>
<tr><th colspan="6">Mine Warfare</th></tr>
<tr><th colspan="6">Mine Neutralization Explosive Ordnance Disposal</th></tr>
<tr><td>Short Description</td><td colspan="3">Personnel place limpet mines or disable threat mines using explosive charges.</td><td>Typical Duration</td><td>Up to 8 hours</td></tr>
<tr><td>Long Description</td><td colspan="5">Navy divers, typically explosive ordnance disposal personnel, disable threat mines with explosive charges to create a safe channel for friendly vessels to transit or placing or detonating limpet mines on steel structures.

Personnel detect, identify, evaluate, and neutralize mines in the water with an explosive device and may involve detonation of one or more explosive charges from 4 to 60 pounds of TNT equivalent. These operations are normally conducted during daylight hours for safety reasons.
Time-delay fuses may be used for these exercises. Personnel also identify and place limpet mine charges on a steel structure in the water and detonate an explosive charge of up to 2.2 pounds of TNT equivalent. These operations are normally conducted during daylight hours for safety reasons.</td></tr>
<tr><td>Typical Components</td><td colspan="5">Platforms: Small boats
Targets: Mine shapes, sub-surface I-beam demolition structure
Systems being Trained/Tested: In-water explosives</td></tr>
<tr><td>Standard Operating Procedures (Section 2.3.3)</td><td colspan="2">Vessel safety</td><td colspan="3">Typical Locations
Range Complexes/Testing Ranges:
Gulf of Mexico
Jacksonville
Key West
Navy Cherry Point
Virginia Capes
Inshore Waters/Pierside:
Lower Chesapeake Bay
Truman Harbor
Demolition Key</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td colspan="2">Acoustic:
Vessel noise

Explosives:
In-water explosives</td><td colspan="2">Physical Disturbance and Strike:
Vessel and in-water device strike
Military expended materials
Seafloor devices

Ingestion:
Military expended materials – other than munitions</td><td>Energy:
None

Entanglement:
None</td></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="2">Air Quality:
Criteria air pollutants</td><td colspan="3">Sediments and Water Quality:
Explosives and explosive byproducts
Metals
Chemicals other than explosives
Other materials</td></tr>
<tr><td>Stressors to Human Resources</td><td>Cultural Resources:
Physical disturbance and strike
Explosives</td><td>Socioeconomic Resources:
Accessibility
Airborne acoustics
Physical disturbance and strike</td><td colspan="3">Public Health and Safety:
Physical interactions
In-water energy</td></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
Mine shape (explosive) fragments

Non-Ingestible Material:
None</td><td>Military Recoverable Material</td><td colspan="2">Mine shapes (non-explosive), metal plates, sub-surface I-beam demolition structure</td></tr>
<tr><td>Sonar and Other Transducer Bins</td><td colspan="5">None</td></tr>
</table>

Mine Warfare		
Mine Neutralization Explosive Ordnance Disposal		
In-Water Explosive Bins	E3 E4 E5 E6 E7	
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement	**Explosive Stressors: (Section 5.3.3)** Explosive mine neutralization activities involving Navy divers
Assumptions Used for Analysis	Time-delayed fuses may be used (up to 10 minutes) for charges up to 29 lb. net explosive weight in some locations. Charge placed anywhere in water column, including bottom. For limpet mines, the detonation is enclosed by steel on the four sides and concrete on the bottom. Almost all acoustic energy will be vented to the air. Some mine shapes and all of the sub-surface I-beam demolition structures will be recovered.	

A.2.8.9 Underwater Mine Countermeasure Raise, Tow, Beach and Exploitation Operations

<table>
<tr><td colspan="6">Mine Warfare</td></tr>
<tr><td colspan="6">Underwater Mine Countermeasure Raise, Tow, Beach and Exploitation Operations</td></tr>
<tr><td>Short Description</td><td colspan="3">Personnel locate mines, perform mine neutralization, raise and tow mines to the beach, and conduct exploitation operations for intelligence gathering.</td><td>Typical Duration
Up to 4 hours</td><td></td></tr>
<tr><td>Long Description</td><td colspan="5">Navy divers, typically explosive ordnance disposal personnel, locate mines using unmanned underwater vehicle, marine mammals, or other diver search techniques. Mines are then neutralized, or prevented from working as they are intended. Explosive ordnance disposal personnel ensure the neutralization measures are effective and the shapes are safe to bring to the beach. A lift balloon is attached to the line and slowly tows the shape to the beach. The final step, exploitation, is intelligence gathering, identifying the mine and how it works, and then disassembling it or disposing of it.</td></tr>
<tr><td>Typical Components</td><td colspan="5">Platforms: Small boats
Targets: Mine shapes
Systems being Trained/Tested: None</td></tr>
<tr><td>Standard Operating Procedures (Section 2.3.3)</td><td>Vessel safety</td><td colspan="4">Typical Locations
Range Complexes/Testing Ranges:
Gulf of Mexico
Jacksonville
Key West
Navy Cherry Point
Virginia Capes
Inshore Waters/Pierside:
James River and tributaries
Lower Chesapeake Bay
York River
Naval Submarine Base Kings Bay</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td colspan="2">Acoustic:
Vessel noise

Explosives:
None</td><td colspan="2">Physical Disturbance and Strike:
Vessel and in-water device strike
Seafloor devices

Ingestion:
None</td><td>Energy:
None

Entanglement:
None</td></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="2">Air Quality:
Criteria air pollutants</td><td colspan="3">Sediments and Water Quality:
None</td></tr>
<tr><td>Stressors to Human Resources</td><td>Cultural Resources:
Physical disturbance and strike</td><td colspan="2">Socioeconomic Resources:
Accessibility
Airborne acoustics
Physical disturbance and strike</td><td colspan="2">Public Health and Safety:
Physical interactions</td></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
None

Non-Ingestible Material:
None</td><td>Military Recoverable Material</td><td colspan="2">Mine shapes (non-explosive)</td></tr>
<tr><td>Sonar and Other Transducer Bins</td><td colspan="5">None</td></tr>
</table>

Mine Warfare	
Underwater Mine Countermeasure Raise, Tow, Beach and Exploitation Operations	
In-Water Explosive Bins	None
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement
Assumptions Used for Analysis	Exercises primarily conducted in W-50 in Virginia Capes Range Complex and beaches at Dam Neck Annex. Mine shapes are recovered as part of the exercise.

A.2.9 SURFACE WARFARE TRAINING

Surface warfare is a type of naval warfare in which aircraft, surface ships, and submarines employ weapons and sensors in operations directed against enemy surface ships or small boats. Aircraft-to-surface warfare is conducted by long-range attacks using air-launched cruise missiles, precision-guided munitions, or aircraft cannon. Surface warfare also is conducted by warships employing torpedoes, naval guns, and surface-to-surface missiles. Submarines attack surface ships using torpedoes or submarine-launched, anti-ship cruise missiles. Training in surface warfare includes surface-to-surface gunnery and missile exercises, air-to-surface gunnery and missile exercises, and submarine missile or torpedo launch events. Gunnery and missile training generally involves expenditure of ordnance against a towed target. A sinking exercise is a specialized training exercise that provides an opportunity for ship, submarine, and aircraft crews to use multiple weapons systems to deliver high-explosive ordnance on a deactivated vessel, which is deliberately sunk.

Surface warfare also encompasses maritime security, that is, the interception of a suspect surface ship by a Navy ship for the purpose of boarding-party inspection or the seizure of the suspect ship. Training in these tasks is conducted in visit, board, search and seizure exercises.

A.2.9.1 Bombing Exercise Air-to-Surface

<table>
<tr><td colspan="4">Surface Warfare</td></tr>
<tr><td colspan="4">Bombing Exercise Air-to-Surface</td></tr>
<tr><td>Short Description</td><td colspan="2">Fixed-wing aircrews deliver bombs against surface targets.</td><td>Typical Duration
1 hour</td></tr>
<tr><td>Long Description</td><td colspan="3">Fixed-wing aircraft conduct bombing exercises against stationary floating targets (e.g., MK-58 smoke buoy), towed targets, or maneuvering targets. An aircraft clears the area, deploys a smoke buoy, and then delivers high-explosive or non-explosive practice bombs on the target. A range boat may be used to deploy towed or maneuvering targets for an aircraft to attack.
Exercises for strike fighters typically involve a flight of two aircraft delivering unguided or guided munitions that may be either high-explosive or non-explosive. The following munitions may be employed by strike fighter aircraft in the course of bombing exercise: Unguided munitions including non-explosive subscale bombs (MK-76 and BDU-45), explosive and non-explosive general purpose bombs (MK-80 series), and MK-20 cluster bombs (explosive, non-explosive). Precision-guided munitions include laser-guided bombs (explosive, non-explosive), laser-guided training rounds (non-explosive), Joint Direct Attack Munitions (explosive, non-explosive).</td></tr>
<tr><td>Typical Components</td><td colspan="3">Platforms: Fixed-wing aircraft, support craft
Targets: Surface targets
Systems being Trained/Tested: Bombs, non-explosive practice munitions, aircraft platforms</td></tr>
<tr><td>Standard Operating Procedures (Section 2.3.3)</td><td>Vessel safety
Aircraft safety
Weapons firing safety</td><td colspan="2">Typical Locations
Range Complexes/Testing Ranges:
Gulf of Mexico
Jacksonville
Navy Cherry Point
Virginia Capes
Inshore Waters/Pierside:
None</td></tr>
</table>

Surface Warfare			
Bombing Exercise Air-to-Surface			
Stressors to Biological Resources and Habitats	**Acoustic:** Aircraft noise Vessel noise Weapons noise **Explosives:** In-water explosives In-air explosives	**Physical Disturbance and Strike:** Aircraft and aerial target strike Vessel and in-water device strike Military expended materials **Ingestion:** Military expended materials – munitions Military expended materials – other than munitions	**Energy:** In-air electromagnetic devices **Entanglement:** None
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** Explosives and explosive byproducts Chemicals other than explosives Other materials	Metals
Stressors to Human Resources	None		
Military Expended Material	**Ingestible Material:** Surface targets (mobile and stationary) fragments, bomb (explosive) fragments **Non-Ingestible Material:** Marine markers, bombs (non-explosive)	**Military Recoverable Material**	Surface targets (mobile)
Sonar and Other Transducer Bins	None		
In-Water Explosive Bins	E9 E10 E12		
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement Non-explosive bombs and mine shapes	**Explosive Stressors:** *(Section 5.3.3)* Explosive bombs	
Assumptions Used for Analysis	Approximately 90 percent of non-explosive bombs are the sub-scale bombs such as the MK-76 and BDU-48. Stressors to human resources were not analyzed for this activity since it occurs greater than 12 NM from shore.		

A.2.9.2 Fast Attack Craft and Fast Inshore Attack Craft

<table>
<tr><td colspan="5">Surface Warfare</td></tr>
<tr><td colspan="5">Fast Attack Craft and Fast Inshore Attack Craft</td></tr>
<tr><td>Short Description</td><td colspan="2">Navy ships and helicopters defend against small boat attacks.</td><td>Typical Duration
2-4 hour</td><td></td></tr>
<tr><td>Long Description</td><td colspan="4">Navy ships and helicopters detect, coordinate, and defend against multiple high speed small boats employing swarm tactics. Ships must coordinate defenses to achieve proper targeting of attack craft. Only blank ordnance is used in this activity. Activities conducted in the open ocean are called Fast Attack Craft, while those in littoral waters are called Fast Inshore Attack Craft.</td></tr>
<tr><td>Typical Components</td><td colspan="4">Platforms: Amphibious warfare ships, surface combatants, rotary-wing aircraft
Targets: None
Systems being Trained/Tested: None</td></tr>
<tr><td>Standard Operating Procedures (Section 2.3.3)</td><td>Vessel safety
Aircraft safety
Weapons firing safety</td><td colspan="3">Typical Locations
Range Complexes/Testing Ranges:
Jacksonville
Virginia Capes
Inshore Waters/Pierside:
Naval Station Mayport, Florida</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td colspan="4">Acoustic:
Aircraft noise
Vessel noise
Weapons noise

Explosives:
None

Physical Disturbance and Strike:
Vessel and in-water device strike
Aircraft and aerial target strike
Military expended material

Ingestion:
Military expended materials – munitions

Energy:
In-air electromagnetic devices

Entanglement:
None</td></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="4">Air Quality:
Criteria air pollutants

Sediments and Water Quality:
Metals</td></tr>
<tr><td>Stressors to Human Resources</td><td colspan="4">Cultural Resources:
Physical disturbance and strike

Socioeconomic Resources:
Accessibility
Airborne acoustics
Physical disturbance and strike

Public Health and Safety:
Physical interactions
In-air energy</td></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
Small-caliber projectiles (casings only)

Non-Ingestible Material:
None</td><td>Military Recoverable Material</td><td>None</td></tr>
<tr><td>Sonar and Other Transducer Bins</td><td colspan="4">None</td></tr>
<tr><td>In-Water Explosive Bins</td><td colspan="4">None</td></tr>
<tr><td>Procedural Mitigation Measures</td><td colspan="4">Physical Disturbance and Strike: (Section 5.3.4)
Vessel movement
Small-, medium-, and large-caliber non-explosive practice munitions</td></tr>
</table>

Surface Warfare	
Fast Attack Craft and Fast Inshore Attack Craft	
Assumptions Used for Analysis	None

A.2.9.3 Gunnery Exercise Air-to-Surface Medium-Caliber

Surface Warfare				
Gunnery Exercise Air-to-Surface Medium-Caliber				
Short Description	Fixed-wing and helicopter aircrews fire medium-caliber guns at surface targets.	**Typical Duration**	1 hour	
Long Description	Fighter and helicopter aircrews engage surface targets with medium-caliber guns. Targets simulate enemy ships, boats, swimmers, and floating/near- surface mines. Fighter aircraft descend on a target firing high-explosive or non-explosive practice munitions medium-caliber projectiles. Helicopters will fly a racetrack pattern around an at-sea target. Aircrew will engage the target with medium-caliber weapons. Targets range from a smoke float, or an empty steel drum, to high speed remote controlled boats and jet-skis.			
Typical Components	**Platforms:** Fixed-wing aircraft, rotary-wing aircraft **Targets:** Surface targets (e.g., MK 58 marine markers, empty steel drums, high speed remote controlled boats and jet-skis) **Systems being Trained/Tested:** Medium-caliber gun systems			
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety Aircraft safety Weapons firing safety	**Typical Locations**		
		Range Complexes/Testing Ranges: Gulf of Mexico Jacksonville Navy Cherry Point Virginia Capes	**Inshore Waters/Pierside:** None	
Stressors to Biological Resources and Habitats	**Acoustic:** Aircraft noise Vessel noise Weapons noise **Explosives:** De minimis explosives	**Physical Disturbance and Strike:** Aircraft and aerial target strike Vessel and in-water device strike Military expended materials **Ingestion:** Military expended materials – munitions Military expended materials – other than munitions	**Energy:** In-air electromagnetic energy **Entanglement:** None	
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediment and Water Quality:** Metals Other materials Chemicals other than explosives		
Stressors to Human Resources	None			
Military Expended Material	**Ingestible Material:** Medium-caliber projectiles (non-explosive), medium-caliber casings, surface target (stationary) fragments **Non-Ingestible Material:** Marine markers	**Military Recoverable Material**	Surface targets (mobile)	
Sonar and Other Transducer Bins	None			

Surface Warfare	
Gunnery Exercise Air-to-Surface Medium-Caliber	
In-Water Explosive Bins	None
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement Small-, medium-, and large-caliber non-explosive practice munitions **Explosive Stressors:** *(Section 5.3.3)* Explosive medium-caliber and large-caliber projectiles
Assumptions Used for Analysis	Most medium-caliber air-to-surface gunnery exercises will be with non-explosive training projectiles. High-explosive rounds will supplement when non-explosive training projectiles are not available. Fixed-wing projectile casings remain with aircraft and rotary-wing projectile casings are expended into the water. Two fixed-wing aircraft (400 rounds each) or one helicopter (400 rounds) per activity. One target used per exercise; expendable smoke floats (50 percent), stationary targets (45 percent), or remote-controlled targets (5 percent). De minimis explosives used during this activity are not quantitatively analyzed and, therefore, not included under munitions. Stressors to human resources were not analyzed for this activity since it occurs greater than 12 NM from shore.

A.2.9.4 Gunnery Exercise Air-to-Surface Small-Caliber

Surface Warfare				
Gunnery Exercise Air-to-Surface Small-Caliber				
Short Description	Helicopter and tiltrotor aircrews, use small-caliber guns to engage surface targets.	**Typical Duration**	1 hour	
Long Description	Helicopters and tiltrotor aircraft, fly a racetrack pattern around an at-sea target. Targets simulate enemy ships, boats, and floating/near-surface mines. Each gunner will engage the target with small-caliber weapons. Targets range from a smoke float, an empty steel drum, to high speed remote controlled boats and jet-skis.			
Typical Components	**Platforms:** Rotary-wing aircraft, tiltrotor aircraft **Targets:** Surface targets (e.g., MK 58 marine markers, empty steel drums, high speed remote controlled boats and jet-skis **Systems being Trained/Tested:** None			
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety Aircraft safety Weapons firing safety	**Typical Locations**		
		Range Complexes/Testing Ranges: Jacksonville Navy Cherry Point Virginia Capes	**Inshore Waters/Pierside:** None	
Stressors to Biological Resources and Habitats	**Acoustic:** Aircraft noise Vessel noise Weapons noise	**Physical Disturbance and Strike:** Aircraft and aerial target strike Vessel and in-water device strike Military expended material	**Energy:** In-air electromagnetic devices	
	Explosives: None	**Ingestion:** Military expended materials – munitions Military expended materials – other than munitions	**Entanglement:** None	
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** Metals Other materials		
Stressors to Human Resources	**Cultural Resources:** Physical disturbance and strike	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-air energy	
Military Expended Material	**Ingestible Material:** Small-caliber projectiles (non-explosive), small-caliber casings, surface target (stationary) fragments **Non-Ingestible Material:** Marine markers	**Military Recoverable Material**	Surface targets (mobile)	
Sonar and Other Transducer Bins	None			
In-Water Explosive Bins	None			

Surface Warfare	
Gunnery Exercise Air-to-Surface Small-Caliber	
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement Small-, medium-, and large-caliber non-explosive practice munitions
Assumptions Used for Analysis	Most exercises will occur proximate to naval stations where MH-60 helicopters are home based and target services are available.

A.2.9.5 Gunnery Exercise Surface-to-Surface Boat Medium-Caliber

<table>
<tr><th colspan="5">Surface Warfare</th></tr>
<tr><th colspan="5">Gunnery Exercise Surface-to-Surface Boat Medium-Caliber</th></tr>
<tr><td>Short Description</td><td colspan="2">Small boat crews fire medium-caliber guns at surface targets.</td><td colspan="2">Typical Duration
1 hour</td></tr>
<tr><td>Long Description</td><td colspan="4">Small boat crews fire medium-caliber guns at surface targets. Boat crews may use high or low speeds to approach and engage targets simulating other boats, floating mines, or nearshore land targets with medium-caliber (up to and including 40 mm) weapons. A commonly used target is an empty steel drum.

A number of different types of boats are used depending on the unit using the boat and their mission. Boats are most used to protect ships in harbors and high value units, such as: aircraft carriers, nuclear submarines, liquid natural gas tankers, etc., while entering and leaving ports, as well as to conduct riverine operations and various naval special warfare operations. The boats used by these units include small unit river craft, combat rubber raiding craft, rigid-hull inflatable boats, patrol craft, and many other versions of these types of boats. These boats use inboard or outboard diesel or gasoline engines with either propeller or water jet propulsion.</td></tr>
<tr><td>Typical Components</td><td colspan="4">Platforms: Small boats
Targets: Surface targets (e.g., empty steel drums)
Systems being Trained/Tested: Medium-caliber gun systems</td></tr>
<tr><td>Standard Operating Procedures
(Section 2.3.3)</td><td colspan="2">Vessel safety
Weapons firing safety</td><td colspan="2">Typical Locations
Range Complexes/Testing Ranges:
Gulf of Mexico
Jacksonville
Navy Cherry Point
Northeast
Virginia Capes
Inshore Waters/Pierside:
None</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td>Acoustic:
Vessel noise
Weapons noise

Explosives:
In-water explosives</td><td colspan="2">Physical Disturbance and Strike:
Vessel and in-water device strike
Military expended material

Ingestion:
Military expended material – munitions
Military expended material – other than munitions</td><td>Energy:
None

Entanglement:
None</td></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="2">Air Quality:
Criteria air pollutants</td><td colspan="2">Sediments and Water Quality:
Explosives and explosive byproducts
Metals
Chemicals other than explosives
Other materials</td></tr>
<tr><td>Stressors to Human Resources</td><td>Cultural Resources:
Physical disturbance and strike
Explosives</td><td>Socioeconomic Resources:
Accessibility
Airborne acoustics
Physical disturbance and strike</td><td colspan="2">Public Health and Safety:
Physical interactions
In-water energy</td></tr>
</table>

Surface Warfare			
Gunnery Exercise Surface-to-Surface Boat Medium-Caliber			
Military Expended Material	**Ingestible Material:** Medium-caliber projectile (explosive) fragments, medium-caliber casings, surface target (stationary) fragments **Non-Ingestible Material:** Surface targets (stationary)	**Military Recoverable Material**	Surface target (mobile)
Sonar and Other Transducer Bins	None		
In-Water Explosive Bins	E1		
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement Small-, medium-, and large-caliber non-explosive practice munitions	**Explosive Stressors:** *(Section 5.3.3)* Explosive medium-caliber and large-caliber projectiles	
Assumptions Used for Analysis	Approximately 500 rounds expended per exercise. One target used per exercise, typically a stationary target such as a 50-liter steel drum.		

A.2.9.6 Gunnery Exercise Surface-to-Surface Boat Small-Caliber

Surface Warfare				
Gunnery Exercise Surface-to-Surface Boat Small-Caliber				
Short Description	Small boat crews fire small-caliber guns at surface targets.	**Typical Duration**	1 hour	
Long Description	Small boat crews fire small-caliber guns at surface targets. Boat crews may use high or low speeds to approach and engage targets simulating other boats, swimmers, floating mines, or nearshore land targets with small-caliber (up to and including 0.50 caliber) weapons. A commonly used target is an empty steel drum. A number of different types of boats are used depending on the unit using the boat and their mission. Boats are most used to protect ships in harbors and high value units, such as: aircraft carriers, nuclear submarines, liquid natural gas tankers, etc., while entering and leaving ports, as well as to conduct riverine operations, and various naval special warfare operations. The boats used by these units include: small unit river craft, combat rubber raiding craft, rigid-hull inflatable boats, patrol craft, and many other versions of these types of boats. These boats use inboard or outboard, diesel or gasoline engines with either propeller or water jet propulsion.			
Typical Components	**Platforms:** Small boats **Targets:** Surface targets (e.g., empty steel drums) **Systems being Trained/Tested:** None			
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety Weapons firing safety	**Typical Locations**		
		Range Complexes/Testing Ranges: Gulf of Mexico Jacksonville Navy Cherry Point Northeast Virginia Capes	**Inshore Waters/Pierside:** None	
Stressors to Biological Resources and Habitats	**Acoustic:** Vessel noise Weapons noise **Explosives:** None	**Physical Disturbance and Strike:** Vessel and in-water device strike Military expended material **Ingestion:** Military expended materials – munitions Military expended materials – other than munitions	**Energy:** None **Entanglement:** None	
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** Metals	Other materials	
Stressors to Human Resources	**Cultural Resources:** Physical disturbance and strike	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strike	**Public Health and Safety:** Physical interactions	
Military Expended Material	**Ingestible Material:** Small-caliber (non-explosive) projectiles, small-caliber casings **Non-Ingestible Material:** Surface target (stationary)	**Military Recoverable Material**	Surface target (mobile)	

Surface Warfare	
Gunnery Exercise Surface-to-Surface Boat Small-Caliber	
Sonar and Other Transducer Bins	None
In-Water Explosive Bins	None
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement Small-, medium-, and large-caliber non-explosive practice munitions
Assumptions Used for Analysis	The majority of exercises will occur proximate to naval stations. Exercises will occur relatively nearshore due to short range of boats and safety concerns. Exercises mostly occur within 3 NM of the shoreline, but can occur further from shore.

A.2.9.7 Gunnery Exercise Surface-to-Surface Ship Large-Caliber

<table>
<tr><th colspan="4">Surface Warfare</th></tr>
<tr><th colspan="4">Gunnery Exercise Surface-to-Surface Ship – Large-Caliber</th></tr>
<tr><td>Short Description</td><td colspan="2">Surface ship crews fire large-caliber guns at surface targets.</td><td>Typical Duration
Up to 3 hours</td></tr>
<tr><td>Long Description</td><td colspan="3">This exercise involves ships' gun crews engaging surface targets at sea with their main battery large-caliber (typically 57 mm and 5-inch) guns. Targets include the QST-35 seaborne powered target, high speed maneuverable surface target, or a specially configured remote controlled watercraft. Some targets are expended during the exercise and are not recovered.

The exercise proceeds with the target boat approaching from about 10-NM distance. The target is tracked by radar and when within a predetermined range, it is engaged first with large-caliber "warning shots." As threats get closer all weapons may be used to disable the threat.

This exercise may involve a single firing ship, or be undertaken in the context of a coordinated larger exercise involving multiple ships, including a major training exercise.

Large-caliber guns will also be fired during weapon certification events and in conjunction with weapon maintenance.

During all exercises, either high-explosive or non-explosive rounds may be used. High-explosive rounds can either be fused for detonation on impact (with water surface or targets), or for proximity to the target (in air detonation).</td></tr>
<tr><td>Typical Components</td><td colspan="3">Platforms: Surface combatants
Targets: Surface targets (e.g., QST-35 seaborne powered targets, high speed maneuverable surface targets, or specially configured remote controlled water craft)
Systems being Trained/Tested: Large-caliber gun systems</td></tr>
<tr><td>Standard Operating Procedures
(Section 2.3.3)</td><td>Vessel safety
Weapons firing safety</td><td colspan="2">Typical Locations
Range Complexes/Testing Ranges:
Gulf of Mexico
Jacksonville
Navy Cherry Point
Virginia Capes
Other AFTT Areas
Inshore Waters/Pierside:
None</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td>Acoustic:
Vessel noise
Weapons noise

Explosives:
In-water explosives
In-air explosives</td><td>Physical Disturbance and Strike:
Vessel and in-water device strike
Military expended materials

Ingestion:
Military expended materials – munitions
Military expended materials – other than munitions</td><td>Energy:
In-air electromagnetic devices
In-water electromagnetic devices

Entanglement:
None</td></tr>
<tr><td>Stressors to Physical Resources</td><td>Air Quality:
Criteria air pollutants</td><td colspan="2">Sediments and Water Quality:
Explosives and explosive byproducts
Metals
Chemicals other than explosives
Other materials</td></tr>
<tr><td>Stressors to Human Resources</td><td colspan="3">None</td></tr>
</table>

Surface Warfare			
Gunnery Exercise Surface-to-Surface Ship – Large-Caliber			
Military Expended Material	**Ingestible Material:** Surface target (stationary)fragments, large-caliber projectile (explosive) fragments **Non-Ingestible Material:** Large-caliber projectiles (non-explosive), large-caliber casings, kinetic energy round, sabot- kinetic energy round	**Military Recoverable Material**	Surface target (mobile)
Sonar and Other Transducer Bins	None		
In-Water Explosive Bins	E3 E5		
Procedural Mitigation Measures	**Acoustic Stressors:** *(Section 5.3.2)* Weapons firing noise **Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement Small-, medium-, and large-caliber non-explosive practice munitions	**Explosive Stressors:** *(Section 5.3.3)* Explosive medium-caliber and large-caliber projectiles	
Assumptions Used for Analysis	For analytical purposes assume all high-explosive rounds are fused to detonate upon impact with the water surface or target. After impacting the water, the high-explosive rounds are expected to detonate within 33 ft. of the surface. Non-explosive rounds, and fragments from the high-explosive rounds will sink to the bottom of the ocean. Assume each non-explosive projectile will be up to 5 in. in diameter and 30 in. in length, and each firing will also expend a metallic sleeve used to convey the projectile down the gun barrel. Stressors to human resources were not analyzed for this activity since it occurs greater than 12 NM from shore.		

A.2.9.8 Gunnery Exercise Surface-to-Surface Ship Medium-Caliber

<table>
<tr><th colspan="5">Surface Warfare</th></tr>
<tr><th colspan="5">Gunnery Exercise Surface-to-Surface Ship Medium-Caliber</th></tr>
<tr><td>Short Description</td><td colspan="2">Surface ship crews fire medium-caliber guns at surface targets.</td><td>Typical Duration</td><td>2-3 hours</td></tr>
<tr><td>Long Description</td><td colspan="4">Surface ship crews fire medium-caliber guns at surface targets.

Ships use medium-caliber weapons to practice defensive marksmanship, typically against a stationary floating target (a 10 ft. diameter red balloon [Killer Tomato]) and high-speed mobile targets. Some targets are expended during the exercise and are not recovered.

Shipboard protection systems (Close-In Weapon System) utilizing medium-caliber projectiles would train against high speed mobile targets.</td></tr>
<tr><td>Typical Components</td><td colspan="4">Platforms: Patrol combatants, surface combatants
Targets: Surface targets (e.g., stationary floating targets, high-speed mobile targets)
Systems being Trained/Tested: Medium-caliber gun systems</td></tr>
<tr><td>Standard Operating Procedures
(Section 2.3.3)</td><td colspan="2">Vessel safety
Weapons firing safety</td><td colspan="2">Typical Locations
Range Complexes/Testing Ranges:
Virginia Capes
Navy Cherry Point
Jacksonville
Gulf of Mexico
Other AFTT Areas
Inshore Waters/Pierside:
None</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td>Acoustic:
Vessel noise
Weapons noise

Explosives:
In-water explosives</td><td colspan="2">Physical Disturbance and Strike:
Vessel and in-water device strike
Military expended material

Ingestion:
Military expended materials – munitions
Military expended materials – other than munitions</td><td>Energy:
In-air electromagnetic devices

Entanglement:
None</td></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="2">Air Quality:
Criteria air pollutants</td><td colspan="2">Sediments and Water Quality:
Explosives and explosive byproducts
Metals
Chemicals other than explosives
Other materials</td></tr>
<tr><td>Stressors to Human Resources</td><td>Cultural Resources:
Explosives
Physical disturbance and strike</td><td>Socioeconomic Resources:
Accessibility
Airborne acoustics
Physical disturbance and strike</td><td colspan="2">Public Health and Safety:
Physical interactions
In-air energy
In-water energy</td></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
Surface target (stationary) fragments, medium-caliber projectile (explosive) fragments, medium-caliber casings

Non-Ingestible Material:
None</td><td>Military Recoverable Material</td><td>Surface targets (mobile)</td></tr>
<tr><td>Sonar and Other Transducer Bins</td><td colspan="4">None</td></tr>
</table>

Surface Warfare		
Gunnery Exercise Surface-to-Surface Ship Medium-Caliber		
In-Water Explosive Bins	E1	
Procedural Mitigation Measures	**Acoustic Stressors:** *(Section 5.3.2)* Large-caliber weapons firing **Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement	**Explosive Stressors:** *(Section 5.3.3)* Explosive medium-caliber and large-caliber projectiles
Assumptions Used for Analysis	One target used per exercise. Approximately 50 percent of targets are "Killer Tomatoes" (usually recovered). Approximately 35 percent are high-speed maneuvering targets, which are recovered. Approximately 15 percent of targets are other stationary targets such as a steel drum that are not recovered. Number or rounds per exercise varies depending on munitions used.	

A.2.9.9 Gunnery Exercise Surface-to-Surface Ship Small-Caliber

<table>
<tr><td colspan="5">Surface Warfare</td></tr>
<tr><td colspan="5">Gunnery Exercise Surface-to-Surface Ship Small-Caliber</td></tr>
<tr><td>Short Description</td><td colspan="2">Surface ship crews fire small-caliber guns at surface targets.</td><td>Typical Duration</td><td>2-3 hours</td></tr>
<tr><td>Long Description</td><td colspan="4">Surface ship crews fire small-caliber guns at surface targets.

Ships use small-caliber weapons to practice defensive marksmanship, typically against stationary floating targets. The target may be a 10 ft. diameter red balloon (Killer Tomato, see Figure A.2-4), a 50 gallon steel drum, or other available target, such as a cardboard box. Some targets are expended during the exercise and are not recovered.

Ship crew qualifications conducted at sea employ stationary targets on deck. Small-caliber projectiles fired during these exercises will be expended in the water.

Shipboard protection systems utilizing small-caliber projectiles will train against high speed mobile targets.</td></tr>
<tr><td>Typical Components</td><td colspan="4">Platforms: Navy ships
Targets: Surface targets (e.g., Killer Tomatoes, 50-gallon steel drums, cardboard boxes)
Systems being Trained/Tested: Small-caliber gun systems</td></tr>
<tr><td>Standard Operating Procedures (Section 2.3.3)</td><td colspan="2">Vessel safety
Weapons firing safety</td><td colspan="2">Typical Locations
Range Complexes/Testing Ranges:
Gulf of Mexico
Jacksonville
Navy Cherry Point
Virginia Capes
Other AFTT Areas
Inshore Waters/Pierside:
None</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td>Acoustic:
Vessel noise
Weapons noise

Explosives:
None</td><td colspan="2">Physical Disturbance and Strike:
Vessel and in-water device strike
Military expended materials

Ingestion:
Military expended materials – munitions
Military expended materials – other than munitions</td><td>Energy:
In-air electromagnetic devices
In-water electromagnetic devices

Entanglement:
None</td></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="2">Air Quality:
Criteria air pollutants</td><td colspan="2">Sediments and Water Quality:
Metals Other materials</td></tr>
<tr><td>Stressors to Human Resources</td><td>Cultural Resources:
Physical disturbance and strike</td><td>Socioeconomic Resources:
Accessibility
Airborne acoustics
Physical disturbance and strike</td><td colspan="2">Public Health and Safety:
Physical interactions
In-air energy</td></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
Small-caliber projectiles (non-explosive), small-caliber casings, surface target (stationary) fragments

Non-Ingestible Material:
None</td><td>Military Recoverable Material</td><td>Surface target (mobile)</td></tr>
</table>

Surface Warfare	
Gunnery Exercise Surface-to-Surface Ship Small-Caliber	
Sonar and Other Transducer Bins	None
In-Water Explosive Bins	None
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement Small-, medium-, and large-caliber non-explosive practice munitions
Assumptions Used for Analysis	Small-caliber gun rounds per exercise: 1,000 to 3,000 non-explosive practice munitions. The majority of the activities will occur proximate to Navy homeports in Jacksonville, Florida and Norfolk, Virginia.

Figure A.2-4: "Killer Tomato" Stationary Floating Target

Figure A.2-5: QST-35 Seaborne Powered Target (on Left) and High-Speed Maneuvering Surface Target (on Right)

A.2.9.10 Integrated Live Fire

<table>
<tr><td colspan="5">Surface Warfare</td></tr>
<tr><td colspan="5">Integrated Live Fire</td></tr>
<tr><td>Short Description</td><td colspan="2">Naval forces defend against a swarm of surface threats (ships or small boats) with bombs, missiles, rockets, and small-, medium- and large-caliber guns.</td><td colspan="2">Typical Duration
6-8 hours</td></tr>
<tr><td>Long Description</td><td colspan="4">Naval forces use coordinated tactics and deliver high-explosive ordnance against a swarm of surface maritime threats. Events within this activity include: exercises for strike fighters typically involve a flight of two to four aircraft delivering unguided or guided munitions that may be either high-explosive or non-explosive bombs against surface targets. The bombs may be surface detonating or designed to detonate as an air-burst bomb; strike fighter aircraft, helicopter aircrews, and ship crews fire high-explosive precision-guided missiles against surface targets. If explosive, helicopter launched missiles (including rockets) typically detonate at or just below the water's surface; fighter and helicopter aircrew engage surface targets with small- and medium-caliber guns. Ships' gun crews engage surface targets with large-caliber (typically 57 mm and 5-inch) guns; this exercise may involve a single firing ship or be undertaken in the context of a coordinated larger exercise involving multiple ships, including a major training exercise.</td></tr>
<tr><td>Typical Components</td><td colspan="4">Platforms: Fixed-wing aircraft, rotary-wing aircraft, surface combatants, support craft
Targets: Surface targets (e.g., remote controlled surface targets, towed surface targets)
Systems being Trained/Tested: In-air low energy laser, medium- and large-caliber gun systems, aircraft platforms</td></tr>
<tr><td>Standard Operating Procedures
(Section 2.3.3)</td><td>Vessel safety
Aircraft safety
Weapons firing safety</td><td colspan="3">Typical Locations
Range Complexes/Testing Ranges:
Jacksonville
Virginia Capes
Inshore Waters/Pierside:
None</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td>Acoustic:
Aircraft noise
Vessel noise
Weapons noise

Explosives:
In-water explosives
In-air explosives</td><td>Physical Disturbance and Strike:
Aircraft and aerial target strike
Vessel and in-water device strike
Military expended material

Ingestion:
Military expended materials – munitions
Military expended materials – other than munitions</td><td>Energy:
In-air electromagnetic devices

Entanglement:
None</td><td></td></tr>
<tr><td>Stressors to Physical Resources</td><td>Air Quality:
Criteria air pollutants</td><td colspan="3">Sediments and Water Quality:
Explosives and explosive byproducts
Metals
Chemicals other than explosives
Other materials</td></tr>
<tr><td>Stressors to Human Resources</td><td colspan="4">None</td></tr>
</table>

Surface Warfare			
Integrated Live Fire			
Military Expended Material	**Ingestible Material:** Bomb (explosive) fragments, missile (explosive) fragments, medium-caliber projectiles (non-explosive), medium-caliber and large-caliber projectile (explosive) fragments, medium-caliber casings, rocket (explosive) fragments, surface target (stationary and mobile) fragments **Non-Ingestible Material:** Bombs (non-explosive), , large-caliber casings	**Military Recoverable Material**	Surface targets (mobile)
Sonar and Other Transducer Bins	None		
In-Water Explosive Bins	E1 E3 E6 E10		
Procedural Mitigation Measures	**Acoustic Stressors:** *(Section 5.3.2)* Weapons firing **Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement Small-, medium-, and large-caliber non-explosive practice munitions Non-explosive missiles and rockets Non-explosive bombs	**Explosive Stressors:** *(Section 5.3.3)* Explosive medium-caliber and large-caliber projectiles Explosive missiles and rockets Explosive bombs	
Assumptions Used for Analysis	Stressors to human resources were not analyzed for this activity since it occurs greater than 12 NM from shore.		

A.2.9.11 Laser Targeting – Aircraft

<table>
<tr><th colspan="6">Surface Warfare</th></tr>
<tr><th colspan="6">Laser Targeting – Aircraft</th></tr>
<tr><td>Short Description</td><td colspan="3">Fixed-wing and helicopter aircrews illuminate enemy targets with lasers.</td><td>Typical Duration
1-2 hours</td><td></td></tr>
<tr><td>Long Description</td><td colspan="5">Fixed-wing and helicopter aircrew illuminate enemy targets with lasers for engagement by aircraft with laser guided bombs or missiles. This exercise may be conducted alone or in conjunction with other exercises utilizing precision guided munitions, such as surface missiles and guided rockets. Exercises where weapons are fired are addressed in the appropriate activity (e.g., air-to-surface missile exercise). Lower powered lasers may also be used as non-lethal deterrents during maritime security operations (force protection).</td></tr>
<tr><td>Typical Components</td><td colspan="5">Platforms: Fixed-wing aircraft, rotary-wing aircraft, unmanned aerial systems
Targets: Surface targets
Systems being Trained/Tested: Aircraft platforms</td></tr>
<tr><td>Standard Operating Procedures (Section 2.3.3)</td><td colspan="2">Aircraft safety
Unmanned aerial, surface, and subsurface vehicle safety</td><td colspan="3">Typical Locations
Range Complexes/Testing Ranges:
Jacksonville
Virginia Capes
Inshore Waters/Pierside:
None</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td colspan="2">Acoustic:
Aircraft noise
Vessel noise

Explosives:
None</td><td colspan="2">Physical Disturbance and Strike:
Aircraft and aerial target strike
Vessel and in-water device

Ingestion:
Military expended materials – other than munitions</td><td>Energy:
In-air electromagnetic devices
In-water electromagnetic devices

Entanglement:
None</td></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="3">Air Quality:
Criteria air pollutants</td><td colspan="2">Sediments and Water Quality:
Metals
Other materials</td></tr>
<tr><td>Stressors to Human Resources</td><td colspan="5">None</td></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
None

Non-Ingestible Material:
None</td><td>Military Recoverable Material</td><td colspan="2">Surface target (mobile)</td></tr>
<tr><td>Sonar and Other Transducer Bins</td><td colspan="5">None</td></tr>
<tr><td>In-Water Explosive Bins</td><td colspan="5">None</td></tr>
<tr><td>Procedural Mitigation Measures</td><td colspan="5">Physical Disturbance and Strike: (Section 5.3.4)
Vessel movement</td></tr>
<tr><td>Assumptions Used for Analysis</td><td colspan="5">Laser targeting for missile/rocket guidance will occur in areas where these exercises also occur. Stressors to human resources were not analyzed for this activity since it occurs greater than 12 NM from shore.</td></tr>
</table>

A.2.9.12 Laser Targeting – Ship

<table>
<tr><th colspan="6">Surface Warfare</th></tr>
<tr><th colspan="6">Laser Targeting – Ship</th></tr>
<tr><td>Short Description</td><td colspan="3">Surface ship crews illuminate air and surface targets with high-energy laser systems.</td><td>Typical Duration
1-2 hours</td><td></td></tr>
<tr><td>Long Description</td><td colspan="5">Ship crews employ high-power energy laser systems that are used to create critical failures in airborne and surface targets. System directs a directed energy beam that can penetrate thin layers of metal at short distances (less than 1 nautical mile) that can render air and surface targets inoperative. Laser systems can also be used in a low power setting as non-lethal deterrent during maritime security operations (force protection). The low power capability would not be used against manned platforms during training.</td></tr>
<tr><td>Typical Components</td><td colspan="5">Platforms: Aircraft carriers, amphibious warfare ships, combat logistics, specialized high-speed vehicles, support craft, surface combatants
Targets: Air targets, surface targets
Systems being Trained/Tested: Laser weapon system</td></tr>
<tr><td>Standard Operating Procedures (Section 2.3.3)</td><td colspan="2">High-powered laser safety
Unmanned aerial, surface, and subsurface vehicle safety</td><td colspan="3">Typical Locations
Range Complexes/Testing Ranges:
Jacksonville
Virginia Capes
Inshore Waters/Pierside:
None</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td colspan="2">Acoustic:
Aircraft noise
Vessel noise

Explosives:
None</td><td colspan="2">Physical Disturbance and Strike:
Military expended material
Vessel and in-water device strike
Aircraft and aerial target strike

Ingestion:
Military expended materials – other than munitions</td><td>Energy:
High-energy lasers
In-air electromagnetic devices

Entanglement:
None</td></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="3">Air Quality:
Criteria air pollutants</td><td colspan="2">Sediments and Water Quality:
None</td></tr>
<tr><td>Stressors to Human Resources</td><td colspan="5">None</td></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
Air target (drone) fragments

Non-Ingestible Material:
None</td><td>Military Recoverable Material</td><td colspan="2">Surface target (mobile)</td></tr>
<tr><td>Sonar and Other Transducer Bins</td><td colspan="5">None</td></tr>
<tr><td>In-Water Explosive Bins</td><td colspan="5">None</td></tr>
<tr><td>Procedural Mitigation Measures</td><td colspan="5">Physical Disturbance and Strike: (Section 5.3.4)
Vessel movement</td></tr>
<tr><td>Assumptions Used for Analysis</td><td colspan="5">Laser targeting for missile/rocket guidance will occur in areas where these exercises also occur.
Stressors to human resources were not analyzed for this activity since it occurs greater than 12 NM from shore.</td></tr>
</table>

A.2.9.13 Maritime Security Operations

<table>
<tr><th colspan="4">Surface Warfare</th></tr>
<tr><th colspan="4">Maritime Security Operations</th></tr>
<tr><td>Short Description</td><td colspan="2">Helicopter, surface ship, and small boat crews conduct a suite of maritime security operations at sea, to include visit, board, search and seizure; maritime interdiction operations; force protection; and anti-piracy operations.</td><td>Typical Duration
Up to 3 hours</td></tr>
<tr><td>Long Description</td><td colspan="3">Helicopter and surface ship crews conduct a suite of maritime security operations (e.g., visit, board, search and seizure, maritime interdiction operations, force protection, and anti-piracy operations). These activities involve training of boarding parties delivered by helicopters and surface ships to surface vessels for the purpose of simulating vessel search and seizure operations. Various training scenarios are employed and may include small arms with non-explosive blanks and surveillance or reconnaissance unmanned surface and aerial vehicles. The entire exercise may last two to three hours.

Vessel Visit, Board, Search, and Seizure: Military personnel from ships and aircraft board suspect vessels, potentially under hostile conditions.

Maritime Interdiction Operations: Ships and aircraft train in pursuing, intercepting, and ultimately detaining suspect vessels.

Maritime Infrastructure Protection and Harbor Defense: Naval personnel train to defend oil platforms, similar at sea structures, harbors, piers, and other infrastructure.

Warning Shot/Disabling Fire: Naval personnel train in the use of weapons to force fleeing or threatening small boats (typically operating at high speeds) to come to a stop.

Ship Force Protection: Ship crews train in tracking multiple approaching, circling small craft, assessing threat potential, and communicating amongst crewmates and other vessels to ensure ships are protected against attack.

Anti-Piracy Training: Naval personnel train in deterring and interrupting piracy activity. Training includes large vessels (pirate “mother ships”), and multiple small, maneuverable, and fast craft.</td></tr>
<tr><td>Typical Components</td><td colspan="3">Platforms: Amphibious warfare ships, rotary-wing aircraft, surface combatants, small boats
Targets: Surface targets
Systems being Trained/Tested: None</td></tr>
<tr><td>Standard Operating Procedures
(Section 2.3.3)</td><td>Vessel safety
Aircraft safety</td><td colspan="2">Typical Locations
Range Complexes/Testing Ranges:
Gulf of Mexico
Jacksonville
Navy Cherry Point
Northeast
Virginia Capes

Inshore Waters/Pierside:
James River and tributaries
Lower Chesapeake Bay
Naval Station Norfolk, Virginia
Naval Station Mayport, Florida
Narragansett Bay, Rhode Island
Port Canaveral, Florida</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td>Acoustic:
Aircraft noise
Vessel noise
Weapons noise

Explosives:
None</td><td>Physical Disturbance and Strike:
Aircraft and aerial target strike
Vessel and in-water device strike
Military expended material

Ingestion:
Military expended materials – munitions
Military expended materials – other than munitions</td><td>Energy:
In-air electromagnetic devices
In-water electromagnetic devices

Entanglement:
None</td></tr>
</table>

<table>
<tr><th colspan="5">Surface Warfare</th></tr>
<tr><th colspan="5">Maritime Security Operations</th></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="4">Air Quality:
Criteria air pollutants

Sediments and Water Quality:
Metals Other materials</td></tr>
<tr><td>Stressors to Human Resources</td><td>Cultural Resources:
Physical disturbance and strike</td><td colspan="2">Socioeconomic Resources:
Accessibility
Airborne acoustics
Physical disturbance and strike</td><td>Public Health and Safety:
Physical interactions
In-water energy</td></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
Small caliber projectile (casing only), compression pad or plastic piston, endcap – chaff and flare, flare o-ring

Non-Ingestible Material:
Marine marker</td><td>Military Recoverable Material</td><td>None</td></tr>
<tr><td>Sonar and Other Transducer Bins</td><td colspan="4">None</td></tr>
<tr><td>In-Water Explosive Bins</td><td colspan="4">None</td></tr>
<tr><td>Procedural Mitigation Measures</td><td colspan="4">Physical Disturbance and Strike: (Section 5.3.4)
Vessel movement</td></tr>
<tr><td>Assumptions Used for Analysis</td><td colspan="4">Maritime Security Operations is a broad term used to describe activities intended to train naval forces in the skills necessary to protect naval vessels from small boat attack, counter piracy and drug operations (maritime interdiction operations and visit, board, search, and seizure), and protect key infrastructure (e.g. oil platforms). Maritime security operations need to remain broad as naval forces need to be able to tailor training exercises to respond to emergent threats. Maritime Security Operations exercises typically do not involve live fire of weapons. All Maritime Security Operations exercises involve vessel movement, sometimes at high rates of speed (naval vessels maneuvering to overtake suspect vessel and/or small boats [targets] closing in and maneuvering around naval vessels), and some event involve helicopters and boarding parties. Maritime Security Operations training exercises are conducted proximate to naval homeports in Norfolk, Virginia and Jacksonville, Florida including during times of transit into and out of port, as well as during major training exercises.
Firing of weapons during offshore exercises is accounted for in gunnery exercises, surface-to-surface activities. Inshore exercises include firing small caliber blank ammunition.
Other components associated with chaff and flare use are not expected to float and would sink to the seafloor.</td></tr>
</table>

A.2.9.14 Missile Exercise Air-to-Surface

Surface Warfare				
Missile Exercise Air-to-Surface				
Short Description	Fixed-wing and helicopter aircrews fire air-to-surface missiles at surface targets.	**Typical Duration**	1 hour	
Long Description	Fighter, maritime patrol aircraft, and helicopter aircrews fire precision-guided missiles against surface targets. Aircraft involved may be unmanned. Fixed-wing aircraft (fighters or maritime patrol aircraft) approach an at-sea surface target from high altitude, and launch high-explosive precision guided missiles. Helicopters designate at-sea surface targets with a laser or optics for a precision guided high-explosive or non-explosive practice munitions missile. Helicopter launched missiles typically pass through the target's "sail," and, if explosive, detonate at or just below, the water's surface.			
Typical Components	**Platforms:** Fixed-wing aircraft, rotary-wing aircraft **Targets:** Surface targets **Systems being Trained/Tested:** Air-to-surface missile systems			
Standard Operating Procedures *(Section 2.3.3)*	Aircraft safety Weapons firing safety Vessel safety Unmanned aerial, surface, and subsurface vehicle safety	**Typical Locations** **Range Complexes/Testing Ranges:** Jacksonville Navy Cherry Point Virginia Capes	**Inshore Waters/Pierside:** None	
Stressors to Biological Resources and Habitats	**Acoustic:** Aircraft noise Weapons noise Vessel noise **Explosives:** In-water explosives	**Physical Disturbance and Strike:** Aircraft and aerial target strike Military expended material Vessel and in-water device strike **Ingestion:** Military expended materials – munitions Military expended materials – other than munitions	**Energy:** In-air electromagnetic devices **Entanglement:** None	
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** Explosives and explosive byproducts Chemicals other than explosives Metals Other materials		
Stressors to Human Resources	None			
Military Expended Material	**Ingestible Material:** Missile (explosive) fragments, surface target (stationary) fragments **Non-Ingestible Material:** None	**Military Recoverable Material**	Surface targets (mobile)	
Sonar and Other Transducer Bins	None			

Surface Warfare				
Missile Exercise Air-to-Surface				
In-Water Explosive Bins	E6	E8	E10	
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Non-explosive missiles and rockets Vessel movement		**Explosive Stressors:** *(Section 5.3.3)* Explosive missiles and rockets	
Assumptions Used for Analysis	Assume one missile and one target are used per exercise. While missiles could explode above the water's surface after contacting targets, analysis assumes that all warheads explode at or just below the water's surface. Stressors to human resources were not analyzed for this activity since it occurs greater than 12 NM from shore.			

A.2.9.15 Missile Exercise Air-to-Surface – Rocket

Surface Warfare			
Missile Exercise Air-to-Surface—Rocket			
Short Description	Helicopter aircrews fire both precision-guided and unguided rockets at surface targets.	**Typical Duration**	1 hour
Long Description	Helicopters designate an at-sea surface target with a laser or optics for precision-guided high explosive or non-explosive practice munitions rockets.		
Typical Components	**Platforms:** Rotary-wing aircraft, unmanned aerial systems **Targets:** Surface targets **Systems being Trained/Tested:** Air-to-surface missile systems		
Standard Operating Procedures *(Section 2.3.3)*	Aircraft safety Weapons firing safety Unmanned aerial, surface, and subsurface vehicle safety Towed in-water device safety	**Typical Locations** **Range Complexes/Testing Ranges:** Gulf of Mexico Jacksonville Navy Cherry Point Virginia Capes	**Inshore Waters/Pierside:** None
Stressors to Biological Resources and Habitats	**Acoustic:** Aircraft noise Weapons noise Vessel noise **Explosives:** In-water explosives In-air explosives	**Physical Disturbance and Strike:** Aircraft and aerial target strike Vessel and in-water device Military expended material **Ingestion:** Military expended materials – munitions Military expended materials – other than munitions	**Energy:** In-air electromagnetic devices **Entanglement:** None
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** Explosives and explosive byproducts Chemicals other than explosives Metals Other materials	
Stressors to Human Resources	None		
Military Expended Material	**Ingestible Material:** Rocket (explosive) fragments, surface target (stationary) fragments, flechettes **Non-Ingestible Material:** Rockets (non-explosive), rocket (non-explosive): flechette	**Military Recoverable Material**	Surface target (mobile)
Sonar and Other Transducer Bins	None		
In-Water Explosive Bins	E3		

Surface Warfare		
Missile Exercise Air-to-Surface—Rocket		
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Non-explosive missiles and rockets Vessel movement	**Explosive Stressors:** *(Section 5.3.3)* Explosive missiles and rockets
Assumptions Used for Analysis	Assume all explosive rockets detonate in the water. Rockets may be used in conjunction with force protection events. Stressors to human resources were not analyzed for this activity since it occurs greater than 12 NM from shore. Assume 5 percent of nonexplosive practice munitions in Virginia Capes Range Complex and Jacksonville Range Complex are flechette rockets.	

A.2.9.16 Missile Exercise Surface-to-Surface

<table>
<tr><td colspan="5">Surface Warfare</td></tr>
<tr><td colspan="5">Missile Exercise Surface-to-Surface</td></tr>
<tr><td>Short Description</td><td colspan="2">Surface ship crews defend against surface threats (ships or small boats) and engage them with missiles.</td><td colspan="2">Typical Duration
2-5 hours</td></tr>
<tr><td>Long Description</td><td colspan="4">Surface ships launch missiles at surface maritime targets with the goal of destroying or disabling enemy ships or boats.
After detecting and confirming a surface threat, the ship will fire a precision guided surface missile.

Events with destroyers and cruisers will involve long range (over the horizon) Harpoon (or similar) surface missiles. While past Harpoon exercises occurred during sinking exercises, the requirement exists for non-sinking exercise events to certify ship crews. If a sinking exercise target is unavailable, a towed sled would likely be used.

Events with littoral combat and patrol combatant ships will involve shorter range surface missiles, such as Hellfire and Griffin. Events with littoral combat and patrol combatant ships would be to certify ship's crew to defend against "close-in" (less than 10 miles) surface threats.
These exercises are live fire, meaning that a missile is fired down range. Surface missiles could be equipped with either high-explosive or non-explosive warheads.</td></tr>
<tr><td>Typical Components</td><td colspan="4">Platforms: Surface combatants
Targets: Surface targets
Systems being Trained/Tested: Surface-to-surface missile systems</td></tr>
<tr><td>Standard Operating Procedures (Section 2.3.3)</td><td colspan="2">Vessel safety
Weapons firing safety</td><td colspan="2">Typical Locations
Range Complexes/Testing Ranges:
Jacksonville
Virginia Capes
Inshore Waters/Pierside:
None</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td>Acoustic:
Vessel noise
Weapons noise

Explosives:
In-water explosives</td><td>Physical Disturbance and Strike:
Vessel and in-water device strike
Military expended materials

Ingestion:
Military expended materials – munitions
Military expended materials – other than munitions</td><td colspan="2">Energy:
In-air electromagnetic devices

Entanglement:
None</td></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="2">Air Quality:
Criteria air pollutants</td><td colspan="2">Sediments and Water Quality:
Explosives and explosive byproducts
Chemicals other than explosives
Metals Other materials</td></tr>
<tr><td>Stressors to Human Resources</td><td colspan="4">None</td></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
Missile (explosive) fragments, surface target (stationary) fragments

Non-Ingestible Material:
None</td><td>Military Recoverable Material</td><td>Surface target (mobile)</td></tr>
</table>

Surface Warfare	
Missile Exercise Surface-to-Surface	
Sonar and Other Transducer Bins	None
In-Water Explosive Bins	E6 E10
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement
Assumptions Used for Analysis	Assume one missile and one target used per exercise. While missile could explode above the water's surface after contacting target, analysis assumes all warheads explode at or just below the surface. Stressors to human resources were not analyzed for this activity since it occurs greater than 12 NM from shore.

A.2.9.17 Sinking Exercise

<table>
<tr><th colspan="4">Surface Warfare</th></tr>
<tr><th colspan="4">Sinking Exercise</th></tr>
<tr><td>Short Description</td><td colspan="2">Aircraft, ship, and submarine crews deliberately sink a seaborne target, usually a decommissioned ship made environmentally safe for sinking according to U.S. Environmental Protection Agency standards, with a variety of ordnance.</td><td>Typical Duration
4-8 hours, possibly over 1-2 days</td></tr>
<tr><td>Long Description</td><td colspan="3">Ship personnel and aircrew deliver high-explosive ordnance on a seaborne target, (large deactivated vessel), which is deliberately sunk using multiple weapon systems. A sinking exercise is typically conducted by aircraft, surface vessels, and submarines to train in live ordnance delivery on a full-size ship target.

The target is typically a decommissioned ship made environmentally safe for sinking according to U.S. Environmental Protection Agency standards. The location is greater than 50 nautical miles from shore and in water depths greater than 6,000 feet.

Ship, aircraft, and submarine crews attack with coordinated tactics and deliver a variety of inert and high-explosive ordnance. Typically, the exercise lasts for 4 to 8 hours and possibly over 1 to 2 days; however, it is unpredictable and ultimately ends when the target ship sinks.</td></tr>
<tr><td>Typical Components</td><td colspan="3">Platforms: Fixed-wing aircraft, submarines, surface combatants
Targets: Ship hulks
Systems being Trained/Tested: Large-caliber gun systems, missile systems, bombs, torpedoes, small-caliber gun systems</td></tr>
<tr><td>Standard Operating Procedures (Section 2.3.3)</td><td>Vessel safety
Aircraft safety
Weapons firing safety</td><td colspan="2">Typical Locations
Range Complexes/Testing Ranges:
Virginia Capes sinking exercise box
Inshore Waters/Pierside:
None</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td>Acoustic:
Sonar and other transducers
Aircraft noise
Vessel noise
Weapons noise

Explosives:
In-water explosives</td><td>Physical Disturbance and Strike:
Aircraft and aerial target strike
Vessel and in-water device strike
Military expended material

Ingestion:
Military expended materials – munitions
Military expended materials – other than munitions</td><td>Energy:
In-air electromagnetic devices

Entanglement:
Wires and cables</td></tr>
<tr><td>Stressors to Physical Resources</td><td>Air Quality:
Criteria air pollutants</td><td colspan="2">Sediments and Water Quality:
Explosives and explosive byproducts
Chemicals other than explosives
Metals Other materials</td></tr>
<tr><td>Stressors to Human Resources</td><td colspan="3">None</td></tr>
</table>

<table>
<tr><th colspan="4">Surface Warfare</th></tr>
<tr><th colspan="4">Sinking Exercise</th></tr>
<tr><td>Military Expended Material</td><td>Ingestible Material:
Bomb (explosive) fragments, missile (explosive) fragments, large-caliber projectiles (explosive) fragments, heavyweight torpedo (explosive) fragments, heavyweight torpedo accessories

Non-Ingestible Material:
large-caliber casings, guidance wires; ship hulks</td><td>Military Recoverable Material</td><td>None</td></tr>
<tr><td>Sonar and Other Transducer Bins</td><td colspan="3">Torpedoes:
TORP2</td></tr>
<tr><td>In-Water Explosive Bins</td><td colspan="3">E5 E8 E9 E10 E11</td></tr>
<tr><td>Procedural Mitigation Measures</td><td colspan="3">Acoustic Stressors: (Section 5.3.2)
Weapons firing noise

Physical Disturbance and Strike: (Section 5.3.4)
Vessel movement
Small-, medium-, and large-caliber non-explosive practice munitions
Non-explosive missiles and rockets
Non-explosive bombs

Explosive Stressors: (Section 5.3.3)
Explosive medium-caliber and large-caliber projectiles
Explosive missiles and rockets
Explosive bombs
Sinking exercises
Explosives torpedoes</td></tr>
<tr><td>Assumptions Used for Analysis</td><td colspan="3">Exercises occur greater than 50 NM from shore and in water depths greater than 6,000 ft. during daylight hours only. Due to the distance from shore, stressors to human resources were not analyzed for this activity.
The participants and assets typically include:
• 1 full-size target ship hulk
• 1-5 CG, DDG, or LCS ships
• 1-10 F/A-18, or maritime patrol aircraft
• 1 or 2 MH-60 helicopters
• 1 E-2 aircraft for Command and Control
• 1 submarine
• 1-3 range clearance aircraft
• 1-2 Harpoon surface-to-surface or air-to-surface missiles
• 2-4 Maverick or Hellfire air-to-surface missiles
• 2-12 MK-80 series general purpose bombs
• 200 rounds large-caliber projectiles
• 1-2 MK-48 heavyweight submarine-launched torpedo</td></tr>
</table>

A.2.10 OTHER TRAINING EXERCISES

A.2.10.1 Elevated Causeway System

Other Training Exercises				
Elevated Causeway System				
Short Description	A temporary pier is constructed off the beach. Supporting pilings are driven into the sand and then later removed.	**Typical Duration**	Up to 20 days for construction and up to 10 days for removal (the pier can be in place for up to 60 days)	
Long Description	An Elevated Causeway System (a temporary pier) is constructed off the beach. The pier is built for offloading materials and equipment, and personnel from ships. Support pilings are driven into the sand with an impact hammer. Causeway platforms are then hoisted and secured onto the piles with hydraulic jacks and cranes. The pier is assembled by joining standard causeway sections together and can be assembled in 20 days. The pier, including associated piles, is removed at the conclusion of training. The Elevated Causeway System can be constructed as an individual training event without the support of ships, or during a Joint Logistics Over-the-Shore training event, which can last up to 30 days.			
Typical Components	**Platforms:** Combat logistics ships, fleet support ships, support craft **Targets:** None **Systems being Trained/Tested:** Elevated Causeway System, including impact hammer and vibratory extractor			
Standard Operating Procedures *(Section 2.3.3)*	Pile driving safety	**Typical Locations**		
		Range Complexes/Testing Ranges: Navy Cherry Point	**Inshore Waters/Pierside:** Lower Chesapeake Bay	
Stressors to Biological Resources and Habitats	**Acoustic:** Vessel noise Pile driving **Explosives:** None	**Physical Disturbance and Strike:** Vessel and in-water device strike Pile driving **Ingestion:** None	**Energy:** None **Entanglement:** None	
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** None		
Stressors to Human Resources	**Cultural Resources:** Physical disturbance and strike	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-water energy In-air energy	
Military Expended Material	**Ingestible Material:** None **Non-Ingestible Material:** None	**Military Recoverable Material**	None	
Sonar and Other Transducer Bins	Pile driving and removal			

Other Training Exercises		
Elevated Causeway System		
In-Water Explosive Bins	None	
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement	**Acoustic Stressors:** *(Section 5.3.2)* Pile driving
Assumptions Used for Analysis	None	

A.2.10.2 Precision Anchoring

Other Training Exercises			
Precision Anchoring			
Short Description	Releasing of anchors in designated locations.	**Typical Duration**	Up to 1 hour
Long Description	Ship crews choose the best available anchoring sites. The ship uses all means available to determine its position when anchor is dropped to demonstrate calculating and plotting the anchor's position within 100 yards of center of planned anchorage.		
Typical Components	**Platforms:** Navy ships **Targets:** None **Systems being Trained/Tested:** None		
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety	**Typical Locations**	
		Range Complexes/Testing Ranges: Gulf of Mexico Jacksonville Virginia Capes	**Inshore Waters/Pierside:** Naval Station Mayport, Florida James River and tributaries
Stressors to Biological Resources and Habitats	**Acoustic:** Vessel noise **Explosives:** None	**Physical Disturbance and Strike:** Vessel and in-water device strike Seafloor devices **Ingestion:** None	**Energy:** In-air electromagnetic devices **Entanglement:** None
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** None	
Stressors to Human Resources	**Cultural Resources:** Physical disturbance and strike	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-air energy
Military Expended Material	**Ingestible Material:** None **Non-Ingestible Material:** None	**Military Recoverable Material**	None
Sonar and Other Transducer Bins	None		
In-Water Explosive Bins	None		
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement		
Assumptions Used for Analysis	None		

A.2.10.3 Search and Rescue

<table>
<tr><th colspan="6">Other Training Exercises</th></tr>
<tr><th colspan="6">Search and Rescue</th></tr>
<tr><td>Short Description</td><td colspan="3">Helicopter and ship crews rescue military personnel at sea.</td><td>Typical Duration</td><td>Up to 2 hours</td></tr>
<tr><td>Long Description</td><td colspan="5">Helicopter, ship, and submarine crews practice the skills required to recover personnel lost at sea. Helicopters locate survivors and deploy rescue swimmer and rescue basket. Survivors are winched up to the hovering helicopter. Surface ships would conduct man overboard drills and deploy a dummy figure in the water. Ship crews would launch a small boat, direct the recovery of the dummy, and recover the small boat. Submarine crews would maneuver submarine to effect recovery of personnel.</td></tr>
<tr><td>Typical Components</td><td colspan="5">Platforms: Rotary-wing aircraft, surface combatants, aircraft carriers, amphibious warfare ships, submarines, small boats
Targets: None
Systems being Trained/Tested: None</td></tr>
<tr><td>Standard Operating Procedures (Section 2.3.3)</td><td colspan="2">Vessel safety
Aircraft safety</td><td colspan="3">Typical Locations
Range Complexes/Testing Ranges:
Jacksonville
Virginia Capes
Inshore Waters/Pierside:
Mayport , Florida
Kings Bay, Georgia
James River and tributaries</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td colspan="2">Acoustic:
Vessel noise
Aircraft noise

Explosives:
None</td><td colspan="2">Physical Disturbance and Strike:
Vessel and in-water device strike
Aircraft and aerial target strike
Military expended material

Ingestion:
None</td><td>Energy:
In-air electromagnetic devices

Entanglement:
None</td></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="2">Air Quality:
Criteria air pollutants</td><td colspan="3">Sediments and Water Quality:
Metals
Chemicals other than explosives</td></tr>
<tr><td>Stressors to Human Resources</td><td>Cultural Resources:
Physical disturbance and strike</td><td colspan="2">Socioeconomic Resources:
Accessibility
Airborne acoustics
Physical disturbance and strike</td><td colspan="2">Public Health and Safety:
Physical interactions
In-air energy</td></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
None

Non-Ingestible Material:
Marine markers</td><td>Military Recoverable Material</td><td colspan="2">None</td></tr>
<tr><td>Sonar and Other Transducer Bins</td><td colspan="5">None</td></tr>
<tr><td>In-Water Explosive Bins</td><td colspan="5">None</td></tr>
<tr><td>Procedural Mitigation Measures</td><td colspan="5">Physical Disturbance and Strike: (Section 5.3.4)
Vessel movement</td></tr>
</table>

Other Training Exercises	
Search and Rescue	
Assumptions Used for Analysis	Locations are typical, but ships may conduct man overboard training throughout the Study Area.

A.2.10.4 Submarine Navigation

Other Training Exercises			
Submarine Navigation			
Short Description	Submarine crews operate sonar for navigation and detection while transiting into and out of port during reduced visibility.	**Typical Duration**	Up to 2 hours
Long Description	Submarine crews train to operate sonar for navigation. The ability to navigate using sonar is critical for detection while transiting into and out of port during periods of reduced visibility. During this activity the submarine will be surfaced.		
Typical Components	**Platforms:** Submarines **Targets:** None **Systems being Trained/Tested:** Sonar systems		
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety	**Typical Locations** **Range Complexes/Testing Ranges:** None	**Inshore Waters/Pierside:** Groton, Connecticut Kings Bay, Georgia Naval Station Mayport, Florida Naval Base Norfolk, Virginia Port Canaveral, Florida
Stressors to Biological Resources and Habitats	**Acoustic:** Sonar and other transducers Vessel noise **Explosives:** None	**Physical Disturbance and Strike:** Vessel and in-water device strike **Ingestion:** None	**Energy:** None **Entanglement:** None
Stressors to Physical Resources	**Air Quality:** None	**Sediments and Water Quality:** None	
Stressors to Human Resources	**Cultural Resources:** Physical disturbance and strike	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-water energy
Military Expended Material	**Ingestible Material:** None **Non-Ingestible Material:** None	**Military Recoverable Material**	None
Sonar and Other Transducer Bins	**Mid-Frequency:** MF3	**High-Frequency:** HF1	
In-Water Explosive Bins	None		
Procedural Mitigation Measures	**Acoustic Stressors:** *(Section 5.3.2)* Active sonar	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement	

Other Training Exercises	
Submarine Navigation	
Assumptions Used for Analysis	For biological resource analysis, vessel noise and vessel strike are only analyzed for the periods while the submarines are surfaced, typically brief in nature. Mitigation measures related to vessel movement are only considered during the period of surfacing as well. For human resource stressor analysis, physical disturbance and strike and physical interactions are only analyzed for the periods while the submarine are surfaced, typically brief in nature.

A.2.10.5 Submarine Sonar Maintenance and Systems Checks

Other Training Exercises			
Submarine Sonar Maintenance and Systems Checks			
Short Description	Maintenance of submarine sonar and other system checks are conducted pierside or at sea.	**Typical Duration**	Up to 1 hour
Long Description	A submarine performs periodic maintenance on the AN/BQQ-10 and submarine high-frequency sonar systems while in port or at sea. Submarines conduct maintenance to their sonar systems in shallow water near their homeport, however, sonar maintenance could occur anywhere as the system's performance may warrant.		
Typical Components	**Platforms:** Submarines **Targets:** None **Systems being Trained/Tested:** Sonar systems		
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety	**Typical Locations**	
		Range Complexes/Testing Ranges: Jacksonville Northeast Virginia Capes Other AFTT Areas	**Inshore Waters/Pierside:** Groton, Connecticut Kings Bay, Georgia Norfolk, Virginia Port Canaveral, Florida
Stressors to Biological Resources and Habitats	**Acoustic:** Sonar and other transducers Vessel noise **Explosives:** None	**Physical Disturbance and Strike:** Vessel and in-water device strike **Ingestion:** None	**Energy:** None **Entanglement:** None
Stressors to Physical Resources	**Air Quality:** None	**Sediments and Water Quality:** None	
Stressors to Human Resources	**Cultural Resources:** None	**Socioeconomic Resources:** None	**Public Health and Safety:** In-water energy
Military Expended Material	**Ingestible Material:** None **Non-Ingestible Material:** None	**Military Recoverable Material**	None
Sonar and Other Transducer Bins	**Mid-Frequency:** MF3		
In-Water Explosive Bins	None		
Procedural Mitigation Measures	**Acoustic Stressors:** *(Section 5.3.2)* Active sonar	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement	
Assumptions Used for Analysis	"Other AFTT Areas" refers to areas outside of existing range complexes and testing ranges. Activities occurring within 12 NM are pierside.		

A.2.10.6 Submarine Under Ice Certification

Other Training Exercises			
Submarine Under Ice Certification			
Short Description	Submarine crews operate sonar while transiting under ice. Ice conditions are simulated during training and certification events.	**Typical Duration**	Up to 6 hours per day over 5 days
Long Description	Submarine crews train to operate under ice. Ice conditions are simulated during training and certification exercises. A single exercise is comprised of 30 hours of training, spread out over 5 days in 6-hour training sessions.		
Typical Components	**Platforms:** Submarines **Targets:** None **Systems being Trained/Tested:** Sonar systems		
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety	**Typical Locations** **Range Complexes/Testing Ranges:** Jacksonville Navy Cherry Point Northeast Virginia Capes	**Inshore Waters/Pierside:** None
Stressors to Biological Resources and Habitats	**Acoustic:** Sonar and other transducers Vessel noise **Explosives:** None	**Physical Disturbance and Strike:** Vessel and in-water device strike Military expended materials **Ingestion:** None	**Energy:** None **Entanglement:** Wires and cables
Stressors to Physical Resources	**Air Quality:** None	**Sediments and Water Quality:** Metals	
Stressors to Human Resources	None		
Military Expended Material	**Ingestible Material:** None **Non-Ingestible Material:** Expended bathythermograph	**Military Recoverable Material**	None
Sonar and Other Transducer Bins	**High-Frequency:** HF1		
In-Water Explosive Bins	None		
Procedural Mitigation Measures	**Acoustic Stressors:** *(Section 5.3.2)* Active sonar	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement	
Assumptions Used for Analysis	Stressors to human resources were not analyzed for this activity since it occurs greater than 12 NM from shore.		

A.2.10.7 Surface Ship Object Detection

Mine Warfare			
Surface Ship Object Detection			
Short Description	Ship crews detect and avoid mines while navigating restricted areas or channels using active sonar.	**Typical Duration**	Up to 2 hours
Long Description	Surface ship crews detect and avoid mines or other underwater hazardous objects while navigating restricted areas or channels using active sonar. A Littoral Combat Ship utilizes unmanned surface vehicles and remotely operated vehicles to tow mine detection (hunting) equipment. Systems will operate from a shallow zone greater than 40 ft. to deep water. Exercises could be embedded within major training exercises.		
Typical Components	**Platforms:** Surface combatants, unmanned surface vehicles **Targets:** Mine shapes **Systems being Trained/Tested:** Sonar systems		
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety Unmanned aerial, surface, and subsurface vehicle safety Towed in-water device safety	**Typical Locations** **Range Complexes/Testing Ranges:** None	**Inshore Waters/Pierside:** Mayport, Florida Norfolk, Virginia
Stressors to Biological Resources and Habitats	**Acoustic:** Sonar and other transducers Vessel noise **Explosives:** None	**Physical Disturbance and Strike:** Vessel and in-water device strike Seafloor devices **Ingestion:** None	**Energy:** In-air electromagnetic devices In-water electromagnetic devices **Entanglement:** None
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** None	
Stressors to Human Resources	**Cultural Resources:** Physical disturbance and strike	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-air energy In-water energy
Military Expended Material	**Ingestible Material:** None **Non-Ingestible Material:** None	**Military Recoverable Material**	Mine shapes (non-explosive)
Sonar and Other Transducer Bins	**Mid-Frequency:** MF1K	**High-Frequency:** HF8	
In-Water Explosive Bins	None		
Procedural Mitigation Measures	**Acoustic Stressors:** *(Section 5.3.2)* Active sonar	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement Towed in-water devices	

Mine Warfare	
Surface Ship Object Detection	
Assumptions Used for Analysis	None

A.2.10.8 Surface Ship Sonar Maintenance and Systems Checks

Other Training Exercises			
Surface Ship Sonar Maintenance and Systems Checks			
Short Description	Maintenance of surface ship sonar and other system checks are conducted pierside or at sea.	**Typical Duration**	Up to 4 hours
Long Description	This scenario consists of surface ships performing periodic maintenance to the AN/SQS-53 sonar and other ship systems while in port or at sea. This maintenance takes up to 4 hours. Surface ships operate active sonar systems for maintenance while in shallow water near their homeport, however, sonar maintenance could occur anywhere as the system's performance may warrant.		
Typical Components	**Platforms:** Surface combatants **Targets:** None **Systems being Trained/Tested:** Sonar systems		
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety	**Typical Locations**	
		Range Complexes/Testing Ranges: Jacksonville Navy Cherry Point Virginia Capes Other AFTT Areas	**Inshore Waters/Pierside:** Naval Station Mayport, Florida Naval Station Norfolk, Virginia
Stressors to Biological Resources and Habitats	**Acoustic:** Sonar and other transducers Vessel noise **Explosives:** None	**Physical Disturbance and Strike:** Vessel and in-water device strike **Ingestion:** None	**Energy:** In-air electromagnetic devices **Entanglement:** None
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** None	
Stressors to Human Resources	**Cultural Resources:** None	**Socioeconomic Resources:** None	**Public Health and Safety:** In-water energy
Military Expended Material	**Ingestible Material:** None **Non-Ingestible Material:** None	**Military Recoverable Material**	None
Sonar and Other Transducer Bins	**Mid-Frequency:** MF1	**High-Frequency:** HF8	
In-Water Explosive Bins	None		
Procedural Mitigation Measures	**Acoustic Stressors:** *(Section 5.3.2)* Active sonar	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement	
Assumptions Used for Analysis	"Other AFTT Areas" refers to areas outside of existing range complexes and testing ranges. Activities occurring within 12 NM are pierside.		

A.2.10.9 Waterborne Training

<table>
<tr><th colspan="6">Other Training Exercises</th></tr>
<tr><th colspan="6">Waterborne Training</th></tr>
<tr><td>Short Description</td><td colspan="3">Personnel launch, operate, and recover a variety of small boats to achieve certifications such as coxswain, crewman, and safety observer.</td><td>Typical Duration</td><td>Up to 12 hours</td></tr>
<tr><td>Long Description</td><td colspan="5">Waterborne Training may include qualification and certification as safety observer, safety swimmer, coxswain, and crewman utilizing a variety of small crafts to include but not limited to rigid hull inflatables, aluminum chambered boat, stand-up paddleboards, kayaks, and jet skis. Boat crews train to launch and recover, moor to buoys, anchor, and operate a variety of missions in shallow waters.</td></tr>
<tr><td>Typical Components</td><td colspan="5">Platforms: Small boats
Targets: None
Systems being Trained/Tested: None</td></tr>
<tr><td>Standard Operating Procedures (Section 2.3.3)</td><td colspan="2">Vessel safety</td><td colspan="3">Typical Locations
Range Complexes/Testing Ranges:
Northeast
Jacksonville
Virginia Capes
Inshore Waters/Pierside:
Cooper River
St. Johns River
York River
James River and tributaries
Lower Chesapeake Bay
Narragansett Bay, Rhode Island</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td colspan="2">Acoustic:
Vessel noise

Explosives:
None</td><td colspan="2">Physical Disturbance and Strike:
Vessel and in-water device strike
Military expended material

Ingestion:
Military expended materials - munitions</td><td>Energy:
None

Entanglement:
None</td></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="3">Air Quality:
Criteria air pollutants</td><td colspan="2">Sediments and Water Quality:
Metals</td></tr>
<tr><td>Stressors to Human Resources</td><td>Cultural Resources:
Physical disturbance and strike</td><td colspan="2">Socioeconomic Resources:
Accessibility
Airborne acoustics
Physical disturbance and strike</td><td colspan="2">Public Health and Safety:
Physical interactions</td></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
Small caliber (casings only)

Non-Ingestible Material:
None</td><td>Military Recoverable Material</td><td colspan="2">None</td></tr>
<tr><td>Sonar and Other Transducer Bins</td><td colspan="5">None</td></tr>
<tr><td>In-Water Explosive Bins</td><td colspan="5">None</td></tr>
</table>

Other Training Exercises	
Waterborne Training	
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement
Assumptions Used for Analysis	None

A.3 TESTING ACTIVITIES

A.3.1 NAVAL AIR SYSTEMS COMMAND TESTING ACTIVITIES

Naval Air Systems Command activities will generally fall under fleet primary mission areas, such as the testing of airborne mine warfare and anti-submarine warfare weapons and systems. Naval Air Systems Command activities include, but are not limited to, the testing of new aircraft platforms (e.g., the F-35 Joint Strike Fighter aircraft), weapons, and systems (e.g., newly developed sonobuoys) that will ultimately be integrated into fleet training activities. In addition to testing new platforms, weapons, and systems, Naval Air Systems Command also conducts lot acceptance testing of sonobuoys and follow-on testing and evaluation of updated systems in support of fleet operational units. In general, the potential environmental effects from most Naval Air Systems Command testing events are similar to the associated fleet training exercises.

While many of these systems tested by Naval Air Systems Command will ultimately be used by the fleet, testing activities involving the same or similar systems may be conducted in different locations and manners than when conducted by the fleet. Because of these differences, the results of the analysis for testing activities may differ from the results for training activities.

A.3.1.1 Air Warfare

A.3.1.1.1 Air Combat Maneuver Test

Air Warfare			
Air Combat Maneuver Test			
Short Description	Aircrews engage in flight maneuvers designed to gain a tactical advantage during combat.	**Typical Duration**	Up to 2 flight hours per aircraft per event
Long Description	Air combat maneuver is the general term used to describe an air-to-air test event involving two or more aircraft, each engaged in continuous proactive and reactive changes in aircraft attitude, altitude, and airspeed. No weapons are fired during air combat maneuver activities.		
Typical Components	**Platforms:** Fixed-wing aircraft **Targets:** None **Systems being Trained/Tested:** Aircraft platforms		
Standard Operating Procedures *(Section 2.3.3)*	Aircraft safety	**Typical Locations**	
		Range Complexes/Testing Ranges: Virginia Capes	**Inshore Waters/Pierside:** None
Stressors to Biological Resources and Habitats	**Acoustic:** Aircraft noise **Explosives:** None	**Physical Disturbance and Strike:** Aircraft and aerial target strike **Ingestion:** Military expended materials – other than munitions	**Energy:** In-air electromagnetic devices **Entanglement:** None
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediment and Water Quality:** Metals Other materials	
Stressors to Human Resources	**Cultural Resources:** Physical disturbance and strike	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-air energy

Air Warfare			
Air Combat Maneuver Test			
Military Expended Material	**Ingestible Material:** Per chaff-air: one chaff-air cartridge, one plastic endcap, chaff fibers Per flare: one casing, one compression pad or one plastic piston, one plastic end cap, one O-ring **Non-Ingestible Material:** None	**Military Recoverable Material**	None
Sonar and Other Transducer Bins	None		
In-Water Explosive Bins	None		
Procedural Mitigation Measures	None		
Assumptions Used for Analysis	All combustible material in flares is assumed to be consumed before contact of the casing with the water.		

A.3.1.1.2 Air Platform – Vehicle Test

<table>
<tr><td colspan="5">Air Warfare</td></tr>
<tr><td colspan="5">Air Platform - Vehicle Test</td></tr>
<tr><td>Short Description</td><td colspan="2">Testing performed to quantify the flying qualities, handling, airworthiness, stability, controllability, and integrity of an air platform or vehicle. No explosive weapons are released during an air platform/vehicle test.</td><td colspan="2">Typical Duration
2-8 flight hours per event</td></tr>
<tr><td>Long Description</td><td colspan="4">The air platform/vehicle test describes the testing performed to quantify the flying qualities, handling, airworthiness, stability, controllability, and integrity of an air platform/vehicle. Integration of non-weapons system including aerial refueling tests are also conducted as part of an air platform/vehicle test. Test results are compared against design and performance specifications for compliance. The test results are also used to define stability and controllability characteristics and limitations and to improve and update existing analytical and predictive models. A wide variety of fixed-wing and rotary-wing aircraft, including unmanned aerial systems may undergo air platform/vehicle testing. No weapons are released during an Air Platform/Vehicle Test. Aircraft may employ laser detection for targeting systems and trailing antenna. Events may involve two or more fighter jet aircraft and a towed target tractor by a contracted aircraft (e.g., Learjet for laser targeting tests).</td></tr>
<tr><td>Typical Components</td><td colspan="4">Platforms: Fixed-wing aircraft, rotary-wing aircraft, unmanned aerial systems
Targets: None
Systems being Trained/Tested: Aircraft platforms</td></tr>
<tr><td>Standard Operating Procedures (Section 2.3.3)</td><td>Aircraft safety
Unmanned aerial, surface, and subsurface vehicle safety</td><td colspan="3">Typical Locations
Range Complexes/Testing Ranges:
Gulf of Mexico
Jacksonville
Key West
Navy Cherry Point
Virginia Capes
Inshore Waters/Pierside:
None</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td>Acoustic:
Aircraft noise

Explosives:
None</td><td colspan="2">Physical Disturbance and Strike:
Aircraft and aerial target strike
Military expended material

Ingestion:
Military expended materials – other than munitions</td><td>Energy:
In-air electromagnetic devices

Entanglement:
None</td></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="4">Air Quality:
Criteria air pollutants
Sediments and Water Quality:
Metals Other materials</td></tr>
<tr><td>Stressors to Human Resources</td><td>Cultural Resources:
Physical disturbance and strike</td><td colspan="2">Socioeconomic Resources:
Accessibility
Airborne acoustics
Physical disturbance and strike</td><td>Public Health and Safety:
Physical interactions
In-air energy</td></tr>
</table>

Air Warfare			
Air Platform - Vehicle Test			
Military Expended Material	**Ingestible Material:** Per one chaff-air: one chaff-air cartridge, one plastic endcap, chaff fibers Per one flare: one compression pad or one plastic piston, one plastic end cap, one O-ring **Non-Ingestible Material:** Bomb (Non-explosive)	**Military Recoverable Material**	None
Sonar and Other Transducer Bins	None		
In-Water Explosive Bins	None		
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement		
Assumptions Used for Analysis	None		

A.3.1.1.3 Air Platform Weapons Integration Test

Air Warfare				
Air Platform Weapons Integration Test				
Short Description	Testing performed to quantify the compatibility of weapons with the aircraft from which they would be launched or released. Non-explosive weapons or shapes are used.	**Typical Duration**	Up to 2.5 flight hours per aircraft per event	
Long Description	The air platform weapons integration test describes the testing performed to quantify the compatibility of weapons with the aircraft from which they would be released. Tests evaluate the compatibility of the weapon and its carriage, suspension, and launch equipment with the performance and handling characteristics of the designated aircraft. Additional tests assess the ability of the weapon to separate or launch safely from the aircraft at combat velocities, including at supersonic speeds. Test results are compared against design specifications for compliance. The test results are also used to define performance characteristics and to improve and update existing analytical and predictive models.			
Typical Components	**Platforms:** Fixed-wing aircraft, unmanned aerial systems **Targets:** None **Systems being Trained/Tested:** Munitions firing/launching systems			
Standard Operating Procedures *(Section 2.3.3)*	Aircraft safety Unmanned aerial, surface, and subsurface vehicle safety	**Typical Locations**		
		Range Complexes/Testing Ranges: Virginia Capes	**Inshore Waters/Pierside:** None	
Stressors to Biological Resources and Habitats	**Acoustic:** Aircraft noise Weapons noise	**Physical Disturbance and Strike:** Aircraft and aerial target strike Military expended material	**Energy:** In-air electromagnetic devices	
	Explosives: None	**Ingestion:** None	**Entanglement:** None	
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** Metals Other materials		
Stressors to Human Resources	**Cultural Resources:** Physical disturbance and strike	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance	**Public Health and Safety:** Physical interactions In-air energy	
Military Expended Material	**Ingestible Material:** None **Non-Ingestible Material:** Bomb (non-explosive), missile (non-explosive) , air target (drone)	**Military Recoverable Material**	Air target (drone), surface target (stationary)	
Sonar and Other Transducer Bins	None			
In-Water Explosive Bins	None			

Air Warfare	
Air Platform Weapons Integration Test	
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Non-explosive bombs and mine shapes
Assumptions Used for Analysis	None

A.3.1.1.4 Air-to-Air Weapons System Test

<table>
<tr><th colspan="6">Air Warfare</th></tr>
<tr><th colspan="6">Air-to-Air Weapons System Test</th></tr>
<tr><td>Short Description</td><td colspan="3">Test to evaluate the effectiveness of air-launched weapons against designated air targets.</td><td>Typical Duration
2.5 flight hours per aircraft per event</td><td></td></tr>
<tr><td>Long Description</td><td colspan="5">The air-to-air weapons systems test evaluates the performance of air-launched weapons systems against air targets, such as the BQM-34, a high-performance target simulating a strike fighter aircraft. During an air-to-air weapons systems test, a strike fighter aircraft locates, tracks, and, in some tests, fires on an air target used to simulate another strike fighter aircraft using non-explosive ordnance. No testing of explosive weapons is planned.</td></tr>
<tr><td>Typical Components</td><td colspan="5">Platforms: Fixed-wing aircraft
Targets: Air targets
Systems being Trained/Tested: Munitions firing/launching systems</td></tr>
<tr><td>Standard Operating Procedures (Section 2.3.3)</td><td>Aircraft safety</td><td colspan="4">Typical Locations
Range Complexes/Testing Ranges:
Gulf of Mexico
Inshore Waters/Pierside:
None</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td colspan="2">Acoustic:
Aircraft noise
Weapons noise

Explosives:
None</td><td colspan="2">Physical Disturbance and Strike:
Aircraft and aerial target strike
Military expended material

Ingestion:
None</td><td>Energy:
In-air electromagnetic devices

Entanglement:
Decelerators/parachutes</td></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="2">Air Quality:
Criteria air pollutants</td><td colspan="3">Sediment and Water Quality:
Metals
Other materials</td></tr>
<tr><td>Stressors to Human Resources</td><td>Cultural Resources:
Physical disturbance and strike</td><td colspan="2">Socioeconomic Resources:
Accessibility
Airborne acoustics
Physical disturbance and strike</td><td colspan="2">Public Health and Safety:
Physical interactions
In-air energy</td></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
None

Non-Ingestible Material:
Missiles (non-explosive), air target (drone), decelerator/parachute-extra-large</td><td>Military Recoverable Material</td><td colspan="2">Air target (drone)</td></tr>
<tr><td>Sonar and Other Transducer Bins</td><td colspan="5">None</td></tr>
<tr><td>In-Water Explosive Bins</td><td colspan="5">None</td></tr>
<tr><td>Procedural Mitigation Measures</td><td colspan="5">Physical Disturbance and Strike: (Section 5.3.4)
Non-explosive missiles and rockets</td></tr>
<tr><td>Assumptions Used for Analysis</td><td colspan="5">None</td></tr>
</table>

A.3.1.1.5 Air-to-Air Gunnery Test – Medium-Caliber

<table>
<tr><th colspan="5">Air Warfare</th></tr>
<tr><th colspan="5">Air-to-Air Gunnery Test – Medium-Caliber</th></tr>
<tr><td>Short Description</td><td colspan="2">Test performed to evaluate the effectiveness of air-to-air guns against designated airborne targets. Fixed-wing aircraft may be used.</td><td colspan="2">Typical Duration
2 flight hours per aircraft per event</td></tr>
<tr><td>Long Description</td><td colspan="4">This event is similar to the training event gunnery exercise air-to-air. An air-to-air gunnery test involves the firing of guns from fixed-wing aircraft against a towed aerial banner that serves as the target. Non-explosive rounds are fired, and the targets fired upon are typically towed aerial banners.</td></tr>
<tr><td>Typical Components</td><td colspan="4">Platforms: Fixed-wing aircraft
Targets: Air targets
Systems being Trained/Tested: Medium-caliber gun systems</td></tr>
<tr><td>Standard Operating Procedures (Section 2.3.3)</td><td colspan="2">Aircraft safety
Weapons firing safety</td><td colspan="2">Typical Locations
Range Complexes/Testing Ranges:
Virginia Capes
Inshore Waters/Pierside:
None</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td>Acoustic:
Aircraft noise
Weapons noise

Explosives:
None</td><td colspan="2">Physical Disturbance and Strike:
Aircraft and aerial target strike
Military expended material

Ingestion:
Military expended materials – munitions</td><td>Energy:
In-air electromagnetic devices

Entanglement:
None</td></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="2">Air Quality:
Criteria air pollutants</td><td colspan="2">Sediments and Water Quality:
Metals</td></tr>
<tr><td>Stressors to Human Resources</td><td colspan="4">None</td></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
Medium-caliber projectiles (non-explosive), medium-caliber casings

Non-Ingestible Material:
None</td><td>Military Recoverable Material</td><td>None</td></tr>
<tr><td>Sonar and Other Transducer Bins</td><td colspan="4">None</td></tr>
<tr><td>In-Water Explosive Bins</td><td colspan="4">None</td></tr>
<tr><td>Procedural Mitigation Measures</td><td colspan="4">Physical Disturbance and Strike: (Section 5.3.4)
Small-, medium-, and large-caliber non-explosive practice munitions</td></tr>
<tr><td>Assumptions Used for Analysis</td><td colspan="4">None</td></tr>
</table>

A.3.1.1.6 Air-to-Air Missile Test

Air Warfare			
Air-to-Air Missile Test			
Short Description	Test performed to evaluate the effectiveness of air-launched missiles against designated airborne targets. Fixed-wing aircraft will be used.	**Typical Duration**	2.5 flight hours per aircraft per event
Long Description	This event is similar to the training event missile exercise (air-to-air). Tests are a type of air-to-air weapons system test in which air-to-air missiles (non-explosive) are fired from fixed-wing aircraft against unmanned aerial drones such as BQM-34 and BQM-74.		
Typical Components	**Platforms:** Fixed-wing aircraft **Targets:** Air targets **Systems being Trained/Tested:** Missile firing/launching systems		
Standard Operating Procedures *(Section 2.3.3)*	Aircraft safety Weapons firing safety	**Typical Locations** **Range Complexes/Testing Ranges:** Virginia Capes	**Inshore Waters/Pierside:** None
Stressors to Biological Resources and Habitats	**Acoustic:** Aircraft noise Weapons noise **Explosives:** None	**Physical Disturbance and Strike:** Aircraft and aerial target strike Military expended material **Ingestion:** None	**Energy:** In-air electromagnetic devices **Entanglement:** Decelerators/parachutes
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediment and Water Quality:** Metals Other materials	
Stressors to Human Resources	**Cultural Resources:** Physical disturbance and strike	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-air energy
Military Expended Material	**Ingestible Material:** None **Non-Ingestible Material:** Missiles (non-explosive), decelerator/parachute - large and extra-large	**Military Recoverable Material**	Air target (drone)
Sonar and Other Transducer Bins	None		
In-Water Explosive Bins	None		
Procedural Mitigation Measures	None		
Assumptions Used for Analysis	None		

A.3.1.1.7 Intelligence, Surveillance, and Reconnaissance Test

<table>
<tr><th colspan="5">Air Warfare</th></tr>
<tr><th colspan="5">Intelligence, Surveillance, and Reconnaissance Test</th></tr>
<tr><td>Short Description</td><td colspan="3">Aircrews use all available sensors to collect data on threat vessels.</td><td>Typical Duration
2-20 flight hours per event</td></tr>
<tr><td>Long Description</td><td colspan="4">An air warfare intelligence, surveillance, and reconnaissance (ISR) test involves evaluating communications capabilities of aircraft, including unmanned aerial systems that can carry cameras, sensors, communications equipment, or other payloads. New systems are tested at sea to ensure proper communications between aircraft and ships.

ISR aircraft systems act as eyes in the sky, relaying raw imagery back to military personnel on the ground or to ships at-sea. The data is processed, analyzed, and shared with U.S. Navy or other U.S. military aircraft or vessels. New ISR technology systems provide combat identification (friend or foe) and are used for aircraft and ship-based communications.</td></tr>
<tr><td>Typical Components</td><td colspan="4">Platforms: Fixed-wing aircraft, rotary-wing aircraft, fixed-wing unmanned aerial systems
Targets: Air targets
Systems being Trained/Tested: ISR systems</td></tr>
<tr><td>Standard Operating Procedures (Section 2.3.3)</td><td colspan="2">Aircraft safety
Unmanned aerial, surface, and subsurface vehicle safety</td><td colspan="2">Typical Locations
Range Complexes/Testing Ranges:
Jacksonville
Navy Cherry Point
Virginia Capes
Inshore Waters/Pierside:
None</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td>Acoustic:
Aircraft noise

Explosives:
None</td><td>Physical Disturbance and Strike:
Aircraft and aerial target strike

Ingestion:
None</td><td colspan="2">Energy:
In-air electromagnetic devices

Entanglement:
None</td></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="2">Air Quality:
Criteria air pollutants</td><td colspan="2">Sediments and Water Quality:
None</td></tr>
<tr><td>Stressors to Human Resources</td><td>Cultural Resources:
None</td><td>Socioeconomic Resources:
Accessibility
Airborne acoustics
Physical disturbance and strike</td><td colspan="2">Public Health and Safety:
Physical interactions
In-air energy</td></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
None

Non-Ingestible Material:
None</td><td>Military Recoverable Material</td><td>Air target (drone)</td></tr>
<tr><td>Sonar and Other Transducer Bins</td><td colspan="4">None</td></tr>
<tr><td>In-Water Explosive Bins</td><td colspan="4">None</td></tr>
<tr><td>Procedural Mitigation Measures</td><td colspan="4">None</td></tr>
<tr><td>Assumptions Used for Analysis</td><td colspan="4">Surface targets consist of Navy vessels accounted for in unit level training activities.</td></tr>
</table>

A.3.1.2 Anti-Submarine Warfare

Anti-submarine warfare activities involve helicopter and maritime patrol aircraft, ships, and submarines, conducting operations alone or in combination, to enhance or evaluate the ability to locate, track, and neutralize submarines. Anti-submarine warfare tests are intended to evaluate the capabilities of a variety of active and passive sonar systems. Some systems are used to characterize the environment by measuring water depth, for example, whereas others are designed to locate mines and identify, track, and target submarines. Passive sonar systems "listen" for sound by using underwater microphones, called hydrophones, which receive, filter, amplify, and process underwater sound in search of certain acoustic signatures. No sound is introduced into the water when using passive sonar. Passive sonar can indicate the presence, character, and movement of a submarine, to the extent that the submarine generates noise.

Active sonar is the most effective means for locating quiet, modern submarines because active sonar is not dependent on the sound being generated by the submarine. Active sonar transmits pulses of sound that travel through the water, reflect off objects, and return to a receiver. By knowing the speed of sound in water and the time taken for the sound wave to travel to the object and back, active sonar systems can quickly calculate direction and distance from the sonar platform to the underwater object. Being able to accurately track moving submarines is essential to U.S. ship survivability.

Advanced, large-scale anti-submarine warfare events (i.e., anti-submarine warfare coordinated events) involving active sonar are conducted in coordinated, at-sea activities during multidimensional fleet training events involving submarines, ships, fixed-wing aircraft, and helicopters. These integrated training events offer opportunities to conduct testing activities and to train aircrews in the use of new or newly enhanced systems during a large-scale, complex exercise. Coordinated anti-submarine warfare events often involve the full anti-submarine warfare continuum from detecting and tracking a submarine to attacking a target using either exercise torpedoes or simulated weapons. Training events include detection and tracking exercises against "enemy" submarine contacts, torpedo employment exercises against the target, and exercising command and control tasks in a multidimensional battlespace.

The torpedoes released during a torpedo employment exercise are non-explosive. No other weapons are fired during Naval Air Systems Command anti-submarine warfare tests. Anti-submarine warfare sonar systems are deployed from certain classes of surface ships, submarines, helicopters, and fixed-wing patrol aircraft. Helicopters equipped with dipping sonar or sonobuoys are utilized to locate suspect submarines or submarine targets within the training or testing area. In addition, fixed-wing patrol aircrafts are used to deploy both active and passive sonobuoys to assist in locating and tracking submarines during the duration of the test.

Anti-submarine warfare tests include sonobuoy lot acceptance tests, which evaluate the integrity of a series, or lot, of sonobuoys before the lot is turned over to the fleet; dipping sonar tests in both shallow and deep water; torpedo tests (non-explosive warhead); and sonobuoy tests with both coherent (acoustic) and incoherent (explosive) sonobuoys. The types of sound sources tested by Naval Air Systems Command during anti-submarine warfare sonar tests in the Study Area are identified in Table A.1-1, and descriptions of anti-submarine warfare tests are provided in the sections below.

A.3.1.2.1 Anti-Submarine Warfare Torpedo Test

Anti-Submarine Warfare			
Anti-Submarine Warfare Torpedo Test			
Short Description	This event is similar to the training event torpedo exercise. Test evaluates anti-submarine warfare systems onboard rotary-wing and fixed-wing aircraft and the ability to search for, detect, classify, localize, track, and attack a submarine or similar target.	**Typical Duration**	2-6 flight hours per event
Long Description	Similar to a torpedo exercise, an anti-submarine warfare torpedo test evaluates anti-submarine warfare systems onboard rotary-wing (e.g., MH-60R helicopter) and fixed-wing (maritime patrol aircraft P-8) aircraft and the ability to search for, detect, classify, localize, track, and attack a submarine or similar target (e.g., MK-39 EMATT, or MK-30). Both sonobuoys and torpedoes (using the High Altitude Anti-Submarine Warfare Weapon Capability kit) may be delivered at high altitudes to remain clear of high threat areas. The focus of the anti-submarine warfare torpedo test is the operation of non-explosive torpedoes (e.g., MK-46 or MK-54), but other anti-submarine warfare systems are often used during the test. MK-39 (EMATT) or MK-30 targets simulate a submarine threat and are deployed at varying depths and speeds. If available, tests may be conducted using an actual submarine as the target. This activity can be conducted in shallow or deep waters and aircraft can originate from a land base or from a surface ship. The torpedo test culminates with the release of an exercise torpedo against the target and is intended to evaluate the targeting, release, and tracking process of deploying torpedoes from aircraft. All exercise torpedoes used in testing are either running (EXTORP) or non-running (REXTORP) and are non-explosive. Eighty five percent of torpedoes are recovered. A parachute assembly used for aircraft-launched torpedoes is jettisoned and sinks. Ballast (typically lead weights) may be released from the torpedoes to allow for recovery, leaving the ballast to sink to the bottom.		
Typical Components	**Platforms:** Fixed-wing aircraft, rotary-wing aircraft **Targets:** Sub-surface targets **Systems being Trained/Tested:** Torpedoes/torpedo launching systems		
Standard Operating Procedures *(Section 2.3.3)*	Aircraft safety Weapons firing safety	**Typical Locations**	
		Range Complexes/Testing Ranges: Jacksonville Virginia Capes	**Inshore Waters/Pierside:** None
Stressors to Biological Resources and Habitats	**Acoustic:** Sonar and other transducers Aircraft noise Weapons noise **Explosives:** None	**Physical Disturbance and Strike:** Aircraft and aerial target strike Vessel and in-water device strike Military expended material **Ingestion:** Military expended materials – other than munitions	**Energy:** In-air electromagnetic devices **Entanglement:** Wires and cables Decelerators/parachutes
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** Metals Chemicals other than explosives Other materials	
Stressors to Human Resources	**Cultural Resources:** Physical disturbance and strike	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-air energy In-water energy

<table>
<tr><th colspan="4">Anti-Submarine Warfare</th></tr>
<tr><th colspan="4">Anti-Submarine Warfare Torpedo Test</th></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
Decelerators/parachutes - small

Non-Ingestible Material:
Expendable bathythermographs, expendable bathythermograph wires, sonobuoys (non-explosive), sonobuoy wires, sub-surface targets (mobile), lightweight torpedo accessories</td><td>Military Recoverable Material</td><td>Lightweight torpedoes (non-explosive), sub-surface targets (mobile)</td></tr>
<tr><td>Sonar and Other Transducer Bins</td><td colspan="3">Mid-Frequency:
MF5

Torpedoes:
TORP1</td></tr>
<tr><td>Explosive Bins</td><td colspan="3">None</td></tr>
<tr><td>Procedural Mitigation Measures</td><td colspan="3">Acoustic Stressors: (Section 5.3.2)
Active sonar</td></tr>
<tr><td>Assumptions Used for Analysis</td><td colspan="3">Assume one torpedo accessory package (ballast, etc.) per torpedo.
Assume one target per torpedo.</td></tr>
</table>

A.3.1.2.2 Anti-Submarine Warfare Tracking Test – Helicopter

<table>
<tr><th colspan="5">Anti-Submarine Warfare</th></tr>
<tr><th colspan="5">Anti-Submarine Warfare Tracking Test – Helicopter</th></tr>
<tr><td>Short Description</td><td colspan="2">This event is similar to the training event anti-submarine tracking exercise–helicopter. The test evaluates the sensors and systems used to detect and track submarines and to ensure that helicopter systems used to deploy the tracking systems perform to specifications.</td><td colspan="2">Typical Duration
2 flight hours per event</td></tr>
<tr><td>Long Description</td><td colspan="4">Similar to an anti-submarine tracking exercise–helicopter, an Anti-Submarine Warfare Tracking Test — helicopter evaluates the sensors and systems used to detect and track submarines and to ensure that platform systems used to deploy the tracking systems perform to specifications. Typically, one helicopter (e.g., MH-60) conducts anti-submarine warfare testing using the dipping sonar (e.g., AN/AQS–22), non-impulsive sonobuoys (e.g., AN/SSQ-62), passive sonobuoys (e.g., AN/SSQ-53D/E), or explosive sonobuoys (e.g., mini sound-source seeker buoys). Targets (e.g., MK-39 EMATT or MK-30) may also be employed during an anti-submarine warfare tracking test event. If available, tests may be conducted using an actual submarine as the target. This activity would be conducted in shallow or deep waters and could initiate from a land base or from a surface ship. Helicopter anti-submarine warfare tests are intended to evaluate the sensors and systems used to detect and track submarines and to ensure that platform systems used to deploy the tracking systems perform to specifications. Some anti-submarine helicopter tracking tests could be conducted as part of an anti-submarine tracking coordinated event with fleet training activities.</td></tr>
<tr><td>Typical Components</td><td colspan="4">Platforms: Rotary-wing aircraft
Targets: Sub-surface targets
Systems being Trained/Tested: Sonobuoys, dipping sonar systems</td></tr>
<tr><td>Standard Operating Procedures (Section 2.3.3)</td><td>Aircraft safety</td><td colspan="3">Typical Locations
Range Complexes/Testing Ranges:
Gulf of Mexico
Jacksonville
Key West
Northeast
Virginia Capes
Inshore Waters/Pierside:
None</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td colspan="4">Acoustic:
Sonar and other transducers
Aircraft noise

Explosives:
In-water explosives

Physical Disturbance and Strike:
Aircraft and aerial target strike
Military expended material
Vessel and in-water device strike

Ingestion:
Military expended materials – other than munitions

Energy:
In-air electromagnetic devices

Entanglement:
Wires and cables
Decelerators/parachutes</td></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="4">Air Quality:
Criteria air pollutants

Sediments and Water Quality:
Chemicals other than explosives
Metals
Other materials</td></tr>
<tr><td>Stressors to Human Resources</td><td colspan="4">Cultural Resources:
Physical disturbance and strike
Explosives

Socioeconomic Resources:
Accessibility
Airborne acoustics
Physical disturbance and strike

Public Health and Safety:
Physical interactions
In-air energy
In-water energy</td></tr>
</table>

Anti-Submarine Warfare			
Anti-Submarine Warfare Tracking Test – Helicopter			
Military Expended Material	**Ingestible Material:** Decelerators/parachutes - small, sonobuoy (explosive) fragments **Non-Ingestible Material:** Sonobuoys (non-explosive), sonobuoy wires, subsurface target (stationary)	**Military Recoverable Material**	Sub-surface targets (mobile)
Sonar and Other Transducer Bins	**Mid-Frequency:** MF4 MF5		
In-Water Explosive Bins	E3		
Procedural Mitigation Measures	**Acoustic Stressors:** *(Section 5.3.2)* Active sonar	**Explosive Stressors:** *(Section 5.3.3)* Explosive sonobuoys	
Assumptions Used for Analysis	None		

A.3.1.2.3 Anti-Submarine Warfare Tracking Test – Maritime Patrol Aircraft

Anti-Submarine Warfare			
Anti-Submarine Warfare Tracking Test – Maritime Patrol Aircraft			
Short Description	The test evaluates the sensors and systems used by maritime patrol aircraft to detect and track submarines and to ensure that aircraft systems used to deploy the tracking systems perform to specifications and meet operational requirements.	**Typical Duration**	4-6 flight hours per event
Long Description	Similar to an Anti-Submarine Warfare Tracking Exercise-Maritime Patrol Aircraft, an Anti-Submarine Warfare Tracking Test—Maritime Patrol Aircraft evaluates the sensors and systems used to detect and track submarines and to ensure that platform systems used to deploy the tracking systems perform to specifications and meet operational requirements. P-3 or P-8 fixed-wing aircraft conduct anti-submarine warfare testing using non-impulsive sonobuoys (e.g., AN/SSQ-62 DICASS), explosive sonobuoys (e.g., MK-61 SUS), passive sonobuoys (e.g., AN/SSQ-53 DIFAR), and smoke devices (e.g., MK-58). Targets (e.g., MK-39 EMATT) may also be employed during an anti-submarine warfare scenario. If available, tests may be conducted using an actual submarine as the target. This activity would be conducted in deep (typically beyond 100 ft.) waters. Some anti-submarine warfare maritime patrol aircraft tracking tests could be conducted as part of a coordinated event with fleet training activities.		
Typical Components	**Platforms:** Fixed-wing aircraft **Targets:** Sub-surface targets **Systems being Trained/Tested:** Sonobuoys/sonobuoy launching systems, data transmission systems		
Standard Operating Procedures *(Section 2.3.3)*	Aircraft safety	**Typical Locations** **Range Complexes/Testing Ranges:** Gulf of Mexico Jacksonville Key West Navy Cherry Point Northeast Virginia Capes	**Inshore Waters/Pierside:** None
Stressors to Biological Resources and Habitats	**Acoustic:** Sonar and other transducers Aircraft noise **Explosives:** In-water explosives	**Physical Disturbance and Strike:** Aircraft and aerial target strike Vessel and in-water device strike Military expended materials **Ingestion:** Military expended materials – other than munitions	**Energy:** In-air electromagnetic devices **Entanglement:** Wires and cables Decelerators/parachutes
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** Explosives and explosive byproducts Chemicals other than explosives Metals Other materials	
Stressors to Human Resources	**Cultural Resources:** Physical disturbance and strike Explosives	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-air energy In-water energy

Anti-Submarine Warfare			
Anti-Submarine Warfare Tracking Test – Maritime Patrol Aircraft			
Military Expended Material	**Ingestible Material:** Decelerators/parachutes - small, sonobuoy (explosive) fragments **Non-Ingestible Material:** Sonobuoys (non-explosive), sonobuoy wires, sub-surface target (mobile)	**Military Recoverable Material**	Sub-surface target (mobile)
Sonar and Other Transducer Bins	**Mid-Frequency:** MF5 MF6 **Anti-Submarine Warfare:** ASW2 ASW5		
In-Water Explosive Bins	E1 E3		
Procedural Mitigation Measures	None		
Assumptions Used for Analysis	None		

A.3.1.2.4 Kilo Dip

Anti-Submarine Warfare				
Kilo Dip				
Short Description	Functional check of a helicopter deployed dipping sonar system (e.g., AN/AQS-22) prior to conducting a testing or training event using the dipping sonar system.	**Typical Duration** 1.5 flight hours per event		
Long Description	A kilo dip is the operational term used to describe a functional check of a helicopter deployed dipping sonar system. During a functional check, a single helicopter (e.g., MH-60) would transit to an area designated for dipping sonar testing (i.e., a dip point usually close to shore) and would deploy the sonar transducer assembly via a reel mechanism to a predetermined depth or series of depths while the helicopter hovers over the dip point. Once at the desired depth, the sonar transducer would be activated and would briefly transmit a pulsed, acoustic signal (i.e., ping) to check that all systems are functioning properly. After the check is completed, the sonar transducer assembly would be reeled in, and in some instances the helicopter would transit to a second dip point before the procedure is repeated. A kilo dip is a precursor to more comprehensive testing.			
Typical Components	**Platforms:** Rotary-wing aircraft **Targets:** None **Systems being Trained/Tested:** Dipping sonar systems			
Standard Operating Procedures *(Section 2.3.3)*	Aircraft safety	**Typical Locations** **Range Complexes/Testing Ranges:** Gulf of Mexico Jacksonville Key West Northeast Virginia Capes	**Inshore Waters/Pierside:** None	
Stressors to Biological Resources and Habitats	**Acoustic:** Sonar and other transducers Aircraft noise **Explosives:** None	**Physical Disturbance and Strike:** Aircraft and aerial target strike **Ingestion:** None	**Energy:** In-air electromagnetic devices	
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** None		
Stressors to Human Resources	**Cultural Resources:** None	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-air energy In-water energy	
Military Expended Material	**Ingestible Material:** None **Non-Ingestible Material:** None	**Military Recoverable Material**	None	
Sonar and Other Transducer Bins	**Mid-Frequency:** MF4			

Anti-Submarine Warfare	
Kilo Dip	
In-Water Explosive Bins	None
Procedural Mitigation Measures	**Acoustic Stressors:** *(Section 5.3.2)* Active sonar
Assumptions Used for Analysis	None

A.3.1.2.5 Sonobuoy Lot Acceptance Test

Anti-Submarine Warfare			
Sonobuoy Lot Acceptance Test			
Short Description	Sonobuoys are deployed from surface vessels and aircraft to verify the integrity and performance of a lot or group of sonobuoys in advance of delivery to the fleet for operational use.	**Typical Duration**	6 flight hours per event
Long Description	Sonobuoys are deployed from surface vessels and aircraft to verify the integrity and performance of a lot or group of sonobuoys in advance of delivery to the fleet for operational use. Lot acceptance testing would occur for multiple types of sonobuoys including non-impulsive (e.g., AN/SSQ-62 DICASS) and explosive (e.g., MK-61 SUS).		
Typical Components	**Platforms:** Fixed-wing aircraft, surface combatants **Targets:** None **Systems being Trained/Tested:** Sonobuoy systems		
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety Aircraft safety	**Typical Locations**	**Range Complexes/Testing Ranges:** Key West **Inshore Waters/Pierside:** None
Stressors to Biological Resources and Habitats	**Acoustic:** Sonar and other transducers Aircraft noise Vessel noise **Explosives:** In-water explosives	**Physical Disturbance and Strike:** Aircraft and aerial target strike Vessel and in-water device strike Military expended material **Ingestion:** Military expended materials – other than munitions	**Energy:** In-air electromagnetic devices **Entanglement:** Wires and cables Decelerators/parachutes
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** Explosives and explosive byproducts Chemicals other than explosives Metals Other materials	
Stressors to Human Resources	**Cultural Resources:** Physical disturbance and strike Explosives	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-energy In-water energy
Military Expended Material	**Ingestible Material:** Decelerators/parachutes - small, sonobuoy (explosive) fragments **Non-Ingestible Material:** Sonobuoys (non-explosive), sonobuoy wires	**Military Recoverable Material**	None
Sonar and Other Transducer Bins	**Low-Frequency:** LF4 **Mid-Frequency:** MF5 MF6	**High-Frequency:** HF5 HF6 **Anti-Submarine Warfare:** ASW2 ASW5	
In-Water Explosive Bins	E1 E3 E4		

Anti-Submarine Warfare		
Sonobuoy Lot Acceptance Test		
Procedural Mitigation Measures	**Acoustic Stressors:** *(Section 5.3.2)* Active sonar **Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement	**Explosive Stressors:** *(Section 5.3.3)* Explosive sonobuoys
Assumptions Used for Analysis	Assume one parachute per sonobuoy	

A.3.1.3 Electronic Warfare

A.3.1.3.1 Chaff Test

<table>
<tr><th colspan="4">Electronic Warfare</th></tr>
<tr><th colspan="4">Chaff Test</th></tr>
<tr><td>Short Description</td><td colspan="2">This event is similar to the training event chaff exercise. Chaff tests evaluate newly developed or enhanced chaff, chaff dispensing equipment, or modified aircraft systems against chaff deployment. Tests may also train pilots and aircrews in the use of new chaff dispensing equipment. Chaff tests are often conducted with flare tests and air combat maneuver events, as well as other test events, and are not typically conducted as standalone tests.</td><td>Typical Duration
2-4 flight hours per event</td></tr>
<tr><td>Long Description</td><td colspan="3">Chaff tests are conducted to evaluate newly developed or enhanced chaff dispensing equipment, to ensure other newly developed or modified aircraft systems are compatible with chaff deployment, and to train pilots and aircrew in the use of new chaff dispensing equipment. Fixed-wing, rotary-wing, and tiltrotor aircraft deploy chaff to disrupt threat targeting and missile guidance radars and to defend against an attack (Electronic Protect deployment). Chaff tests are often conducted with flare tests or air combat maneuver events, as well as other tests, rather than as a standalone test. Weapons are not typically fired during chaff tests. Chaff is employed for a number of different tactical reasons, but the end goal is to create a target that will distract enemy radar and weapon systems away from the friendly platform. Chaff may also be employed offensively (Electronic Attack deployment), such as before a major strike to "hide" inbound striking aircraft. Different chaff types (e.g., RR-129A/AL, RR-144A/AL, and RR-170A/AL) are used by a variety of different Navy aircraft; however all chaff consists of a radar reflector material made of thin, narrow, metallic strips cut in various lengths, and is intended to elicit frequency responses which deceive enemy radars. Defensive chaff tests are the most common type of chaff test. In most cases, the chaff test is conducted to evaluate systems on the aircraft deploying the chaff, but it is also critical to view the effect of the chaff from the "enemy" perspective so that radar system operators may practice corrective procedures to overcome the chaff jamming effect. Chaff tests are often designed to gain experience and data from both perspectives. Chaff is typically deployed from an aircraft as the aircraft makes evasive maneuvers to defeat a simulated threat missile or threat aircraft. The chaff deploys in a cloud of the highly reflective filaments and deceives the guidance system of an inbound missile, allowing the aircraft to escape the threat.</td></tr>
<tr><td>Typical Components</td><td colspan="3">Platforms: Fixed-wing aircraft, rotary-wing aircraft, tiltrotor aircraft
Targets: None
Systems being Trained/Tested: Chaff, chaff dispensing systems</td></tr>
<tr><td>Standard Operating Procedures (Section 2.3.3)</td><td>Aircraft safety</td><td colspan="2">Typical Locations
Range Complexes/Testing Ranges:
Gulf of Mexico
Jacksonville
Virginia Capes
Inshore Waters/Pierside:
None</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td>Acoustic:
Aircraft noise

Explosives:
None</td><td>Physical Disturbance and Strike:
Aircraft and aerial target strike
Military expended material

Ingestion:
Military expended materials – other than munitions</td><td>Energy:
In-air electromagnetic devices

Entanglement:
None</td></tr>
</table>

<table>
<tr><th colspan="5">Electronic Warfare</th></tr>
<tr><th colspan="5">Chaff Test</th></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="4">Air Quality:
Criteria air pollutants

Sediments and Water Quality:
Metals Other materials</td></tr>
<tr><td>Stressors to Human Resources</td><td>Cultural Resources:
Physical disturbance and strike</td><td colspan="2">Socioeconomic Resources:
Accessibility
Airborne acoustics
Physical disturbance and strike</td><td>Public Health and Safety:
Physical interactions
In-air energy</td></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
Per chaff cartridge: one plastic endcap, chaff fibers

Non-Ingestible Material:
None</td><td>Military Recoverable Material</td><td>None</td></tr>
<tr><td>Sonar and Other Transducer Bins</td><td colspan="4">None</td></tr>
<tr><td>In-Water Explosive Bins</td><td colspan="4">None</td></tr>
<tr><td>Procedural Mitigation Measures</td><td colspan="4">None</td></tr>
<tr><td>Assumptions Used for Analysis</td><td colspan="4">None</td></tr>
</table>

A.3.1.3.2 Electronic System Evaluation

<table>
<tr><th colspan="6">Electronic Warfare</th></tr>
<tr><th colspan="6">Electronic Systems Evaluation</th></tr>
<tr><td>Short Description</td><td colspan="3">Test that evaluates the effectiveness of electronic systems to control, deny, or monitor critical portions of the electromagnetic spectrum. In general, electronic warfare testing will assess the performance of three types of electronic warfare systems: electronic attack, electronic protect, and electronic support.</td><td colspan="2">Typical Duration
2-6 flight hours per event</td></tr>
<tr><td>Long Description</td><td colspan="5">Electronic systems evaluations are performed to determine the effectiveness of designated electronic warfare systems to control, deny, or monitor critical portions of the electromagnetic spectrum. In general, electronic warfare testing will assess the performance of three types of electronic warfare systems; specifically, electronic attack, electronic protect, and electronic support.

Aircraft electronic attack systems are designed to confuse the enemy or deny the enemy the use of its electronically-targeted weapons systems. The suppression of enemy air defenses and active jamming against hostile aircraft and surface combatant radars are examples of the application of electronic attack. Aircraft electronic protect systems are designed to intercept, identify, categorize, and defeat threat weapons systems that are already targeting that or other friendly aircraft. Aircraft electronic support systems employ passive tactics to intercept, exploit, locate (target), collect, collate, and decipher information from the radio frequency spectrum for the purpose of determining the intentions of the radiating source. Test results are compared against design specifications to evaluate the performance of the actually electronic warfare system. The test results are also used to define performance characteristics and to improve and update existing analytical and predictive models.</td></tr>
<tr><td>Typical Components</td><td colspan="5">Platforms: Fixed-wing aircraft
Targets: Air targets, electronic warfare targets
Systems being Trained/Tested: Electronic warfare systems, radar systems</td></tr>
<tr><td>Standard Operating Procedures (Section 2.3.3)</td><td colspan="2">Aircraft safety</td><td colspan="3">Typical Locations
Range Complexes/Testing Ranges:
Jacksonville
Virginia Capes
Inshore Waters/Pierside:
None</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td colspan="2">Acoustic:
Aircraft noise

Explosives:
None</td><td colspan="2">Physical Disturbance and Strike:
Aircraft and aerial target strike

Ingestion:
None</td><td>Energy:
In-air electromagnetic devices

Entanglement:
None</td></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="3">Air Quality:
Criteria air pollutants</td><td colspan="2">Sediments and Water Quality:
None</td></tr>
<tr><td>Stressors to Human Resources</td><td>Cultural Resources:
None</td><td colspan="2">Socioeconomic Resources:
Accessibility
Airborne acoustics
Physical disturbance and strike</td><td colspan="2">Public Health and Safety:
Physical interactions
In-air energy</td></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
None

Non-Ingestible Material:
None</td><td>Military Recoverable Material</td><td colspan="2">Air target (drone)</td></tr>
</table>

Electronic Warfare	
Electronic Systems Evaluation	
Sonar and Other Transducer Bins	None
In-Water Explosive Bins	None
Procedural Mitigation Measures	None
Assumptions Used for Analysis	None

A.3.1.3.3 Flare Test

<table>
<tr><th colspan="4">Electronic Warfare</th></tr>
<tr><th colspan="4">Flare Test</th></tr>
<tr><td>Short Description</td><td colspan="2">This event is similar to the training event flare exercise. Flare tests evaluate newly developed or enhanced flares, flare dispensing equipment, or modified aircraft systems against flare deployment. Tests may also train pilots and aircrew in the use of newly developed or modified flare deployment systems. Flare tests are often conducted with chaff tests and air combat maneuver events, as well as other test events, and are not typically conducted as standalone tests.</td><td>Typical Duration
2 flight hours per event</td></tr>
<tr><td>Long Description</td><td colspan="3">Flare tests are conducted to evaluate new flares, newly developed or modified flare deployment systems, to ensure that other newly enhanced aircraft systems are compatible with flare deployment, and to train pilots and aircrew in the use of newly developed or modified flare deployment systems. Flare tests are often conducted with chaff tests and air combat maneuver events, as well as other test events, and are not typically conducted as stand-alone tests. During a flare test, flares (and in some cases chaff) are deployed, but no weapons are typically fired. Flare dispensers may also be jettisoned during a flare test intended to assess the safe release of the dispenser in the event of an emergency.

Rotary-wing and tiltrotor aircraft deploy flares as a defensive tactic (electronic protect deployment) to disrupt the infrared missile guidance systems used by heat-seeking missiles, thereby causing the missile to lock onto the flare instead of onto the aircraft and enabling the aircraft to avoid the threat. In a typical scenario, an aircraft may detect the electronic targeting signals emitted from threat radars or missiles, or aircrew may visually identify a threat missile plume when a missile is launched. At a strategically appropriate time, the pilot dispenses flares and immediately maneuvers the aircraft to distract and defeat the threat. During a typical flare test, an aircraft will dispense flares 3,000 ft. above mean sea level and flares are completely consumed while in the air.

Aircraft flares use a magnesium extruded flare grain. Flare types commonly deployed during Naval Air Systems Command testing activities include but are not limited to: MJU-57, MJU-49, and MJU-38 for high speed aircraft and MJU-32 for low speed aircraft.</td></tr>
<tr><td>Typical Components</td><td colspan="3">Platforms: Rotary-wing aircraft, tiltrotor aircraft
Targets: None
Systems being Trained/Tested: Flares, flare dispensing systems</td></tr>
<tr><td>Standard Operating Procedures (Section 2.3.3)</td><td>Aircraft safety</td><td colspan="2">Typical Locations
Range Complexes/Testing Ranges:
Gulf of Mexico
Virginia Capes
Inshore Waters/Pierside:
None</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td colspan="3">Acoustic:
Aircraft noise

Explosives:
None

Physical Disturbance and Strike:
Aircraft and aerial target strike
Military expended material

Ingestion:
Military expended materials – other than munitions

Energy:
In-air electromagnetic devices

Entanglement:
None</td></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="3">Air Quality:
Criteria air pollutants

Sediment and Water Quality:
Other materials</td></tr>
</table>

<table>
<tr><th colspan="5">Electronic Warfare</th></tr>
<tr><th colspan="5">Flare Test</th></tr>
<tr><td>Stressors to Human Resources</td><td colspan="2">Cultural Resources:
Physical disturbance and strike</td><td colspan="2">Socioeconomic Resources:
Accessibility
Airborne acoustics
Physical disturbance and strike</td><td>Public Health and Safety:
Physical interactions
In-air energy</td></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
Per flare: one casing, one compression pad or one plastic piston, one plastic endcap, one O-ring

Non-Ingestible Material:
None</td><td>Military Recoverable Material</td><td colspan="2">None</td></tr>
<tr><td>Sonar and Other Transducer Bins</td><td colspan="5">None</td></tr>
<tr><td>Explosive Bins</td><td colspan="5">None</td></tr>
<tr><td>Procedural Mitigation Measures</td><td colspan="5">None</td></tr>
<tr><td>Assumptions Used for Analysis</td><td colspan="5">Other components associated with chaff and flare use are not expected to float and would sink to the seafloor.</td></tr>
</table>

A.3.1.4 Mine Warfare

Mine warfare involves the detection, avoidance, and neutralization of mines to protect Navy ships and submarines and offensive mine laying in naval operations. A naval mine is a self-contained, explosive device placed in the water at predetermined depths to destroy ships or submarines. Naval mines are deposited and left in place until triggered by the approach of or contact with an enemy ship or until removed or otherwise destroyed. Naval mines can be laid by minelayers, other ships, submarines, and aircraft. Naval Air Systems Command mine warfare testing events include airborne mine countermeasures events, mine-laying events (similar to mine exercises), and mine neutralization events. The AN/ASQ-235 airborne mine neutralization system was developed to destroy mines or otherwise rendering them non-functional. The airborne laser mine detection system test, airborne dipping sonar minehunting test, and airborne sonobuoy minehunting test evaluate the capabilities of mine warfare systems to detect, classify, and fix the location of floating, near-surface moored, and bottom moored mines.

A.3.1.4.1 Airborne Dipping Sonar Minehunting Test

<table>
<tr><th colspan="6">Mine Warfare</th></tr>
<tr><th colspan="6">Airborne Dipping Sonar Minehunting Test</th></tr>
<tr><td>Short Description</td><td colspan="3">A mine-hunting dipping sonar system that is deployed from a helicopter and uses high-frequency sonar for the detection and classification of bottom and moored mines.</td><td colspan="2">Typical Duration
2 flight hours per event</td></tr>
<tr><td>Long Description</td><td colspan="5">Tests of a mine-hunting dipping sonar system to evaluate the search capabilities of this helicopter-deployed, mine hunting, detection, and classification system. The sonar identifies mine-like objects.</td></tr>
<tr><td>Typical Components</td><td colspan="5">Platforms: Rotary-wing aircraft
Targets: Mine shapes (on established mine warfare training range)
Systems being Trained/Tested: Dipping sonar systems</td></tr>
<tr><td>Standard Operating Procedures (Section 2.3.3)</td><td>Aircraft safety</td><td colspan="4">Typical Locations
Range Complexes/Testing Ranges:
Virginia Capes
Naval Surface Warfare Center, Panama City Division
Inshore Waters/Pierside:
None</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td colspan="2">Acoustic:
Sonar and other transducers
Aircraft noise</td><td colspan="2">Physical Disturbance and Strike:
Aircraft and aerial target strike
Seafloor devices
Ingestion:
None</td><td>Energy:
In-air electromagnetic devices
Entanglement:
None</td></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="2">Air Quality:
Criteria air pollutants</td><td colspan="3">Sediment and Water Quality:
None</td></tr>
<tr><td>Stressors to Human Resources</td><td colspan="2">Cultural Resources:
Physical disturbance and strike</td><td colspan="2">Socioeconomic Resources:
Accessibility
Airborne acoustics
Physical disturbance and strike</td><td>Public Health and Safety:
Physical interactions
In-air energy
In-water energy</td></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
None
Non-Ingestible Material:
None</td><td>Military Recoverable Material</td><td colspan="2">None</td></tr>
</table>

Mine Warfare	
Airborne Dipping Sonar Minehunting Test	
Sonar and Other Transducer Bins	**High-Frequency:** HF4
In-Water Explosive Bins	None
Procedural Mitigation Measures	**Acoustic Stressors:** *(Section 5.3.2)* Active sonar
Assumptions Used for Analysis	The activity uses an established mine warfare training range and does not require the placement of moored mines.

A.3.1.4.2 Airborne Laser Based Mine Detection System Test

Mine Warfare			
Airborne Laser-Based Mine Detection System Test			
Short Description	An airborne mine hunting test of a laser-based mine detection system, that is operated from a helicopter (e.g., MH-60) and evaluates the system's ability to detect, classify, and fix the location of floating and near-surface, moored mines. The system uses a low energy laser to locate mines.	**Typical Duration**	2.5 flight hours per event
Long Description	During an airborne mine detection system test, a helicopter (e.g., MH-60) evaluates the search capabilities of the AN/AES-1 Airborne Laser Mine Detection System. The Airborne Laser Mine Detection System is a mine hunting system designed to detect, classify, and localize floating and near-surface, moored sea mines using a laser system. The Airborne Laser Mine Detection System will be integrated into the helicopter to provide a rapid wide-area reconnaissance and assessment of mine threats in littoral zones, confined straits, choke points, and amphibious objective areas for Carrier and Expeditionary Strike Groups. The Airborne Laser Mine Detection System uses pulsed laser light to image the entire near-surface volume potentially containing mines. Airborne Laser Mine Detection System is capable of day or night operations without stopping to deploy or recover equipment and without towing any equipment in the water. With untethered operations, it can attain high area search rates. This design uses the forward motion of the aircraft to generate image data negating the requirement for complex scanning mechanisms and ensuring high system reliability. Airborne Laser Mine Detection System also provides accurate target geo-location to support follow on neutralization of the detected mines.		
Typical Components	**Platforms:** Rotary-wing aircraft **Targets:** Mine shapes (on established mine warfare training range) **Systems being Trained/Tested:** Low-energy laser systems		
Standard Operating Procedures *(Section 2.3.3)*	Aircraft safety	**Typical Locations** **Range Complexes/Testing Ranges:** Virginia Capes Naval Surface Warfare Center, Panama City Division	**Inshore Waters/Pierside:** None
Stressors to Biological Resources and Habitats	**Acoustic:** Aircraft noise **Explosives:** None	**Physical Disturbance and Strike:** Aircraft and aerial target strike Seafloor devices **Ingestion:** None	**Energy:** In-air electromagnetic devices **Entanglement:** None
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** None	
Stressors to Human Resources	**Cultural Resources:** Physical disturbance and strike	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-air energy
Military Expended Material	**Ingestible Material:** None **Non-Ingestible Material:** None	**Military Recoverable Material**	None

Mine Warfare	
Airborne Laser-Based Mine Detection System Test	
Sonar and Other Transducer Bins	None
In-Water Explosive Bins	None
Procedural Mitigation Measures	None
Assumptions Used for Analysis	The activity uses an established mine warfare training range and does not require the placement of moored mines.

A.3.1.4.3 Airborne Mine Neutralization Systems Test

<table>
<tr><th colspan="4">Mine Warfare</th></tr>
<tr><th colspan="4">Airborne Mine Neutralization System Test</th></tr>
<tr><td>Short Description</td><td colspan="2">A test of the airborne mine neutralization system evaluates the system's ability to detect and destroy mines from an airborne mine countermeasures capable helicopter (e.g., MH-60). The airborne mine neutralization system uses up to four unmanned underwater vehicles equipped with high-frequency sonar, video cameras, and explosive and non-explosive neutralizers.</td><td>Typical Duration
2.5 flight hours per event</td></tr>
<tr><td>Long Description</td><td colspan="3">Mine neutralization tests evaluate aircraft and aircraft systems intended to neutralize or otherwise destroy mines through the use of explosives or other munitions. For most neutralization tests, mine shapes or non-explosive mines are used to evaluate new or enhanced mine neutralization systems. The airborne mine neutralization system uses up to four unmanned underwater vehicles equipped with high-frequency sonar and video cameras to relocate previously detected submerged mines. The unmanned underwater vehicles are also equipped with explosives to neutralize the mines after they are located. Data from unmanned underwater vehicles are relayed to the operator in the helicopter through a fiber-optic cable enabling the operator to position the neutralizing charge onto the most vulnerable area of the mine. The explosive charge is then detonated to neutralize the mine. For most tests, recoverable non-explosive neutralizers are used. A mine shape, rather than an explosive mine, serves as the target and a range support vessel recovers the non-explosive neutralizer and the mine shape following the test. Testing scenarios include a non-explosive neutralizer against an inert mine shape, or an explosive neutralizer against an explosive mine.</td></tr>
<tr><td>Typical Components</td><td colspan="3">Platforms: Rotary-wing aircraft, support craft, unmanned underwater vehicles
Targets: Mine shapes
Systems being Trained/Tested: Mine neutralization systems</td></tr>
<tr><td>Standard Operating Procedures (Section 2.3.3)</td><td>Vessel safety
Aircraft safety
Unmanned aerial, surface, and subsurface vehicle safety</td><td colspan="2">Typical Locations
Range Complexes/Testing Ranges:
Virginia Capes
Naval Surface Warfare Center, Panama City Division
Inshore Waters/Pierside:
None</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td>Acoustic:
Aircraft noise
Vessel noise

Explosives:
In-water explosives</td><td>Physical Disturbance and Strike:
Aircraft and aerial target strike
Vessel and in-water device strike
Military expended material
Seafloor devices

Ingestion:
Military expended materials – other than munitions</td><td>Energy:
In-air electromagnetic devices

Entanglement:
Wires and cables</td></tr>
<tr><td>Stressors to Physical Resources</td><td>Air Quality:
Criteria air pollutants</td><td colspan="2">Sediments and Water Quality:
Explosives and explosive byproducts
Chemicals other than explosives
Metals Other materials</td></tr>
<tr><td>Stressors to Human Resources</td><td>Cultural Resources:
Physical disturbance and strike
Explosives</td><td>Socioeconomic Resources:
Accessibility
Airborne acoustics
Physical disturbance and strike</td><td>Public Health and Safety:
Physical interactions
In-air energy
In-water energy</td></tr>
</table>

Mine Warfare			
Airborne Mine Neutralization System Test			
Military Expended Material	**Ingestible Material:** Mine (explosive) fragments, neutralizer (explosive) fragments **Non-Ingestible Material:** Fiber optic cans, fiber optic cables, anchor – mines, neutralizer (non-explosive)	**Military Recoverable Material**	Neutralizers (non-explosive), mine shapes (non-explosive)
Sonar and Other Transducer Bins	None		
In-Water Explosive Bins	E4 E11		
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement	**Explosive Stressors:** *(Section 5.3.3)* Explosive mine countermeasure and neutralization activities	
Assumptions Used for Analysis	None		

A.3.1.4.4 Airborne Sonobuoy Minehunting Test

Mine Warfare			
Airborne Sonobuoy Minehunting Test			
Short Description	A mine-hunting system made up of sonobuoys is deployed from a helicopter. A field of sonobuoys, using high-frequency sonar, is used for detection and classification of bottom and moored mines.	**Typical Duration**	2 flight hours per event
Long Description	Tests of mine-hunting sonobuoys to evaluate the search capabilities of this helicopter-deployed, mine hunting, detection, and classification system. The sonar identifies mine-like objects.		
Typical Components	**Platforms:** Rotary-wing aircraft **Targets:** Mine shapes (on established mine warfare training range) **Systems being Trained/Tested:** Sonobuoy systems		
Standard Operating Procedures *(Section 2.3.3)*	Aircraft safety	**Typical Locations** **Range Complexes/Testing Ranges:** Virginia Capes Naval Surface Warfare Center, Panama City Division	**Inshore Waters/Pierside:** None
Stressors to Biological Resources and Habitats	**Acoustic:** Sonar and other transducers Aircraft noise **Explosives:** None	**Physical Disturbance and Strike:** Aircraft and aerial target strike Military expended material Seafloor devices **Ingestion:** Military expended materials – other than munitions	**Energy:** In-air electromagnetic devices **Entanglement:** Wires and cables Decelerators/parachutes
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediment and Water Quality:** Metals Chemicals other than explosives Other materials	
Stressors to Human Resources	**Cultural Resources:** Physical disturbance and strike	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-air energy In-water energy
Military Expended Material	**Ingestible Material:** Decelerators/parachutes - Small **Non-Ingestible Material:** Sonobuoys (non-explosive), sonobuoy wires	**Military Recoverable Material**	Mine shape (non-explosive)
Sonar and Other Transducer Bins	**High-Frequency:** HF6		
In-Water Explosive Bins	None		
Procedural Mitigation Measures	**Acoustic Stressors:** *(Section 5.3.2)* Active sonar		

Mine Warfare	
Airborne Sonobuoy Minehunting Test	
Assumptions Used for Analysis	None

A.3.1.4.5 Mine-Laying Test

Mine Warfare			
Mine Laying Test			
Short Description	Fixed-wing aircraft evaluate the performance of mine laying equipment and software systems to lay mines. A mine test may also train aircrew in laying mines using a new or enhanced mine deployment system.	**Typical Duration**	2 flight hours per event
Long Description	During a mine laying test, fixed-wing aircraft evaluate the performance of aircraft mine laying equipment or associated software systems to lay mines using non-explosive mine shapes. A mine test may also train aircrew in the technique of laying mines and in using a new or enhanced mine deployment system. Aircrew typically drop a series of about four non-explosive mine shapes (i.e., MK 76, BDU-45, or BDU-48), making multiple passes in the same flight pattern and dropping one or more shapes each time. The non-explosive mine shapes are expendable and are typically not recovered after the test.		
Typical Components	**Platforms:** Fixed-wing aircraft **Targets:** Mine shapes **Systems being Trained/Tested:** Mine laying systems		
Standard Operating Procedures *(Section 2.3.3)*	Aircraft safety	**Typical Locations** **Range Complexes/Testing Ranges:** Jacksonville Virginia Capes	**Inshore Waters/Pierside:** None
Stressors to Biological Resources and Habitats	**Acoustic:** Aircraft noise **Explosives:** None	**Physical Disturbance and Strike:** Aircraft and aerial target strike Military expended material **Ingestion:** None	**Energy:** In-air electromagnetic devices **Entanglement:** None
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediment and Water Quality:** Metals	
Stressors to Human Resources	**Cultural Resources:** Physical disturbance and strike	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-air energy
Military Expended Material	**Ingestible Material:** None **Non-Ingestible Material:** Mine shapes (non-explosive)	**Military Recoverable Material**	None
Sonar and Other Transducer Bins	None		
In-Water Explosive Bins	None		
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Non-explosive bombs and mine shapes		

Mine Warfare	
Mine Laying Test	
Assumptions Used for Analysis	When a test event occurs and aircrew receives training, the event will be analyzed as a testing event.

A.3.1.5 Surface Warfare

Surface warfare is a type of naval warfare in which aircraft, surface ships, and submarines employ weapons, sensors, and operations directed against enemy surface vessels. Naval Air Systems Command surface warfare tests include air-to-surface missile, gunnery, and bombing tests, rocket tests, laser targeting tests, and high-energy laser weapons tests.

A sinking exercise is a specialized fleet training event that provides an opportunity for Naval Air Systems Command aircrew along with ship and submarine crews to deliver explosive ordnance on a deactivated vessel that has been cleaned and environmentally remediated. The vessel is deliberately sunk using multiple weapons systems. A Naval Air Systems Command testing event may take place in conjunction with a sinking exercise to test aircraft or aircraft systems in the delivery of explosive ordnance on a surface target.

A.3.1.5.1 Air-to-Surface Bombing Test

<table>
<tr><th colspan="5">Surface Warfare</th></tr>
<tr><th colspan="5">Air-to-Surface Bombing Test</th></tr>
<tr><td>Short Description</td><td colspan="2">This event is similar to the training event bombing exercise air-to-surface. Fixed-wing aircraft test the delivery of bombs against surface maritime targets with the goal of evaluating the bomb, the bomb carry and delivery system, and any associated systems that may have been newly developed or enhanced.</td><td colspan="2">Typical Duration
2 flight hours per event</td></tr>
<tr><td>Long Description</td><td colspan="4">Fixed-wing aircraft test the delivery of bombs against surface maritime targets with the goal of evaluating the bomb, the bomb carry and delivery system, and any associated systems that may have been newly developed or enhanced. Both explosive and non-explosive bombs will be released during this type of test; however, the vast majority of releases will be non-explosive bombs and typically include non-explosive general purpose bombs (e.g., MK 82 and MK 83) and guided bomb units (e.g., GBU-12 and GBU-32) of various sizes. Surface targets may also be used.</td></tr>
<tr><td>Typical Components</td><td colspan="4">Platforms: Fixed-wing aircraft, unmanned aerial systems
Targets: Surface targets
Systems being Trained/Tested: Bomb releasing systems</td></tr>
<tr><td>Standard Operating Procedures (Section 2.3.3)</td><td>Aircraft safety
Unmanned aerial, surface, and subsurface vehicle safety</td><td colspan="3">Typical Locations
Range Complexes/Testing Ranges:
Virginia Capes
Inshore Waters/Pierside:
None</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td>Acoustic:
Aircraft noise

Explosives:
In-water explosives</td><td colspan="2">Physical Disturbance and Strike:
Aircraft and aerial target strike
Military expended materials

Ingestion:
Military expended materials – munitions
Military expended materials – other than munitions</td><td>Energy:
In-air electromagnetic devices

Entanglement:
None</td></tr>
<tr><td>Stressors to Physical Resources</td><td>Air Quality:
Criteria air pollutants</td><td colspan="3">Sediments and Water Quality:
Explosives and explosive byproducts
Metals
Other materials
Chemicals other than explosives</td></tr>
</table>

<table>
<tr><th colspan="5">Surface Warfare</th></tr>
<tr><th colspan="5">Air-to-Surface Bombing Test</th></tr>
<tr><td>Stressors to Human Resources</td><td colspan="2">Cultural Resources:
Physical disturbance and strike
Explosives</td><td colspan="2">Socioeconomic Resources:
Accessibility
Airborne acoustics
Physical disturbance and strike</td><td>Public Health and Safety:
Physical interactions
In-air energy
In-water energy</td></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
Bomb (explosive) fragments, surface target (mobile and stationary) fragments

Non-Ingestible Material:
Bombs (non-explosive)</td><td>Military Recoverable Material</td><td colspan="2">Surface target (mobile)</td></tr>
<tr><td>Sonar and Other Transducer Bins</td><td colspan="5">None</td></tr>
<tr><td>In-Water Explosive Bins</td><td colspan="5">E9</td></tr>
<tr><td>Procedural Mitigation Measures</td><td colspan="2">Physical Disturbance and Strike: (Section 5.3.4)
Non-explosive bombs and mine shapes</td><td colspan="3">Explosive Stressors: (Section 5.3.3)
Explosive bombs</td></tr>
<tr><td>Assumptions Used for Analysis</td><td colspan="5">None</td></tr>
</table>

A.3.1.5.2 Air-to-Surface Gunnery Test

Surface Warfare				
Air-to-Surface Gunnery Test				
Short Description	This event is similar to the training event gunnery exercise air-to-surface. Fixed-wing and rotary-wing aircrews evaluate new or enhanced aircraft guns against surface maritime targets to test that the gun, gun ammunition, or associated systems meet required specifications or to train aircrew in the operation of a new or enhanced weapons system.	**Typical Duration**	2-2.5 flight hours per event	
Long Description	Fixed-wing and rotary-wing aircrews evaluate new or enhanced aircraft guns against surface maritime targets to test that the gun, gun ammunition, or associated systems meet required specifications or to train aircrew in the operation of a new or enhanced weapons system. Non-explosive practice munitions are typically used during this type of test; however, a small number of high explosive rounds may be used during final testing. Rounds that may be used include 7.62 mm, 20 mm, 30 mm, 0.30-caliber, and 0.50-caliber gun ammunition.			
Typical Components	**Platforms:** Rotary-wing aircraft, fixed-wing aircraft, tiltrotor aircraft **Targets:** Surface targets **Systems being Trained/Tested:** Gun systems			
Standard Operating Procedures *(Section 2.3.3)*	Aircraft safety Weapons firing safety	**Typical Locations**		
		Range Complexes/Testing Ranges: Jacksonville Virginia Capes	**Inshore Waters/Pierside:** None	
Stressors to Biological Resources and Habitats	**Acoustic:** Aircraft noise Weapons noise **Explosives:** In-water explosives	**Physical Disturbance and Strike:** Aircraft and aerial target strike Military expended material **Ingestion:** Military expended materials – munitions Military expended materials – other than munitions	**Energy:** In-air electromagnetic devices **Entanglement:** None	
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** Explosives and explosive byproducts Other materials Chemicals other than explosives	Metals	
Stressors to Human Resources	**Cultural Resources:** Physical disturbance and strike Explosives	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-air energy In-water energy	
Military Expended Material	**Ingestible Material:** Medium-caliber projectile (explosive) fragments, small- and medium-caliber projectiles (non-explosive), small-caliber casings, medium-caliber casings, surface targets (stationary) fragments **Non-Ingestible Material:** None	**Military Recoverable Material**	Surface targets (mobile)	

Surface Warfare		
Air-to-Surface Gunnery Test		
Sonar and Other Transducer Bins	None	
In-Water Explosive Bins	E1	
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Small-, medium-, and large-caliber non-explosive practice munitions	**Explosive Stressors:** *(Section 5.3.3)* Explosive medium-caliber and large-caliber projectiles
Assumptions Used for Analysis	None	

A.3.1.5.3 Air-to-Surface Missile Test

Surface Warfare				
Air-to-Surface Missile Test				
Short Description	This event is similar to the training event missile exercise air-to-surface. Test may involve both fixed-wing and rotary-wing aircraft launching missiles at surface maritime targets to evaluate the weapons system or as part of another systems integration test.		**Typical Duration** 2-4 flight hours per event	
Long Description	Similar to a missile exercise air-to-surface, an air-to-surface missile test may involve both fixed-wing and rotary-wing aircraft launching missiles at surface maritime targets to evaluate the weapons system or as part of another systems integration test. Air-to-surface missile tests can include high explosive, non-explosive, or non-firing (captive air training missile) weapons. Laser targeting systems may also be used. Both stationary and mobile targets would be utilized during testing.			
Typical Components	**Platforms:** Fixed-wing aircraft, rotary-wing aircraft, tiltrotor aircraft **Targets:** Surface targets **Systems being Trained/Tested:** Missile firing/launching systems			
Standard Operating Procedures *(Section 2.3.3)*	Aircraft safety Weapons firing safety	**Typical Locations** **Range Complexes/Testing Ranges:** Gulf of Mexico Jacksonville Virginia Capes	**Inshore Waters/Pierside:** None	
Stressors to Biological Resources and Habitats	**Acoustic:** Aircraft noise Weapons noise **Explosives:** In-water explosives	**Physical Disturbance and Strike:** Aircraft and aerial target strike Military expended material **Ingestion:** Military expended materials – munitions Military expended materials – other than munitions	**Energy:** In-air electromagnetic devices **Entanglement:** None	
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediment and Water Quality:** Explosives and explosive byproducts Chemicals other than explosives Metals Other materials		
Stressors to Human Resources	**Cultural Resources:** Physical disturbance and strike Explosives	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-air energy In-water energy	
Military Expended Material	**Ingestible Material:** Missile (explosive) fragments, surface target (mobile and stationary) fragments **Non-Ingestible Material:** Missiles (non-explosive)	**Military Recoverable Material**	Surface targets (mobile)	
Sonar and Other Transducer Bins	None			

Surface Warfare				
Air-to-Surface Missile Test				
In-Water Explosive Bins	E6	E9	E10	
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Non-explosive missiles and rockets			**Explosive Stressors:** *(Section 5.3.3)* Explosive missiles and rockets
Assumptions Used for Analysis	None			

A.3.1.5.4 High-Energy Laser Weapons Test

Surface Warfare				
High-Energy Laser Weapons Test				
Short Description	High-energy laser weapons tests would evaluate the specifications, integration, and performance of an aircraft mounted, approximately 25 kilowatt high-energy laser. The laser is intended to be used as a weapon to disable small surface vessels.	**Typical Duration**	2.5 flight hours per event	
Long Description	During a high-energy laser weapons test, aircrew would evaluate the specifications, integration, and performance of an aircraft mounted, approximately 25 kilowatt high-energy laser that is intended to be used as a weapon against stationary and mobile, unmanned surface targets. The high-energy laser would be employed from a helicopter (e.g., MH-60) either hovering or in forward flight, and is designed to disable the surface vessel, rendering it immobile. The high-energy laser would have a range of up to six kilometers. Unmanned surface targets would be used during the high-energy laser test.			
Typical Components	**Platforms:** Rotary-wing aircraft **Targets:** Surface targets **Systems being Trained/Tested:** High-energy lasers			
Standard Operating Procedures *(Section 2.3.3)*	Aircraft safety Laser safety	**Typical Locations**	**Range Complexes/Testing Ranges:** Virginia Capes	**Inshore Waters/Pierside:** None
Stressors to Biological Resources and Habitats	**Acoustic:** Aircraft noise **Explosives:** None	**Physical Disturbance and Strike:** Aircraft and aerial target strike Military expended material **Ingestion:** Military expended materials – other than munitions	**Energy:** In-air electromagnetic devices High-energy lasers **Entanglement:** None	
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** Metals Other materials		
Stressors to Human Resources	**Cultural Resources:** Physical disturbance and strike	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-air energy	
Military Expended Material	**Ingestible Material:** Surface target (mobile and stationary) fragments **Non-Ingestible Material:** None	**Military Recoverable Material**	Surface target (mobile)	
Sonar and Other Transducer Bins	None			

Surface Warfare	
High-Energy Laser Weapons Test	
In-Water Explosive Bins	None
Procedural Mitigation Measures	None
Assumptions Used for Analysis	None

A.3.1.5.5 Laser Targeting Test

Surface Warfare			
Laser Targeting Test			
Short Description	Aircrews illuminate enemy targets with lasers.	**Typical Duration**	4 flight hours per event
Long Description	During a laser targeting test, aircrews use laser targeting devices integrated into aircraft or weapons systems to evaluate targeting accuracy and precision and to train aircrew in the use of newly developed or enhanced laser targeting devices designed to illuminate designated targets for engagement with laser-guided weapons. No explosive munitions are released during a laser targeting test.		
Typical Components	**Platforms:** Fixed-wing aircraft, rotary-wing aircraft, tiltrotor aircraft, unmanned aerial systems **Targets:** Surface targets **Systems being Trained/Tested:** Laser targeting systems		
Standard Operating Procedures *(Section 2.3.3)*	Aircraft safety	**Typical Locations** **Range Complexes/Testing Ranges:** Virginia Capes	**Inshore Waters/Pierside:** None
Stressors to Biological Resources and Habitats	**Acoustic:** Aircraft noise **Explosives:** None	**Physical Disturbance and Strike:** Aircraft and aerial target strike Military expended material **Ingestion:** None	**Energy:** In-air electromagnetic devices **Entanglement:** None
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** Metals Other materials	
Stressors to Human Resources	**Cultural Resources:** Physical disturbance and strike	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-air energy
Military Expended Material	**Ingestible Material:** None **Non-Ingestible Material:** Bombs (non-explosive)	**Military Recoverable Material**	Surface targets (stationary)
Sonar and Other Transducer Bins	None		
In-Water Explosive Bins	None		
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Non-explosive bombs and mine shapes		
Assumptions Used for Analysis	Military expended material may be non-explosive bombs or other guided munitions.		

A.3.1.5.6 Rocket Test

Surface Warfare				
Rocket Test				
Short Description	Rocket tests are conducted to evaluate the integration, accuracy, performance, and safe separation of guided and unguided 2.75-inch rockets fired from a hovering or forward flying helicopter or tiltrotor aircraft.	**Typical Duration**	1.5-2.5 hours per event	
Long Description	Rocket tests are conducted to evaluate the integration, accuracy, performance, and safe separation of laser-guided and unguided 2.75-inch rockets fired from a hovering or forward flying helicopter. Rocket tests would involve the release of primarily live motor/non-explosive warhead rockets. Some explosive warhead rockets would be tested, and during a jettison test, rockets with a non-explosive motor and non-explosive warhead would be jettisoned along with the rocket launcher. Rocket tests are also conducted to train aircrew on the use of new or enhanced weapons systems. Rocket types may include variations of the Hydra-70 rocket developed under the Advanced Precision Kill Weapons System program or similar munitions developed under Low-cost Guided Imaging Rocket program as well as MEDUSA rockets. Non-explosive warhead rocket types also include flechette rockets. All rockets planned for testing are 2.75-inch rockets. Some rocket tests may be conducted in conjunction with upgrades to or integration of the Forward Looking Infrared targeting system.			
Typical Components	**Platforms:** Rotary-wing aircraft, tiltrotor aircraft **Targets:** Surface targets **Systems being Trained/Tested:** Rocket firing/launching systems			
Standard Operating Procedures *(Section 2.3.3)*	Aircraft safety Weapons firing safety	**Typical Locations**		
		Range Complexes/Testing Ranges: Jacksonville Virginia Capes	**Inshore Waters/Pierside:** None	
Stressors to Biological Resources and Habitats	**Acoustic:** Aircraft noise Weapons noise **Explosives:** In-water explosives	**Physical Disturbance and Strike:** Aircraft and aerial target strike Military expended material **Ingestion:** Military expended materials – munitions Military expended materials – other than munitions	**Energy:** In-air electromagnetic devices **Entanglement:** None	
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** Explosives and explosive byproducts Chemicals other than explosives Metals Other materials		
Stressors to Human Resources	**Cultural Resources:** Physical disturbance and strike Explosives	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-air energy In-water energy	
Military Expended Material	**Ingestible Material:** Rocket (explosive) fragments, surface target (mobile and stationary) fragments, flechettes **Non-Ingestible Material:** Rockets (non-explosive)	**Military Recoverable Material**	Surface targets (mobile and stationary)	

Surface Warfare		
Rocket Test		
Sonar and Other Transducer Bins	None	
In-Water Explosive Bins	E3	
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Non-explosive missiles and rockets	**Explosive Stressors:** *(Section 5.3.3)* Explosive missiles and rockets
Assumptions Used for Analysis	Assume 25 percent of non-explosive practice munitions are flechette rockets.	

A.3.1.6 Other Testing Activities

A.3.1.6.1 Acoustic and Oceanographic Research

Other Testing Activities			
Acoustic and Oceanographic Research			
Short Description	Active transmissions within the band 10 hertz (Hz)-100 kilohertz (kHz) from sources deployed from ships and aircraft.	**Typical Duration**	8 flight hours per event
Long Description	Active acoustic transmissions within the band 10 Hz-100 kHz used for engineering tests of acoustic sources, validation of ocean acoustic models, characterization of acoustic interactions with the ocean bottom and ocean surface.		
Typical Components	**Platforms:** Fixed-wing aircraft, small boats **Targets:** Sub-surface targets **Systems being Trained/Tested:** Low-energy lasers, de minimis sonar systems		
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety Aircraft safety	**Typical Locations** **Range Complexes/Testing Ranges:** Gulf of Mexico Jacksonville Key West Northeast Virginia Capes	**Inshore Waters/Pierside:** None
Stressors to Biological Resources and Habitats	**Acoustic:** Aircraft noise Vessel noise **Explosives:** None	**Physical Disturbance and Strike:** Aircraft and aerial target strike Vessel and in-water device strike Military expended material **Ingestion:** None	**Energy:** In-air electromagnetic devices In-water electromagnetic devices **Entanglement:** None
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** Other materials	
Stressors to Human Resources	**Cultural Resources:** Physical disturbance and strike	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-air energy
Military Expended Material	**Ingestible Material:** None **Non-Ingestible Material:** Subsurface target (mobile)	**Military Recoverable Material**	Subsurface target (mobile)
Sonar and Other Transducer Bins	None		
In-Water Explosive Bins	None		
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement		

Other Testing Activities	
Acoustic and Oceanographic Research	
Assumptions Used for Analysis	None

A.3.1.6.2 Air Platform Shipboard Integration Test

<table>
<tr><th colspan="5">Other Testing Activities</th></tr>
<tr><th colspan="5">Air Platform Shipboard Integration Test</th></tr>
<tr><td>Short Description</td><td colspan="2">Aircraft are tested to determine operability from shipboard platforms, performance of shipboard physical operations, and to verify and evaluate communications and tactical data links.</td><td>Typical Duration</td><td>2-12 flight hours per event</td></tr>
<tr><td>Long Description</td><td colspan="4">The air platform shipboard integration test is performed to evaluate the compatibility of an aircraft to operate from designated shipboard platforms, perform shipboard physical operations, and to verify and evaluate communications and tactical data links. This test function also includes an assessment of carrier-shipboard suitability, such as hazards of electromagnetic radiation to ordnance, hazard of electromagnetic radiation to personnel, and high energy radio frequency.</td></tr>
<tr><td>Typical Components</td><td colspan="4">Platforms: Fixed-wing aircraft, unmanned aerial systems, tiltrotor aircraft
Targets: None
Systems being Trained/Tested: Communications systems</td></tr>
<tr><td>Standard Operating Procedures (Section 2.3.3)</td><td>Aircraft safety</td><td colspan="3">Typical Locations
Range Complexes/Testing Ranges:
Virginia Capes
Inshore Waters/Pierside:
None</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td colspan="2">Acoustic:
Aircraft noise

Explosives:
None</td><td colspan="2">Physical Disturbance and Strike:
Aircraft and aerial target strike

Ingestion:
None</td><td>Energy:
In-air electromagnetic devices

Entanglement:
None</td></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="3">Air Quality:
Criteria air pollutants</td><td>Sediments and Water Quality:
None</td></tr>
<tr><td>Stressors to Human Resources</td><td>Cultural Resources:
None</td><td colspan="2">Socioeconomic Resources:
Accessibility
Airborne acoustics
Physical disturbance and strike</td><td>Public Health and Safety:
Physical interactions
In-air energy</td></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
None

Non-Ingestible Material:
None</td><td>Military Recoverable Material</td><td>None</td></tr>
<tr><td>Sonar and Other Transducer Bins</td><td colspan="4">None</td></tr>
<tr><td>In-Water Explosive Bins</td><td colspan="4">None</td></tr>
<tr><td>Procedural Mitigation Measures</td><td colspan="4">None</td></tr>
</table>

Other Testing Activities	
Air Platform Shipboard Integration Test	
Assumptions Used for Analysis	None

A.3.1.6.3 Maritime Security

<table>
<tr><td colspan="6">Surface Warfare</td></tr>
<tr><td colspan="6">Maritime Security Operations</td></tr>
<tr><td>Short Description</td><td colspan="3">Maritime patrol aircraft participate in maritime security activities and fleet training events. Aircraft identify, track, and monitor foreign merchant vessels suspected of non-compliance with United Nations-allied sanctions or conflict rules of engagement.</td><td colspan="2">Typical Duration

2-8 flight hours per event</td></tr>
<tr><td>Long Description</td><td colspan="5">Crews from Navy fixed-wing aircraft identify, track, and monitor foreign merchant vessels suspected of not complying with United Nations-allied sanctions or conflict rules of engagement. This training event is non-firing. Naval Air Systems Command maritime patrol aircraft may participate in maritime security activities and training events.</td></tr>
<tr><td>Typical Components</td><td colspan="5">Platforms: Fixed-wing aircraft
Targets: Mobile surface vessels
Systems being Trained/Tested: Radar systems</td></tr>
<tr><td>Standard Operating Procedures (Section 2.3.3)</td><td colspan="2">Vessel safety
Aircraft safety</td><td colspan="3">Typical Locations
Range Complexes/Testing Ranges:
Jacksonville
Navy Cherry Point
Virginia Capes
Bays/Estuaries/Pierside:
None</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td colspan="2">Acoustic:
Aircraft noise
Vessel noise

Explosives:
None</td><td colspan="2">Physical Disturbance and Strike:
Aircraft and aerial target strike
Vessel and in-water device strike

Ingestion:
None</td><td>Energy:
In-air electromagnetic devices

Entanglement:
None</td></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="2">Air Quality:
Criteria air pollutants</td><td colspan="3">Sediments and Water Quality:
None</td></tr>
<tr><td>Stressors to Human Resources</td><td>Cultural Resources:
Physical disturbance and strike</td><td colspan="2">Socioeconomic Resources:
Accessibility
Airborne acoustics
Physical disturbance and strike</td><td>Public Health and Safety:
Physical interactions
In-air energy</td></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
None

Non-Ingestible Material:
None</td><td>Military Recoverable Material</td><td colspan="2">None</td></tr>
<tr><td>Sonar and Other Transducer Bins</td><td colspan="5">None</td></tr>
<tr><td>In-Water Explosive Bins</td><td colspan="5">None</td></tr>
<tr><td>Procedural Mitigation Measures</td><td colspan="5">None</td></tr>
</table>

Surface Warfare	
Maritime Security Operations	
Assumptions Used for Analysis	None

A.3.1.6.4 Shipboard Electronic Systems Evaluation

Other Testing Activities				
Shipboard Electronic Systems Evaluation				
Short Description	Tests measure ship antenna radiation patterns and test communication systems with a variety of aircraft.	**Typical Duration**	2-20 flight hours per event	
Long Description	Shipboard electronic systems evaluation tests measure ship antenna radiation patterns and evaluate communication systems linking vessels and aircraft. Aircraft capable of landing on a ship (e.g., aircraft carrier or littoral combat ship) temporarily deploy to a nearshore ship and conduct a variety of tests over a period of days to test newly installed or modified systems onboard the aircraft for compatibility with shipboard electronic systems. Follow-on test and evaluation of unmanned aerial systems would consist of dynamic interface testing, shipboard electromagnetic testing, and envelope expansion tests intended to evaluate capability of aircraft to conduct launch and recovery operations from a ship at sea as well as perform missions in a maritime environment. Altitudes would range from mean seal level to 15,000 ft. above mean sea level with the majority of flights occurring between mean sea level and 3,000 ft. Shipboard testing of new technology systems to provide precision guidance to aircraft landing on air capable ships. At-sea flight test of the aircraft would consist of shipboard compatibility (dynamic interface/envelope expansion) and, during Operational Evaluation, amphibious assault scenarios. Shipboard electronic systems evaluation tests of aircraft would also involve flight and wind envelope expansion interface testing with Amphibious Assault Ships, Amphibious Transport Dock, and Dock Landing Ship class vessels.			
Typical Components	**Platforms:** Rotary-wing aircraft, unmanned aerial systems **Targets:** None **Systems being Trained/Tested:** Communication systems			
Standard Operating Procedures *(Section 2.3.3)*	Aircraft safety Unmanned aerial, surface, and subsurface vehicle safety	**Typical Locations**		
		Range Complexes/Testing Ranges: Gulf of Mexico Jacksonville Key West Virginia Capes	**Inshore Waters/Pierside:** None	
Stressors to Biological Resources and Habitats	**Acoustic:** Aircraft noise **Explosives:** None	**Physical Disturbance and Strike:** Aircraft and aerial target strike **Ingestion:** None	**Energy:** In-air electromagnetic devices **Entanglement:** None	
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** None		
Stressors to Human Resources	**Cultural Resources:** None	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-air energy	
Military Expended Material	**Ingestible Material:** None **Non-Ingestible Material:** None	**Military Recoverable Material**	None	

Other Testing Activities	
Shipboard Electronic Systems Evaluation	
Sonar and Other Transducer Bins	None
In-Water Explosive Bins	None
Procedural Mitigation Measures	None
Assumptions Used for Analysis	Surface targets consist of Navy vessels accounted for in unit level training activities.

A.3.1.6.5 Undersea Range System Test

Other Testing Activities			
Undersea Range System Test			
Short Description	Following installation of a Navy undersea warfare training and testing range, tests of the nodes (components of the range) are conducted to include node surveys and testing of node transmission functionality.	**Typical Duration**	8 hours
Long Description	The bottom-mounted bi-directional nodes are surveyed post-installation utilizing a range pinger and tested to establish system parameters and baseline hearing ranges. Each acoustic projector is activated at full power while listening is occurring on adjacent hydrophones. The nodes may also be activated during periodic operational and maintenance checks and following significant weather events to confirm that nodes are located correctly and functioning properly prior to ongoing training or testing.		
Typical Components	**Platforms:** Surface combatants **Targets:** None **Systems being Trained/Tested:** Undersea range instrumentation		
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety	**Typical Locations** **Range Complexes/Testing Ranges:** Jacksonville	**Inshore Waters/Pierside:** None
Stressors to Biological Resources and Habitats	**Acoustic:** Sonar and other transducers Vessel noise **Explosives:** None	**Physical Disturbance and Strike:** Vessel and in-water device strike **Ingestion:** None	**Energy:** In-air electromagnetic devices **Entanglement:** None
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** None	
Stressors to Human Resources	None		
Military Expended Material	**Ingestible Material:** None **Non-Ingestible Material:** None	**Military Recoverable Material**	None
Sonar and Other Transducer Bins	None		
In-Water Explosive Bins	None		
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement	**Acoustic Stressors:** *(Section 5.3.2)* Active sonar	

Other Testing Activities	
Undersea Range System Test	
Assumptions Used for Analysis	The duration of the node survey varies. Stressors to human resources were not analyzed for this activity since it occurs greater than 12 NM from shore.

A.3.2 NAVAL SEA SYSTEMS COMMAND TESTING ACTIVITIES

A.3.2.1 Anti-Submarine Warfare

A.3.2.1.1 Anti-Submarine Warfare Mission Package Testing

Anti-Submarine Warfare			
Anti-Submarine Warfare Mission Package Testing			
Short Description	Ships and their supporting platforms (e.g., helicopters, unmanned aerial systems) detect, localize, and attack submarines.	**Typical Duration**	1-2 weeks, with 4-8 hours of active sonar use with intervals of non-activity in between
Long Description	Littoral combat ships conduct detect-to-engage operations against modern diesel-electric and nuclear submarines using airborne and surface assets (both manned and unmanned). Active and passive acoustic systems are used to detect and track submarine targets, culminating in the deployment of lightweight torpedoes to engage the threat.		
Typical Components	**Platforms:** Rotary-wing aircraft, surface combatants, unmanned aerial systems, unmanned surface vehicles **Targets:** Sub-surface targets **Systems being Trained/Tested:** Sonar systems, countermeasure systems, torpedo systems, sonobuoys		
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety Aircraft safety Unmanned aerial, surface, and subsurface vehicle safety Towed in-water device safety	**Typical Locations**	**Range Complexes/Testing Ranges:** Jacksonville Virginia Capes Naval Undersea Warfare Center Division, Newport **Inshore Waters/Pierside:** Newport, Rhode Island
Stressors to Biological Resources and Habitats	**Acoustic:** Sonar and other transducers Aircraft noise Vessel noise **Explosives:** None	**Physical Disturbance and Strike:** Aircraft and aerial target strike Vessel and in-water device strike Military expended material **Ingestion:** Military expended materials – other than munitions	**Energy:** In-air electromagnetic devices **Entanglement:** Wires and cables Decelerators/parachutes
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** Chemicals other than explosives Metals Other materials	
Stressors to Human Resources	**Cultural Resources:** Physical disturbance and strike	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-air energy In-water energy
Military Expended Material	**Ingestible Material:** Decelerators/parachutes - small **Non-Ingestible Material:** Sonobuoys (non-explosive), sonobuoy wires, expendable bathythermographs, expendable bathythermograph wires, lightweight torpedo accessories	**Military Recoverable Material**	Lightweight torpedoes (non-explosive)

Anti-Submarine Warfare					
Anti-Submarine Warfare Mission Package Testing					
Sonar and Other Transducer Bins	**Mid-Frequency:**		**Anti-Submarine Warfare:**		**Torpedoes:**
	MF1	MF5	ASW1	ASW3	TORP1
	MF4	MF12	ASW2	ASW5	
In-Water Explosive Bins	None				
Procedural Mitigation Measures	**Acoustic Stressors:** *(Section 5.3.2)* Active sonar			**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement Towed in-water devices	
Assumptions Used for Analysis	All sonobuoys have parachutes unless otherwise noted. Sub-surface targets are submarines.				

A.3.2.1.2 At-Sea Sonar Testing

Anti-Submarine Warfare			
At-Sea Sonar Testing			
Short Description	At-sea testing to ensure systems are fully functional in an open ocean environment.	**Typical Duration**	From 4 hours to 11 days
Long Description	At-sea sonar testing is required to calibrate or document the functionality of sonar and torpedo systems while the ship or submarine is in an open ocean environment. At-sea sonar testing is conducted to verify the ship meets design acoustic specifications, define the underwater characteristics of the ship, determine effects of systems and equipment on ship's acoustic characteristics, and provide technical background necessary to initiate development of design improvements to reduce noise. Tests also consist of electronic support measurement, photonics, and sonar sensor accuracy testing. In some instances, a submarine's passive detection capability is tested when a second submarine utilizes its active sonar or is equipped with a noise augmentation system in order to replicate acoustic or electromagnetic signatures of other vessel types or classes.		
Typical Components	**Platforms:** Submarines, surface combatants, support craft **Targets:** Sub-surface targets, surface targets **Systems being Trained/Tested:** Sonar systems, acoustic countermeasures, sonobuoys, acoustic modems, torpedo systems, underwater communication systems, electromagnetic devices		
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety Towed in-water device safety	**Typical Locations**	
		Range Complexes/Testing Ranges: Gulf of Mexico Jacksonville Navy Cherry Point Northeast Virginia Capes Naval Undersea Warfare Center Division, Newport South Florida Ocean Measurement Facility Offshore of Fort Pierce, Florida	**Inshore Waters/Pierside:** None
Stressors to Biological Resources and Habitats	**Acoustic:** Sonar and other transducers Vessel noise **Explosives:** None	**Physical Disturbance and Strike:** Vessel and in-water device strike Military expended material **Ingestion:** Military expended materials – other than munitions	**Energy:** In-water electromagnetic devices In-air electromagnetic devices **Entanglement:** Wires and cables Decelerators/parachutes
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** Metals Chemicals other than explosives Other materials	
Stressors to Human Resources	**Cultural Resources:** Physical disturbance and strike	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-air energy In-water energy

Anti-Submarine Warfare			
At-Sea Sonar Testing			
Military Expended Material	**Ingestible Material:** Decelerators/parachutes - small **Non-Ingestible Material:** Acoustic countermeasures, expendable bathythermographs, expendable bathythermograph wires, heavyweight torpedo accessories, lightweight torpedo accessories, guidance wires, sonobuoys (non-explosive), sonobuoy wires, sub-surface target (mobile)	**Military Recoverable Material**	Electromagnetic devices, heavyweight torpedoes (non-explosive), surface launched lightweight (non-explosive) torpedoes
Sonar and Other Transducer Bins	**Mid-Frequency:** MF1 MF5 MF1K MF9 MF3 **Torpedoes:** TORP2	**Low-Frequency:** LF5 **High-Frequency:** HF1	**Anti-Submarine Warfare:** ASW3 ASW4 **Acoustic Modems:** M3
In-Water Explosive Bins	None		
Procedural Mitigation Measures	**Acoustic Stressors:** *(Section 5.3.2)* Active sonar	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement Towed in-water devices	
Assumptions Used for Analysis	Active sonar use is intermittent throughout the duration of the event.		

A.3.2.1.3 Countermeasure Testing

Anti-Submarine Warfare			
Countermeasure Testing			
Short Description	Countermeasure testing involves the testing of systems that will detect, localize, and track incoming weapons, including marine vessel targets. Testing includes surface ship torpedo defense systems and marine vessel stopping payloads.	**Typical Duration**	From 4 hours to 6 days, depending on the countermeasure being tested
Long Description	Countermeasure testing involves the testing of systems that will detect, localize, and track incoming weapons, including marine vessel targets. At-sea testing of the Surface Ship Torpedo Defense systems includes towed acoustic systems, torpedo warning systems, and countermeasure anti-torpedo subsystems. Some countermeasure scenarios would employ non-explosive torpedoes against targets released by secondary platforms (helicopter or submarine). While surface vessels are in transit, countermeasure systems may be used to identify false alert rates. Testing of the maritime vessel stopping payloads will deliver the appropriate measure(s) to affect a target vessel's propulsion and associated control surfaces to significantly slow and potentially stop the advance of the vessel.		
Typical Components	**Platforms:** Aircraft carriers, support craft, surface combatants **Targets:** Sub-surface targets, surface targets **Systems being Trained/Tested:** Sonar systems, countermeasures, torpedo systems		
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety Towed in-water device safety	**Typical Locations**	**Range Complexes/Testing Ranges:** Key West Gulf of Mexico Jacksonville Northeast Virginia Capes Naval Undersea Warfare Center Division, Newport **Inshore Waters/Pierside:** None
Stressors to Biological Resources and Habitats	**Acoustic:** Sonar and other transducers Vessel noise **Explosives:** None	**Physical Disturbance and Strike:** Vessel and in-water device strike Military expended material **Ingestion:** Military expended materials – other than munitions	**Energy:** In-air electromagnetic devices **Entanglement:** Wires and cables Decelerators/parachutes Biodegradable polymer
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** Metals Chemicals other than explosives Other materials	
Stressors to Human Resources	**Cultural Resources:** Physical disturbance and strike	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-air energy In-water energy

<table>
<tr><th colspan="6">Anti-Submarine Warfare</th></tr>
<tr><th colspan="6">Countermeasure Testing</th></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
Biodegradable polymer

Non-Ingestible Material:
Anti-torpedo torpedoes, anti-torpedo torpedo accessories, heavyweight torpedo accessories, guidance wires, sub-surface targets (mobile)</td><td>Military Recoverable Material</td><td colspan="2">Heavyweight torpedoes (non-explosive)</td></tr>
<tr><td>Sonar and Other Transducer Bins</td><td>High-Frequency:
HF5</td><td>Anti-Submarine Warfare:
ASW3</td><td>Torpedoes:
TORP1</td><td>TORP2</td><td></td></tr>
<tr><td>In-Water Explosive Bins</td><td colspan="5">None</td></tr>
<tr><td>Procedural Mitigation Measures</td><td colspan="2">Acoustic Stressors: (Section 5.3.2)
Active sonar</td><td colspan="3">Physical Disturbance and Strike: (Section 5.3.4)
Vessel movement
Towed in-water devices</td></tr>
<tr><td>Assumptions Used for Analysis</td><td colspan="5">Not all events will include the use of sonar and other transducers.</td></tr>
</table>

A.3.2.1.4 Pierside Sonar Testing

Anti-Submarine Warfare				
Pierside Sonar Testing				
Short Description	Pierside testing to ensure systems are fully functional in a controlled pierside environment prior to at-sea test activities.		**Typical Duration**	Up to 3 weeks total per ship, with each source run independently and not continuously during this time
Long Description	Ships and submarines would activate mid- and high-frequency tactical sonars, underwater communications systems, and navigational devices to ensure they are fully functional prior to at-sea test events. Testing may also include the firing of inert torpedo shapes. Event duration varies; with average durations of 3 weeks with active sonar used intermittently over 2 days during the total event duration. This also includes pierside sonar testing during surface combatant sea trials.			
Typical Components	**Platforms:** Moored platforms, submarines, surface combatants **Targets:** None **Systems being Trained/Tested:** Sonar systems, acoustic modems, underwater communication systems			
Standard Operating Procedures *(Section 2.3.3)*	None	**Typical Locations**		
		Range Complexes/Testing Ranges: None		**Inshore Waters/Pierside:** Bath, Maine Groton, Connecticut Kings Bay, Georgia Newport, Rhode Island Norfolk, Virginia Pascagoula, Mississippi Port Canaveral, Florida Kittery, Maine
Stressors to Biological Resources and Habitats	**Acoustic:** Sonar and other transducers **Explosives:** None	**Physical Disturbance and Strike:** None **Ingestion:** None		**Energy:** None **Entanglement:** None
Stressors to Physical Resources	**Air Quality:** None	**Sediments and Water Quality:** None		
Stressors to Human Resources	**Cultural Resources:** None	**Socioeconomic Resources:** None		**Public Health and Safety:** In-water energy
Military Expended Material	**Ingestible Material:** None **Non-Ingestible Material:** None	**Military Recoverable Material**	None	
Sonar and Other Transducer Bins	**Mid-Frequency:** MF1 MF9 MF1K MF10 MF3	**High-Frequency:** HF1 HF8 HF3		**Acoustic Modems:** M3 **Anti-Submarine Warfare:** ASW3

Anti-Submarine Warfare	
Pierside Sonar Testing	
In-Water Explosive Bins	None
Procedural Mitigation Measures	**Acoustic Stressors:** *(Section 5.3.2)* Active sonar
Assumptions Used for Analysis	Event duration is 3 weeks with active sonar used intermittently. The facility platform may be a dock or other structure.

A.3.2.1.5 Submarine Sonar Testing/Maintenance

Anti-Submarine Warfare				
Submarine Sonar Testing/Maintenance				
Short Description	Pierside testing of submarine systems occurs periodically following major maintenance periods and for routine maintenance.	**Typical Duration**	Up to three weeks, with intermittent use of active sonar	
Long Description	Following major and routine maintenance periods, pierside testing and maintenance is required. Multiple systems with active and passive acoustic sources such as navigation systems, fathometers, underwater communications systems, underwater distress beacons, range finders, and other similar systems, will be tested.			
Typical Components	**Platforms:** Submarines **Targets:** None **Systems being Trained/Tested:** Sonar systems, acoustic modems			
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety	**Typical Locations**		
		Range Complexes/Testing Ranges: None	**Inshore Waters/Pierside:** Norfolk, Virginia Kittery, Maine	
Stressors to Biological Resources and Habitats	**Acoustic:** Sonar and other transducers	**Physical Disturbance and Strike:** None	**Energy:** None	
		Ingestion: None	**Entanglement:** None	
	Explosives: None			
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** None		
Stressors to Human Resources	**Cultural Resources:** None	**Socioeconomic Resources:** None	**Public Health and Safety:** In-water energy Physical interactions	
Military Expended Material	**Ingestible Material:** None	**Military Recoverable Material**	None	
	Non-Ingestible Material: None			
Sonar and Other Transducer Bins	**Mid-Frequency:** MF3	**High-Frequency:** HF1 HF3	**Acoustic Modems:** M3	
In-Water Explosive Bins	None			
Procedural Mitigation Measures	**Acoustic Stressors:** *(Section 5.3.2)* Active sonar			
Assumptions Used for Analysis	Sonar would not be used continuously throughout the duration of the test.			

A.3.2.1.6 Surface Ship Sonar Testing/Maintenance

Anti-Submarine Warfare			
Surface Ship Sonar Testing/Maintenance			
Short Description	Pierside and at-sea testing of ship systems occurs periodically following major maintenance periods and for routine maintenance.	**Typical Duration**	Up to 3 weeks, with intermittent use of active sonar
Long Description	Following major and routine maintenance periods, pierside and at-sea testing and maintenance is required. Multiple systems with active and passive acoustic sources such as tactical sonar, navigation systems, fathometers, underwater communications systems, underwater distress beacons, range finders, and other similar systems, will be tested.		
Typical Components	**Platforms:** Surface combatants **Targets:** None **Systems being Trained/Tested:** Sonar systems, acoustic countermeasures, underwater communication systems		
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety	**Typical Locations** **Range Complexes/Testing Ranges:** Jacksonville Virginia Capes **Inshore Waters/Pierside:** Mayport, Florida Norfolk, Virginia	
Stressors to Biological Resources and Habitats	**Acoustic:** Sonar and other transducers Vessel noise **Explosives:** None	**Physical Disturbance and Strike:** Vessel and in-water device strike **Ingestion:** None	**Energy:** In-air electromagnetic devices **Entanglement:** None
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** None	
Stressors to Human Resources	**Cultural Resources:** None	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-air energy In-water energy
Military Expended Material	**Ingestible Material:** None **Non-Ingestible Material:** None	**Military Recoverable Material**	None
Sonar and Other Transducer Bins	**Mid-Frequency:** MF1 MF9 MF1K MF10	**Anti-Submarine Warfare:** ASW3	
In-Water Explosive Bins	None		
Procedural Mitigation Measures	**Acoustic Stressors:** *(Section 5.3.2)* Active sonar	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement	

Anti-Submarine Warfare	
Surface Ship Sonar Testing/Maintenance	
Assumptions Used for Analysis	Sonar will not be continuously active for the duration of the test.

A.3.2.1.7 Torpedo (Explosive) Testing

Anti-Submarine Warfare			
Torpedo (Explosive) Testing			
Short Description	Air, surface, or submarine crews employ explosive and non-explosive torpedoes against artificial targets.	**Typical Duration**	1-2 days during daylight hours
Long Description	Non-explosive and explosive torpedoes (carrying a warhead) will be launched at a suspended target by a submarine and fixed- or rotary-wing aircraft or surface combatants. Event duration is 1 to 2 days during daylight hours.		
Typical Components	**Platforms:** Fixed-wing aircraft, moored platforms, rotary-wing aircraft, submarines, support craft, surface combatants **Targets:** Sub-surface targets, surface targets **Systems being Trained/Tested:** Sonar systems, acoustic countermeasures, sonobuoys, torpedo systems		
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety Aircraft safety Weapons firing safety	**Typical Locations**	
		Range Complexes/Testing Ranges: Gulf of Mexico Jacksonville Key West Navy Cherry Point Northeast Virginia Capes Offshore of Fort Pierce, Florida	**Inshore Waters/Pierside:** None
Stressors to Biological Resources and Habitats	**Acoustic:** Sonar and other transducers Aircraft noise Vessel noise **Explosives:** In-water explosives	**Physical Disturbance and Strike:** Aircraft and aerial target strike Vessel and in-water device strike Military expended material **Ingestion:** Military expended materials – munitions Military expended materials – other than munitions	**Energy:** In-air electromagnetic devices **Entanglement:** Wires and cables Decelerators/parachutes
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediment and Water Quality:** Explosives and explosive byproducts Chemicals other than explosives Metals Other materials	
Stressors to Human Resources	**Cultural Resources:** Physical disturbance and strike Explosives	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-air energy In-water energy

<table>
<tr><th colspan="6">Anti-Submarine Warfare</th></tr>
<tr><th colspan="6">Torpedo (Explosive) Testing</th></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
Decelerators/parachutes - small, target fragments, heavyweight torpedo (explosive) fragments, lightweight torpedo (explosive) fragments

Non-Ingestible Material:
Sonobuoys (non-explosive), sonobuoy wire, anti-torpedo torpedoes, anti-torpedo torpedo accessories, guidance wires, expendable bathythermographs, expendable bathythermograph wires, heavyweight torpedo accessories, lightweight torpedo accessories, surface targets (mobile and stationary), sub-surface targets (mobile)</td><td>Military Recoverable Material</td><td colspan="2">Heavyweight torpedoes (non-explosive), lightweight torpedoes (non-explosive)</td></tr>
<tr><td>Sonar and Other Transducer Bins</td><td colspan="5">Mid-Frequency:
MF1 MF5
MF3 MF6
MF4

High-Frequency:
HF1 HF6
HF5

Anti-Submarine Warfare:
ASW3

Torpedoes:
TORP1 TORP2</td></tr>
<tr><td>In-Water Explosive Bins</td><td colspan="5">E8 E11</td></tr>
<tr><td>Procedural Mitigation Measures</td><td colspan="3">Acoustic Stressors: (Section 5.3.2)
Active sonar</td><td colspan="2">Physical Disturbance and Strike: (Section 5.3.4)
Vessel movement

Explosive Stressors: (Section 5.3.3)
Explosive torpedoes</td></tr>
<tr><td>Assumptions Used for Analysis</td><td colspan="5">All sonobuoys have parachutes unless otherwise noted.
Only one heavyweight torpedo test could occur in 1 day; two heavyweight torpedo tests could occur on consecutive days. Two lightweight torpedo tests could occur in a single day.
All non-explosive torpedoes are recovered.</td></tr>
</table>

A.3.2.1.8 Torpedo (Non-Explosive) Testing

Anti-Submarine Warfare			
Torpedo (Non- Explosive) Testing			
Short Description	Air, surface, or submarine crews employ non-explosive torpedoes against submarines, surface vessels or artificial targets.	**Typical Duration**	Up to 2 weeks
Long Description	Aerial, surface, and subsurface assets fire exercise torpedoes against surface or subsurface targets or at no target and programmed with a particular run geometry. Torpedo testing evaluates the performance and the effectiveness of hardware and software upgrades of heavyweight or lightweight torpedoes. It also includes testing of experimental torpedoes. Not all torpedo tests involve acoustics. Exercise torpedoes are recovered, typically from surface ships and helicopters that are specifically crewed and outfitted for torpedo recovery. Event duration is dependent on number of torpedoes fired.		
Typical Components	**Platforms:** Fixed-wing patrol aircraft, moored platforms, rotary-wing aircraft, submarines, support craft, surface combatants **Targets:** Sub-surface targets, surface targets **Systems being Trained/Tested:** Sonar systems, acoustic countermeasures, sonobuoys, torpedoes		
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety Aircraft safety Weapons firing safety	**Typical Locations**	
		Range Complexes/Testing Ranges: Gulf of Mexico Navy Cherry Point Northeast Virginia Capes Naval Undersea Warfare Center Division, Newport Offshore of Fort Pierce, Florida	**Inshore Waters/Pierside:** None
Stressors to Biological Resources and Habitats	**Acoustic:** Sonar and other transducers Aircraft noise Vessel noise **Explosives:** None	**Physical Disturbance and Strike:** Aircraft and aerial target strike Vessel and in-water device strike Military expended material **Ingestion:** Military expended materials – other than munitions	**Energy:** In-air electromagnetic devices **Entanglement:** Wires and cables Decelerators/parachutes
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediment and Water Quality:** Metals Other materials	Chemicals other than explosives
Stressors to Human Resources	**Cultural Resources:** Physical disturbance and strike	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-air energy In-water energy

<table>
<tr><th colspan="5">Anti-Submarine Warfare</th></tr>
<tr><th colspan="5">Torpedo (Non- Explosive) Testing</th></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
Decelerators/parachutes - small

Non-Ingestible Material:
Acoustic countermeasures, expendable bathythermographs, expendable bathythermograph wires, heavyweight torpedo accessories, guidance wires, lightweight torpedo accessories, sonobuoys (non-explosive), sonobuoy wires, sub-surface targets (mobile and stationary)</td><td>Military Recoverable Material</td><td>Heavyweight torpedoes (non-explosive), lightweight torpedoes (non-explosive), acoustic countermeasures</td></tr>
<tr><td>Sonar and Other Transducer Bins</td><td colspan="4">Mid-Frequency:
MF1 MF5
MF3 MF6
MF4

High-Frequency:
HF1 HF6

Anti-Submarine Warfare:
ASW3 ASW4

Torpedoes:
TORP1
TORP2
TORP3</td></tr>
<tr><td>In-Water Explosive Bins</td><td colspan="4">None</td></tr>
<tr><td>Procedural Mitigation Measures</td><td colspan="4">Acoustic Stressors: (Section 5.3.2)
Active sonar

Physical Disturbance and Strike: (Section 5.3.4)
Vessel movement</td></tr>
<tr><td>Assumptions Used for Analysis</td><td colspan="4">All torpedoes are recovered.
Events can last up to two weeks and use up to 40 torpedoes. Typically, no more than eight torpedoes are fired per day during daylight hours.</td></tr>
</table>

A.3.2.2 Electronic Warfare

A.3.2.2.1 Radar and Other System Testing

Electronic Warfare			
Radar and Other System Testing			
Short Description	Test may include use of military or commercial radar, communication systems (or simulators), or high-energy lasers. Testing may occur aboard a ship against drones, small boats, rockets, missiles, or other targets.	**Typical Duration**	12 hours per day over a 7-day period
Long Description	At-sea and docked testing may include use of military or commercial radar, communication systems (or simulators), or high-energy lasers. No subsurface transmission will occur during this testing. Testing of various air and surface targets may include unmanned aerial vehicles, missiles, or small craft (floating cardboard triwalls, towed, anchored, or self-propelled vessels). High-energy laser testing may include tracking, scoring, and neutralization runs with single or multiple targets.		
Typical Components	**Platforms:** Combat logistics ships, rotary-wing aircraft, small boats, submarines, surface combatants **Targets:** Air targets, surface targets **Systems being Trained/Tested:** Radar, high-energy lasers		
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety Aircraft safety High-energy laser safety Towed in-water device safety	**Typical Locations**	**Range Complexes/Testing Ranges:** Gulf of Mexico Jacksonville Key West Navy Cherry Point Northeast Virginia Capes Naval Surface Warfare Center, Panama City Division Naval Undersea Warfare Center Division, Newport South Florida Ocean Measurement Facility **Inshore Waters/Pierside:** Groton, Connecticut Joint Expeditionary Base Little Creek, Virginia Norfolk, Virginia
Stressors to Biological Resources and Habitats	**Acoustic:** Aircraft noise Vessel noise Weapons noise **Explosives:** In-air explosives	**Physical Disturbance and Strike:** Aircraft and aerial target strike Vessel and in-water device strike Military expended material **Ingestion:** Military expended materials – munitions Military expended materials – other than munitions	**Energy:** In-air electromagnetic devices In-water electromagnetic devices High-energy lasers **Entanglement:** None
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** Metals Other materials	
Stressors to Human Resources	**Cultural Resources:** Physical disturbance and strike	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-air energy In-water energy

Electronic Warfare			
Radar and Other System Testing			
Military Expended Material	**Ingestible Material:** Per chaff: one chaff-air cartridge, one plastic endcap, chaff fibers; air target (drone) fragments, missile (explosive) fragments **Non-Ingestible Material:** Missiles (non-explosive), kinetic energy rounds, sabots, air target (drone)	**Military Recoverable Material**	Surface target (mobile and stationary), air target (drone)
Sonar and Other Transducer Bins	None		
In-Water Explosive Bins	None		
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement Non-explosive missiles and rockets		
Assumptions Used for Analysis	All explosive missiles detonate in air during this test event. High-energy lasers will not be tested pierside.		

A.3.2.3 Mine Warfare

A.3.2.3.1 Mine Countermeasure and Neutralization Testing

Mine Warfare			
Mine Countermeasure and Neutralization Testing			
Short Description	Air, surface, and subsurface vessels neutralize threat mines and mine-like objects.	**Typical Duration**	1-10 days, with intermittent use of countermeasure/neutralization systems during this period
Long Description	Mine countermeasure-neutralization and mine system testing is required to ensure systems can effectively neutralize threat (live or inert) mines that will otherwise restrict passage through an area and to ensure U.S. Navy mines remain effective against enemy ships. These systems may be deployed with a variety of ships, aircraft, submarines, or unmanned autonomous vehicles and operate in water depths up to 6,000 feet. Mines are neutralized by cutting mooring cables of buoyant mines, producing acoustic energy that fires acoustic-influence mines, employing radar or laser fields, producing electrical energy to replicate the magnetic signatures of surface ships in order to detonate threat mines, detonation of mines using remotely-operated vehicles, and using explosive charges to destroy threat mines.		
Typical Components	**Platforms:** Surface combatants, submarines, unmanned autonomous vehicle, moored platforms, fixed-wing aircraft, rotary-wing aircraft **Targets:** Mine shapes **Systems being Trained/Tested:** Electromagnetic devices, radar, low energy lasers		
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety Aircraft safety Unmanned aerial, surface, and subsurface vehicle safety Towed in-water device safety	**Typical Locations** **Range Complexes/Testing Ranges:** Virginia Capes Naval Surface Warfare Center, Panama City Division	**Inshore Waters/Pierside:** None
Stressors to Biological Resources and Habitats	**Acoustic:** Sonar and other transducers Aircraft noise Vessel noise **Explosives:** In-water explosives	**Physical Disturbance and Strike:** Aircraft and aerial target strike Vessel and in-water device strike Military expended material Seafloor devices **Ingestion:** Military expended materials – other than munitions	**Energy:** In-water electromagnetic devices In-air electromagnetic devices **Entanglement:** Wires and cables
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediment and Water Quality:** Explosives and explosive byproducts Chemicals other than explosives Other materials Metals	
Stressors to Human Resources	**Cultural Resources:** Physical disturbance and strike Explosives	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-air energy In-water energy

Mine Warfare			
Mine Countermeasure and Neutralization Testing			
Military Expended Material	**Ingestible Material:** Neutralizer (explosive) fragments, mine shape (explosive) **Non-Ingestible Material:** Fiber optic cables, fiber optic cans, mine shapes (non-explosive), anchor - mine	**Military Recoverable Material**	Mine shapes (non-explosive)
Sonar and Other Transducer Bins	None		
In-Water Explosive Bins	E4 E11		
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement Towed in-water devices	**Explosive Stressors:** *(Section 5.3.3)* Explosive mine countermeasure and neutralization activities	
Assumptions Used for Analysis	None		

A.3.2.3.2 Mine Countermeasure Mission Package Testing

Mine Warfare			
Mine Countermeasure Mission Package Testing			
Short Description	Vessels and associated aircraft conduct mine countermeasure operations.	**Typical Duration**	1-2 weeks with intervals of mine countermeasure mission package use during this time
Long Description	Littoral Combat Ships conduct mine detection using unmanned submersible and aerial vehicles, magnetic and acoustic sensor systems deployed by vessel or support helicopters, and laser systems. Mines are then neutralized using magnetic, acoustic, and supercavitating systems.		
Typical Components	**Platforms:** Rotary-wing aircraft, surface combatants, unmanned aerial systems, unmanned underwater vehicles, unmanned surface vehicles **Targets:** Mine shapes **Systems being Trained/Tested:** Sonar systems		
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety Aircraft safety Unmanned aerial, surface, and subsurface vehicle safety Towed in-water device safety	**Typical Locations**	**Range Complexes/Testing Ranges:** Gulf of Mexico Jacksonville Virginia Capes Naval Surface Warfare Center, Panama City Division South Florida Ocean Measurement Facility **Inshore Waters/Pierside:** None
Stressors to Biological Resources and Habitats	**Acoustic:** Sonar and other transducers Aircraft noise Vessel noise **Explosives:** In-water explosives	**Physical Disturbance and Strike:** Aircraft and aerial target strike Vessel and in-water device strike Military expended material Seafloor devices **Ingestion:** Military expended materials – other than munitions	**Energy:** In-air electromagnetic devices **Entanglement:** Wires and cables
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and water Quality:** Explosives and explosive byproducts Chemicals other than explosives Other materials Metals	
Stressors to Human Resources	**Cultural Resources:** Physical disturbance and strike Explosives	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-air energy In-water energy
Military Expended Material	**Ingestible Material:** Neutralizer (explosive) fragments **Non-Ingestible Material:** Fiber optic cables, fiber optic can, mine shapes (non-explosive)	**Military Recoverable Material**	Mine shapes (non-explosive)
Sonar and Other Transducer Bins	**High-Frequency:** HF4	**Synthetic Aperture Sonars:** SAS2	

Mine Warfare		
Mine Countermeasure Mission Package Testing		
In-Water Explosive Bins	E4	
Procedural Mitigation Measures	**Acoustic Stressors:** *(Section 5.3.2)* Active sonar **Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement Towed in-water devices	**Explosive Stressors:** *(Section 5.3.3)* Explosive mine countermeasure and neutralization activities
Assumptions Used for Analysis	8 charges per event The in-air low-energy laser stressor was used in analysis of potential impacts on human resources.	

A.3.2.3.3 Mine Detection and Classification Testing

<table>
<tr><th colspan="5">Mine Warfare</th></tr>
<tr><th colspan="5">Mine Detection and Classification Testing</th></tr>
<tr><td>Short Description</td><td colspan="2">Air, surface, and subsurface vessels detect and classify mines and mine-like objects. Vessels also assess their potential susceptibility to mines and mine-like objects.</td><td colspan="2">Typical Duration
Up to 24 days, with up to 12 hours of acoustic activity each day</td></tr>
<tr><td>Long Description</td><td colspan="4">Mine detection and classification systems require testing to evaluate the capability of generating underwater magnetic and acoustic signature fields as well as sonar systems that can detect, and classify a wide range of threat mines at tactically different water depths. Surface craft may deploy an underwater sensor system that uses ship signature to develop a susceptibility profile against mine-like objects. In order to develop better and safer methods of minesweeping, the Navy is currently testing new systems to detect locate, identify, and avoid mines including a laser airborne mine detection system that uses laser illumination coupled with sensitive electro-optic receivers to find mines in the upper part of the water column. This type of equipment has traditionally been designed for operation from a manned helicopter; however, the Navy is developing the capability to operate from unmanned aerial systems.</td></tr>
<tr><td>Typical Components</td><td colspan="4">Platforms: Moored platforms, rotary-wing aircraft, sea basing ships, small boats, submarines, support craft, surface combatants, remotely operated vehicles, unmanned aerial systems, unmanned underwater vehicles
Targets: Mine shapes
Systems being Trained/Tested: Sonar systems, low-energy lasers</td></tr>
<tr><td>Standard Operating Procedures (Section 2.3.3)</td><td colspan="2">Vessel safety
Aircraft safety
Unmanned aerial, surface, and subsurface vehicle safety</td><td colspan="2">Typical Locations
Range Complexes/Testing Ranges:
Gulf of Mexico
Navy Cherry Point
Virginia Capes
Naval Surface Warfare Center, Panama City Division
South Florida Ocean Measurement Facility
Offshore of Riviera Beach, Florida
Inshore Waters/Pierside:
None</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td>Acoustic:
Sonar and other transducers
Aircraft noise
Vessel noise

Explosives:
None</td><td>Physical Disturbance and Strike:
Aircraft and aerial target strike
Vessel and in-water device strike
Seafloor devices

Ingestion:
None</td><td colspan="2">Energy:
In-air electromagnetic devices
In-water electromagnetic devices

Entanglement:
None</td></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="2">Air Quality:
Criteria air pollutants</td><td colspan="2">Sediments and Water Quality:
None</td></tr>
<tr><td>Stressors to Human Resources</td><td>Cultural resources:
Physical disturbance and strike</td><td>Socioeconomic Resources:
Accessibility
Airborne acoustics
Physical disturbance and strike</td><td colspan="2">Public Health and Safety:
Physical interactions
In-air energy
In-water energy</td></tr>
</table>

<table>
<tr><th colspan="4">Mine Warfare</th></tr>
<tr><th colspan="4">Mine Detection and Classification Testing</th></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
None

Non-Ingestible Material:
None</td><td>Military Recoverable Material</td><td>Mine shapes (non-explosive)</td></tr>
<tr><td>Sonar and Other Transducer Bins</td><td colspan="4">Mid-Frequency:
MF1 MF9
MF1K

High-Frequency:
HF1 HF8
HF4</td></tr>
<tr><td>In-Water Explosive Bins</td><td colspan="4">None</td></tr>
<tr><td>Procedural Mitigation Measures</td><td colspan="2">Acoustic Stressors: (Section 5.3.2)
Active sonar</td><td colspan="2">Physical Disturbance and Strike: (Section 5.3.4)
Vessel movement</td></tr>
<tr><td>Assumptions Used for Analysis</td><td colspan="4">Some mine shapes could be deployed for a specific event, and then retrieved afterwards. However, some mine shapes are left in place so that multiple events can use the same shapes without needing to redeploy.
The in-air low-energy laser stressor was used in analysis of potential impacts on human resources.</td></tr>
</table>

A.3.2.4 Surface Warfare

A.3.2.4.1 Gun Testing – Large-Caliber

Surface Warfare				
Gun Testing – Large-Caliber				
Short Description	Surface crews test large-caliber guns to defend against surface targets with large-caliber guns.	**Typical Duration**	1-2 weeks	
Long Description	Surface combatants conduct surface warfare by detecting, tracking, and prosecuting small-boat threats. Gun testing may also include the surface warfare mission package for the Littoral Combat Ship, which provides a layered strike-defensive capability by use of its embarked support aircraft, medium range surface-to-surface missiles, and 57 millimeter gun weapon system.			
Typical Components	**Platforms:** Surface combatants **Targets:** Surface targets **Systems being Trained/Tested:** None			
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety Weapons firing safety Towed in-water device safety	**Typical Locations**		
		Range Complexes/Testing Ranges: Gulf of Mexico Jacksonville Key West Navy Cherry Point Northeast Virginia Capes Naval Surface Warfare Center, Panama City Division	**Inshore Waters/Pierside:** None	
Stressors to Biological Resources and Habitats	**Acoustic:** Vessel noise Weapons noise **Explosives:** In-water explosives In-air explosives	**Physical Disturbance and Strike:** Vessel and in-water device strike Military expended material **Ingestion:** Military expended materials – munitions Military expended materials – other than munitions	**Energy:** In-air electromagnetic devices **Entanglement:** None	
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** Explosives and explosive byproducts Chemicals other than explosives Other materials Metals		
Stressors to Human Resources	**Cultural Resources:** Explosives Physical disturbance and strike	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-air energy In-water energy	
Military Expended Material	**Ingestible Material:** Large-caliber projectile (explosive) fragments, surface target (stationary) fragments **Non-Ingestible Material:** Surface target (stationary), large-caliber (non-explosive) projectiles, large-caliber casings	**Military Recoverable Material**	Surface target (mobile)	

Surface Warfare		
Gun Testing – Large-Caliber		
Sonar and Other Transducer Bins	None	
In-Water Explosive Bins	E3 E5	
Procedural Mitigation Measures	**Acoustic Stressors:** *(Section 5.3.2)* Weapons firing **Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement Small-, medium-, and large-caliber non-explosive practice munitions	**Explosive Stressors:** *(Section 5.3.3)* Explosive medium- and large-caliber munitions
Assumptions Used for Analysis	None	

A.3.2.4.2 Gun Testing – Medium-Caliber

Surface Warfare			
Gun Testing – Medium-Caliber			
Short Description	Surface crews defend against surface targets with medium-caliber guns.	**Typical Duration**	1-2 weeks, with intervals of surface warfare mission package use during this time
Long Description	Surface combatants conduct surface warfare by detecting, tracking, and prosecuting small-boat threats. Gun testing may also include the surface warfare mission package on the Littoral Combat Ship, which provides a layered strike-defensive capability by use of its embarked support aircraft, medium range surface-to-surface missiles, and 30 mm gun weapon system.		
Typical Components	**Platforms:** Surface combatants, rotary-wing aircraft, support craft **Targets:** Surface targets **Systems being Trained/Tested:** None		
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety Weapons firing safety Towed in-water device safety	**Typical Locations** **Range Complexes/Testing Ranges:** Gulf of Mexico Jacksonville Key West Navy Cherry Point Northeast Virginia Capes Naval Surface Warfare Center, Panama City Division	**Inshore Waters/Pierside:** None
Stressors to Biological Resources and Habitats	**Acoustic:** Vessel noise Weapons noise **Explosives:** In-water explosives In-air explosives	**Physical Disturbance and Strike:** Vessel and in-water device strike Military expended material **Ingestion:** Military expended materials – munitions Military expended materials – other than munitions	**Energy:** In-air electromagnetic devices **Entanglement:** None
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** Explosives and explosive byproducts Chemicals other than explosives Other materials Metals	
Stressors to Human Resources	**Cultural Resources:** Physical disturbance and strike Explosives	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-air energy In-water energy
Military Expended Material	**Ingestible Material:** Medium-caliber projectile (explosive) fragments, surface target (stationary) fragments, medium-caliber (non-explosive) projectiles, medium-caliber projectile casings **Non-Ingestible Material:** Surface targets (stationary)	**Military Recoverable Material**	Surface targets (mobile)

Surface Warfare	
Gun Testing – Medium-Caliber	
Sonar and Other Transducer Bins	None
In-Water Explosive Bins	E1
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement Small-, medium-, and large-caliber non-explosive practice munitions **Explosive Stressors:** *(Section 5.3.3)* Explosive medium-caliber and large-caliber projectiles
Assumptions Used for Analysis	50 or 1,400 rounds are expended per event. Events with 1,400 rounds have 700 explosive and 700 non-explosive rounds per event.

A.3.2.4.3 Gun Testing – Small-Caliber

Surface Warfare			
Gun Testing – Small-Caliber			
Short Description	Surface crews defend against surface targets with small-caliber guns	**Typical Duration**	1 day-2 weeks
Long Description	Small-caliber guns are fired from surface vessels. This testing also includes anti-terrorism/force protection. During this event, surface craft surface targets will make threat profile approaches to the ship. Ship will demonstrate small-caliber gun testing with non-explosive rounds against the threat target. Small-caliber gun testing includes other class ship sea trials and surface warfare mission package testing.		
Typical Components	**Platforms:** Sea basing ships, surface combatants, small boats, rotary-wing aircraft **Targets:** Surface targets **Systems being Trained/Tested:** None		
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety Weapons firing safety Towed in-water device safety	**Typical Locations** **Range Complexes/Testing Ranges:** Gulf of Mexico Jacksonville Key West Navy Cherry Point Northeast Virginia Capes Naval Surface Warfare Center, Panama City Division	**Inshore Waters/Pierside:** None
Stressors to Biological Resources and Habitats	**Acoustic:** Vessel noise Weapons noise **Explosives:** None	**Physical Disturbance and Strike:** Vessel and in-water device strike Military expended material **Ingestion:** Military expended materials – munitions Military expended materials – other than munitions	**Energy:** In-air electromagnetic devices **Entanglement:** None
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** Metals Other materials	
Stressors to Human Resources	**Cultural Resources:** Physical disturbance and strike	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-air energy In-water energy
Military Expended Material	**Ingestible Material:** Small-caliber projectiles (non-explosive), small-caliber projectile casings, chaff-ship fibers **Non-Ingestible Material:** Surface target (stationary), chaff-ship cartridge	**Military Recoverable Material**	Surface target (mobile)
Sonar and Other Transducer Bins	None		

Surface Warfare	
Gun Testing – Small-Caliber	
In-Water Explosive Bins	None
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement Small-, medium-, and large-caliber non-explosive practice munitions
Assumptions Used for Analysis	500-1,000 rounds are expended per event. Ships may not be conducting tests consistently for the duration of the event.

A.3.2.4.4 Kinetic Energy Weapon Testing

<table>
<tr><td colspan="6">Surface Warfare</td></tr>
<tr><td colspan="6">Kinetic Energy Weapon Testing</td></tr>
<tr><td>Short Description</td><td colspan="3">A kinetic energy weapon uses stored energy released in a burst to accelerate a projectile.</td><td>Typical Duration
1 day</td><td></td></tr>
<tr><td>Long Description</td><td colspan="5">A kinetic energy weapon uses stored energy released in a burst to accelerate a projectile to more than seven times the speed of sound to a range of up to 200 miles.</td></tr>
<tr><td>Typical Components</td><td colspan="5">Platforms: Surface combatants
Targets: Air targets, surface targets
Systems being Trained/Tested: Kinetic energy weapon</td></tr>
<tr><td>Standard Operating Procedures
(Section 2.3.3)</td><td colspan="2">Vessel safety
Weapons firing safety</td><td colspan="3">Typical Locations
Range Complexes/Testing Ranges:
Gulf of Mexico
Jacksonville
Key West
Navy Cherry Point
Northeast
Virginia Capes
Inshore Waters/Pierside:
None</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td colspan="2">Acoustic:
Vessel noise
Weapons noise

Explosives:
In-air explosives</td><td colspan="2">Physical Disturbance and Strike:
Aircraft and aerial target strike
Vessel and in-water device strike
Military expended material

Ingestion:
Military expended materials – munitions
Military expended materials – other than munitions</td><td>Energy:
In-air electromagnetic devices

Entanglement:
None</td></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="3">Air Quality:
Criteria air pollutants</td><td colspan="2">Sediments and Water Quality:
Metals Other materials</td></tr>
<tr><td>Stressors to Human Resources</td><td>Cultural Resources:
Physical disturbance and strike</td><td colspan="2">Socioeconomic Resources:
Accessibility
Airborne acoustics
Physical disturbance and strike</td><td colspan="2">Public Health and Safety:
Physical interactions
In-air energy
In-water energy</td></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
Surface target (stationary) and air target (drone) fragments, large caliber (explosive) fragments

Non-Ingestible Material:
Air target (drone), kinetic energy rounds, sabot – kinetic energy rounds, surface target (stationary), large caliber casings</td><td>Military Recoverable Material</td><td colspan="2">None</td></tr>
<tr><td>Sonar and Other Transducer Bins</td><td colspan="5">None</td></tr>
</table>

Surface Warfare	
Kinetic Energy Weapon Testing	
In-Water Explosive Bins	None
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement Small-, medium-, and large-caliber non-explosive practice munitions
Assumptions Used for Analysis	Assume one target is expended per event. Explosive rounds are designed to detonate above the surface target.

A.3.2.4.5 Missile and Rocket Testing

<table>
<tr><th colspan="6">Surface Warfare</th></tr>
<tr><th colspan="6">Missile and Rocket Testing</th></tr>
<tr><td>Short Description</td><td colspan="3">Missile and rocket testing includes various missiles or rockets fired from submarines and surface combatants. Testing of the launching system and ship defense is performed.</td><td>Typical Duration</td><td>1 day-2 weeks</td></tr>
<tr><td>Long Description</td><td colspan="5">Missile and rocket testing includes various missiles or rockets (standard missiles, Water Piercing Missile Launch) fired from submarines and surface combatants. Testing may occur during surface combatant sea trials and surface warfare mission package testing. This activity includes both air warfare and surface warfare events.</td></tr>
<tr><td>Typical Components</td><td colspan="5">Platforms: Submarines, surface combatants
Targets: Air targets, land targets, surface targets
Systems being Trained/Tested: Missile and rocket firing systems</td></tr>
<tr><td>Standard Operating Procedures (Section 2.3.3)</td><td colspan="2">Vessel safety
Weapons firing safety
Towed in-water device safety</td><td colspan="3">Typical Locations
Range Complexes/Testing Ranges:
Gulf of Mexico
Jacksonville
Key West
Navy Cherry Point
Northeast
Virginia Capes
Inshore Waters/Pierside:
None</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td colspan="2">Acoustic:
Vessel noise
Weapons noise

Explosives:
In-water explosives
In-air explosives</td><td colspan="2">Physical Disturbance and Strike:
Aircraft and aerial target strike
Vessel and in-water device strike
Military expended material

Ingestion:
Military expended materials – munitions
Military expended materials – other than munitions</td><td>Energy:
In-air electromagnetic devices

Entanglement:
None</td></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="2">Air Quality:
Criteria air pollutants</td><td colspan="3">Sediments and Water Quality:
Explosives and explosive byproducts
Other materials
Chemicals other than explosives
Metals</td></tr>
<tr><td>Stressors to Human Resources</td><td>Cultural Resources:
Physical disturbance and strike
Explosives</td><td colspan="2">Socioeconomic Resources:
Accessibility
Airborne acoustics
Physical disturbance and strike</td><td colspan="2">Public Health and Safety:
Physical interactions
In-air energy
In-water energy</td></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
Missile (explosive) fragments, rocket (explosive) fragments, air and surface target fragments

Non-Ingestible Material:
Air target (drone), air target (decoy), missiles and rockets (non-explosive)</td><td>Military Recoverable Material</td><td colspan="2">Air target (drone)</td></tr>
</table>

Surface Warfare	
Missile and Rocket Testing	
Sonar and Other Transducer Bins	None
In-Water Explosive Bins	E6 E10
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement Non-explosive missiles and rockets **Explosive Stressors:** *(Section 5.3.3)* Explosive missiles and rockets
Assumptions Used for Analysis	Targets used during non-explosive tests will be recovered. Explosive missiles will detonate either in the air or at the water's surface. Ships will not be conducting test constantly for the duration of the allotted time. This activity includes both air warfare and surface warfare events, but it captured under the Surface warfare Protective Measures Assessment Protocol for simplicity.

A.3.2.5 Unmanned Systems

A.3.2.5.1 Underwater Search, Deployment, and Recovery

<table>
<tr><th colspan="6">Other Testing Activities</th></tr>
<tr><th colspan="6">Underwater Search, Deployment, and Recovery</th></tr>
<tr><td>Short Description</td><td colspan="3">Various underwater, bottom crawling, robotic, vehicles are utilized in underwater search, recovery, installation, and scanning activities.</td><td>Typical Duration</td><td>1 day</td></tr>
<tr><td>Long Description</td><td colspan="5">Subsurface activities include a variety of underwater vehicles, robotic or autonomous systems, and items placed on the seafloor. Diving activities and special operations training also occur. Other subsurface activities involve manned and unmanned underwater vehicles. All subsurface vehicles are retrieved after use, while most objects (e.g., non-explosive mines) remain for a period of time to be used as testing fixtures.</td></tr>
<tr><td>Typical Components</td><td colspan="5">Platforms: Moored platforms, remotely operated vehicles
Targets: Mine shapes
Systems being Trained/Tested: None</td></tr>
<tr><td>Standard Operating Procedures (Section 2.3.3)</td><td colspan="2">Vessel safety
Unmanned aerial, surface, and subsurface vehicle safety</td><td colspan="3">Typical Locations
Range Complexes/Testing Ranges:
South Florida Ocean Measurement Facility
Inshore Waters/Pierside:
None</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td colspan="2">Acoustic:
None
Explosives:
None</td><td colspan="2">Physical Disturbance and Strike:
Vessel and in-water device strike
Seafloor devices
Ingestion:
None</td><td>Energy:
None
Entanglement:
None</td></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="2">Air Quality:
Criteria air pollutants</td><td colspan="3">Sediments and Water Quality:
None</td></tr>
<tr><td>Stressors to Human Resources</td><td colspan="2">Cultural Resources:
Physical disturbance and strike</td><td colspan="2">Socioeconomic Resources:
Accessibility
Physical disturbance and strike</td><td>Public Health and Safety:
Physical interactions
In-water energy</td></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
None
Non-Ingestible Material:
None</td><td>Military Recoverable Material</td><td colspan="2">Mine shapes (non-explosive)</td></tr>
<tr><td>Sonar and Other Transducer Bins</td><td colspan="5">None</td></tr>
<tr><td>In-Water Explosive Bins</td><td colspan="5">None</td></tr>
<tr><td>Procedural Mitigation Measures</td><td colspan="5">Physical Disturbance and Strike: (Section 5.3.4)
Vessel movement</td></tr>
<tr><td>Assumptions Used for Analysis</td><td colspan="5">Mines and other objects may be placed on the bottom where they may remain for a period of time. They will eventually be retrieved.
Any acoustic sources used during this activity would be de minimis and not quantitatively analyzed and, therefore, are not included under systems.</td></tr>
</table>

A.3.2.5.2 Unmanned Aerial System Testing

<table>
<tr><th colspan="6">Unmanned Systems</th></tr>
<tr><th colspan="6">Unmanned Aerial System Testing</th></tr>
<tr><td>Short Description</td><td colspan="3">Unmanned aerial systems are launched from a platform (e.g., fixed platform or submerged submarine) to test the capability to extend the surveillance and communications range of unmanned underwater vehicles, manned and unmanned surface vehicles, and submarines.</td><td colspan="2">Typical Duration
1-12 hours</td></tr>
<tr><td>Long Description</td><td colspan="5">Unmanned aerial systems are reusable, uncrewed vehicles capable of controlled, sustained, level flight. Anticipated scenarios of unmanned aerial system testing include both unmanned aerial system launcher testing and using unmanned aerial systems to extend the surveillance and communications range of distributed sensors, unmanned underwater vehicles, manned and unmanned surface vehicles, and submarines. To test unmanned aerial system launcher systems, a subsurface capsule release may be conducted. During testing, a negatively buoyant capsule is deployed underwater and descends to a programmed depth. The capsule then drops a weight, inflates a flotation collar, rises to the surface, and launches an unmanned aerial system. Personnel use radio frequency communications to control and communicate with the unmanned aerial system during its flight. In the event of an extended communications test, an aerostat (helium filled balloon) may be tethered to either a stationary buoy or an unmanned surface vehicle to test the extended range of communications.</td></tr>
<tr><td>Typical Components</td><td colspan="5">Platforms: Submarines, shore-based facility, support craft, unmanned aerial systems
Targets: Land targets, surface targets
Systems being Trained/Tested: None</td></tr>
<tr><td>Standard Operating Procedures (Section 2.3.3)</td><td colspan="2">Vessel safety
Unmanned aerial, surface, and subsurface vehicle safety</td><td colspan="3">Typical Locations
Range Complexes/Testing Ranges:
Northeast
Virginia Capes
Naval Undersea Warfare Center Division, Newport
Inshore Waters/Pierside:
None</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td>Acoustic:
Vessel noise

Explosives:
None</td><td colspan="2">Physical Disturbance and Strike:
Vessel and in-water device strike
Aircraft and aerial target strike
Military expended materials

Ingestion:
Military expended materials – other than munitions</td><td colspan="2">Energy:
In-air electromagnetic devices

Entanglement:
None</td></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="2">Air Quality:
Criteria air pollutants</td><td colspan="3">Sediments and Water Quality:
Metals Other materials</td></tr>
<tr><td>Stressors to Human Resources</td><td>Cultural Resources:
Physical disturbance and strike</td><td colspan="2">Socioeconomic Resources:
Accessibility
Airborne acoustics
Physical disturbance and strike</td><td colspan="2">Public Health and Safety:
Physical interactions
In-water energy</td></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
Endcaps and pistons (non-chaff and flare)

Non-Ingestible Material:
Canister – miscellaneous</td><td>Military Recoverable Material</td><td colspan="2">None</td></tr>
</table>

Unmanned Systems	
Unmanned Aerial System Testing	
Sonar and Other Transducer Bins	None
In-Water Explosive Bins	None
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement
Assumptions Used for Analysis	Other components associated with chaff and flare use are not expected to float and would sink to the seafloor.

A.3.2.5.3 Unmanned Surface Vehicle System Testing

<table>
<tr><th colspan="6">Unmanned Systems</th></tr>
<tr><th colspan="6">Unmanned Surface Vehicle System Testing</th></tr>
<tr><td>Short Description</td><td colspan="3">Testing involves the production or upgrade of unmanned surface vehicles. This may include testing of mine detection capabilities, evaluating the basic functions of individual platforms, or complex events with multiple vehicles.</td><td colspan="2">Typical Duration
Up to 10 days. Some propulsion systems (gilders) could operate continuously for multiple months.</td></tr>
<tr><td>Long Description</td><td colspan="5">Unmanned surface vehicle testing includes assessment of single-vehicle and multi-vehicle technical performance and functionality during mission operations. Most unmanned vehicle mission operations include launch, transit, mission profile execution, and recovery operations. Unmanned surface vehicles are generally remote-controlled, semi-autonomous, modular, multi-mission platforms. Unmanned surface vehicles include rigid hull inflatable boats, cooperative autonomous research platform (autonomous kayaks), and remote-controlled jet skis. Unmanned surface vehicles may be launched from surface vessels, piers, or land. Once launched, the vehicles may be towed or self-propelled to the test area. Unmanned surface vehicles may deploy, tow, operate, or recover payload systems such as tow bodies containing multi-function sensors. Systems on the unmanned surface vehicle may be acoustically active or produce radio-frequency transmissions or provide laser illumination for electro-optical detection.</td></tr>
<tr><td>Typical Components</td><td colspan="5">Platforms: Unmanned surface vehicles, support craft
Targets: Surface targets
Systems being Trained/Tested: Unmanned surface vehicles</td></tr>
<tr><td>Standard Operating Procedures (Section 2.3.3)</td><td colspan="2">Vessel safety
Unmanned aerial, surface, and subsurface vehicle safety</td><td colspan="3">Typical Locations
Range Complexes/Testing Ranges:
Naval Undersea Warfare Center Division, Newport
Inshore Waters/Pierside:
None</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td colspan="2">Acoustic:
Vessel noise

Explosives:
None</td><td colspan="2">Physical Disturbance and Strike:
Vessel and in-water device strike

Ingestion:
None</td><td>Energy:
In-air electromagnetic devices
In-water electromagnetic devices

Entanglement:
None</td></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="2">Air Quality:
Criteria air pollutants</td><td colspan="3">Sediments and Water Quality:
None</td></tr>
<tr><td>Stressors to Human Resources</td><td>Cultural Resources:
None</td><td colspan="2">Socioeconomic Resources:
Accessibility
Airborne acoustics
Physical disturbance and strike</td><td>Public Health and Safety:
Physical interactions
In-air energy
In-water energy</td></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
None

Non-Ingestible Material:
None</td><td>Military Recoverable Material</td><td colspan="2">Surface targets (stationary)</td></tr>
<tr><td>Sonar and Other Transducer Bins</td><td colspan="5">None</td></tr>
</table>

Unmanned Systems	
Unmanned Surface Vehicle System Testing	
In-Water Explosive Bins	None
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement
Assumptions Used for Analysis	None

A.3.2.5.4 Unmanned Underwater Vehicle Testing

<table>
<tr><th colspan="4">Unmanned Systems</th></tr>
<tr><th colspan="4">Unmanned Underwater Vehicle Testing</th></tr>
<tr><td>Short Description</td><td colspan="2">Testing involves the production or upgrade of unmanned underwater vehicles. This may include testing of mine detection capabilities, evaluating the basic functions of individual platforms, or complex events with multiple vehicles.</td><td>Typical Duration
Up to 35 days. Some propulsion systems (gliders) could operate continuously for multiple months.</td></tr>
<tr><td>Long Description</td><td colspan="3">Unmanned underwater vehicle testing ranges from single-vehicle tests to evaluate hydrodynamic parameters, to full mission, multiple vehicle functionality assessments. Most unmanned underwater vehicle operations include a launch, transit, mission profile execution, and recovery operations. Unmanned underwater vehicles include modular, multi-mission platforms and their payloads, and anti-submarine warfare targets. Unmanned underwater vehicles may be launched from aircraft, surface craft, submarines, piers, or land. Once launched, the vehicles are either towed or self-propelled to the test area. Unmanned underwater vehicles may also deploy, tow, operate, or recover remote sensors and payload systems. Systems on or towed by the unmanned vehicle may be acoustically active, produce radio-frequency transmissions or provide laser illumination for electro-optical detection. Vehicle development involves the production and upgrade of new unmanned platforms on which to attach various payloads used for different purposes. Platforms can include unmanned underwater vehicles, unmanned surface vehicles, and unmanned aerial systems. Payload testing assesses various systems that can be incorporated onto unmanned platforms for mine warfare, bottom mapping, and other missions. This type of test can also include multiple vehicles interacting in formations or acting as individual units and includes tests and demonstrations of unmanned underwater vehicles in detecting and classifying mine-like or other buried objects.</td></tr>
<tr><td>Typical Components</td><td colspan="3">Platforms: Small boats, submarines, support craft, surface combatants, unmanned underwater vehicles, moored platforms
Targets: Mine warfare targets, sub-surface targets, surface targets
Systems being Trained/Tested: Sonar systems, underwater communication systems, unmanned underwater vehicles</td></tr>
<tr><td>Standard Operating Procedures (Section 2.3.3)</td><td>Vessel safety
Unmanned aerial, surface, and subsurface vehicle safety
Towed in-water device safety</td><td colspan="2">Typical Locations
Range Complexes/Testing Ranges:
Gulf of Mexico
Jacksonville
Naval Surface Warfare Center, Panama City Division
Naval Undersea Warfare Center Division, Newport
South Florida Ocean Measurement Facility
Offshore of Riviera Beach, Florida
Inshore Waters/Pierside:
None</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td>Acoustic:
Sonar and other transducers
Vessel noise

Explosives:
In-water explosives</td><td>Physical Disturbance and Strike:
Vessel and in-water device strike
Seafloor devices
Military expended material

Ingestion of Expended Material:
Military expended materials – munitions
Military expended materials – other than munitions</td><td>Energy:
In-air electromagnetic devices

Entanglement:
Decelerators/parachutes
Wires and cables</td></tr>
</table>

<table>
<tr><th colspan="5">Unmanned Systems</th></tr>
<tr><th colspan="5">Unmanned Underwater Vehicle Testing</th></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="4">Air Quality:
Criteria air pollutants

Sediments and Water Quality:
Explosives and explosive byproducts
Chemicals other than explosives
Metals
Other materials</td></tr>
<tr><td>Stressors to Human Resources</td><td>Cultural Resources:
Physical disturbance and strike
Explosives</td><td colspan="2">Socioeconomic Resources:
Accessibility
Airborne acoustics
Physical disturbance and strike</td><td>Public Health and Safety:
Physical interactions
In-air energy
In-water energy</td></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
Surface and sub-surface target fragments, lightweight torpedo (explosive) fragments, decelerators/parachutes - small

Non-Ingestible Material:
Anchors -other, lightweight torpedo accessories, sonobuoys (non-explosive), sonobuoy wires, acoustic countermeasures, surface target (stationary and mobile), sub-surface target (stationary)</td><td>Military Recoverable Material</td><td>Surface target (stationary and mobile), sub-surface target (stationary), bottom-placed instruments, mine shapes (non-explosive), lightweight torpedo (non-explosive), anchor-other</td></tr>
<tr><td>Sonar and Other Transducer Bins</td><td>Low-Frequency:
LF5

Mid-Frequency:
MF9
MF10

Anti-Submarine Warfare
ASW4</td><td colspan="2">Forward-Looking Sonar:
FLS2

High-Frequency:
HF1
HF4
HF5
HF6
HF7</td><td>Synthetic Aperture Sonars:
SAS1
SAS2
SAS3

Very High-Frequency
VHF1</td></tr>
<tr><td>In-Water Explosive Bins</td><td colspan="4">E8</td></tr>
<tr><td>Procedural Mitigation Measures</td><td colspan="2">Acoustic Stressors: (Section 5.3.2)
Active sonar</td><td colspan="2">Physical Disturbance and Strike: (Section 5.3.4)
Vessel movement
Towed in-water devices</td></tr>
<tr><td>Assumptions Used for Analysis</td><td colspan="4">Some mine shapes could be deployed for a specific event, and then retrieved afterwards. However, some mine shapes are left in place so that multiple events can use the same shapes without needing to redeploy.
Multiple vehicles may operate simultaneously in one or multiple areas.</td></tr>
</table>

A.3.2.6 Vessel Evaluation

A.3.2.6.1 Aircraft Carrier Sea Trials – Propulsion Testing

Vessel Evaluation				
Aircraft Carrier Sea Trials – Propulsion Testing				
Short Description	Ship is run at high speeds in various formations (e.g., straight-line and reciprocal paths).	**Typical Duration**	1-2 days	
Long Description	Propulsion testing is one part of the total aircraft carrier sea trial activity. Propulsion testing includes ship maneuvering, including full-power runs (speeds in excess of 30 knots) and endurance runs in both straight line and reciprocal paths.			
Typical Components	**Platforms:** Aircraft carriers **Targets:** None **Systems being Trained/Tested:** None			
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety	**Typical Locations**		
		Range Complexes/Testing Ranges: Virginia Capes	**Inshore Waters/Pierside:** None	
Stressors to Biological Resources and Habitats	**Acoustic:** Vessel noise **Explosives:** None	**Physical Disturbance and Strike:** Vessel and in-water device strike **Ingestion:** None	**Energy:** In-air electromagnetic devices **Entanglement:** None	
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** None		
Stressors to Human Resources	**Cultural Resources:** None	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-air energy In-water energy	
Military Expended Material	**Ingestible Material:** None **Non-Ingestible Material:** None	**Military Recoverable Material**	None	
Sonar and Other Transducer Bins	None			
In-Water Explosive Bins	None			
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement			
Assumptions Used for Analysis	Ships may not be traveling in a straight line. Ships will operate across the full spectrum of capable speeds. Ships will not be conducting test constantly for the duration of the allotted time.			

A.3.2.6.2 Large Ship Shock Trial

<table>
<tr><th colspan="5">Vessel Evaluation</th></tr>
<tr><th colspan="5">Large Ship Shock Trial</th></tr>
<tr><td>Short Description</td><td colspan="2">Underwater detonations against an aircraft carrier or surface combatant.</td><td colspan="2">Typical Duration
Typically over 4 weeks, with one detonation per week. However, smaller charges may be detonated on consecutive days.</td></tr>
<tr><td>Long Description</td><td colspan="4">Each new class (or major upgrade) of surface ships constructed for the Navy may undergo an at-sea shock trial. A shock trial is a series of underwater detonations that sends a shock wave through the ship's hull to simulate near misses during combat. A series of up to four underwater detonations will be conducted at various distances from the ship (charges are set closer to the ship as the trial progresses).</td></tr>
<tr><td>Typical Components</td><td colspan="4">Platforms: Aircraft carriers, support craft, fixed-wing aircraft, rotary-wing aircraft
Targets: None
Systems being Trained/Tested: None</td></tr>
<tr><td>Standard Operating Procedures (Section 2.3.3)</td><td colspan="2">Vessel safety
Aircraft safety</td><td colspan="2">Typical Locations
Range Complexes/Testing Ranges:
Gulf of Mexico
Jacksonville
Virginia Capes
Inshore Waters/Pierside:
None</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td>Acoustic:
Vessel noise
Aircraft noise

Explosives:
In-water explosives</td><td colspan="2">Physical Disturbance and Strike:
Vessel and in-water device strike
Aircraft and aerial target strike
Military expended material

Ingestion:
Military expended materials – other than munitions</td><td>Energy:
In-air electromagnetic devices

Entanglement:
None</td></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="2">Air Quality:
Criteria air pollutants</td><td colspan="2">Sediments and Water Quality:
Explosives and explosive byproducts
Chemicals other than explosives
Other materials</td></tr>
<tr><td>Stressors to Human Resources</td><td colspan="4">None</td></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
Ship shock charge fragments

Non-Ingestible Material:
None</td><td>Military Recoverable Material</td><td>None</td></tr>
<tr><td>Sonar and Other Transducer Bins</td><td colspan="4">None</td></tr>
<tr><td>In-Water Explosive Bins</td><td colspan="4">E17</td></tr>
<tr><td>Procedural Mitigation Measures</td><td colspan="2">Physical Disturbance and Strike: (Section 5.3.4)
Vessel movement</td><td colspan="2">Explosive Stressors: (Section 5.3.3)
Ship shock trials</td></tr>
</table>

Vessel Evaluation	
Large Ship Shock Trial	
Assumptions Used for Analysis	Four charges are used per event. Only one event will occur per 5-year period. Ship shock trials will occur in waters deeper than 650 ft. Modeling scenario: Four 40,000-lb. charges Stressors to human resources were not analyzed for this activity since it occurs greater than 12 NM from shore.

A.3.2.6.3 Air Defense Testing

Vessel Evaluation			
Air Defense Testing			
Short Description	Tests the ship's capability to detect, identify, track, and successfully engage live and simulated targets. Gun systems are tested using non-explosive and explosive rounds.	**Typical Duration**	7 days
Long Description	Air Defense events are conducted in clear and varied electronic attack environments, using a mix of missile firings to verify the ship's capability to detect, identify, track, and successfully engage live and simulated targets. The tests include testing the radar's track load in the presence of debris, long range engagement processing, low-elevation detection and tracking, track load in the presence of electronic attack and chaff, and missile performance. Tests currently include firing of the 5-inch 0.62-caliber gun, and will potentially include a 155 millimeter gun.		
Typical Components	**Platforms:** Surface combatants **Targets:** Air targets **Systems being Trained/Tested:** Radar systems, gun systems		
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety Weapons firing safety	**Typical Locations**	
		Range Complexes/Testing Ranges: Jacksonville Virginia Capes Gulf of Mexico Northeast	**Inshore Waters/Pierside:** None
Stressors to Biological Resources and Habitats	**Acoustic:** Vessel noise Weapons noise **Explosives:** In-air explosives	**Physical Disturbance and Strike:** Aircraft and aerial target strike Vessel and in-water device strike Military expended material **Ingestion:** Military expended materials – munitions Military expended materials – other than munitions	**Energy:** In-air electromagnetic devices **Entanglement:** None
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** Metals	Other materials
Stressors to Human Resources	**Cultural Resources:** Physical disturbance and strike	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-air energy In-water energy

<table>
<tr><th colspan="4">Vessel Evaluation</th></tr>
<tr><th colspan="4">Air Defense Testing</th></tr>
<tr><td>Military Expended Material</td><td>Ingestible Material:
Chaff-ship fibers, missile (explosive) fragments; large-caliber projectile (explosive) fragments, medium-caliber (non-explosive) projectiles, air target (drone) and (drone) fragments

Non-Ingestible Material:
Large-caliber projectiles (non-explosive), larger caliber projectile casings, missiles (non-explosive), canisters, large-caliber projectile casings, air target (drone) and (decoy), chaff- ship cartridge</td><td>Military Recoverable Material</td><td>Air target (drone)</td></tr>
<tr><td>Sonar and Other Transducer Bins</td><td colspan="3">None</td></tr>
<tr><td>In-Water Explosive Bins</td><td colspan="3">None</td></tr>
<tr><td>Procedural Mitigation Measures</td><td colspan="3">Acoustic Stressors: (Section 5.3.2)
Weapons firing

Explosive Stressors: (Section 5.3.3)
Explosive medium-caliber and large-caliber projectiles

Physical Disturbance and Strike: (Section 5.3.4)
Vessel movement
Small-, medium-, and large-caliber non-explosive practice munitions
Non-explosive missiles and rockets</td></tr>
<tr><td>Assumptions Used for Analysis</td><td colspan="3">Ships will not be conducting test constantly for the duration of the allotted time.
This activity incorporates components of both surface warfare and air defense events.</td></tr>
</table>

A.3.2.6.4 Hydrodynamic and Maneuverability Testing

Other Testing Activities				
Hydrodynamic and Maneuverability Testing				
Short Description	Submarines maneuver in the submerged operating environment.		**Typical Duration**	10 days
Long Description	Hydrodynamic testing is required to validate the control and maneuverability of a submarine in the submerged operating environment.			
Typical Components	**Platforms:** Submarines **Targets:** None **Systems being Trained/Tested:** Submersibles			
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety	**Typical Locations**		
		Range Complexes/Testing Ranges: Gulf of Mexico Jacksonville Key West Navy Cherry Point Northeast Virginia Capes	**Inshore Waters/Pierside:** None	
Stressors to Biological Resources and Habitats	**Acoustic:** Vessel noise	**Physical Disturbance and Strike:** Vessel and in-water device strike	**Energy:** None	
	Explosives: None	**Ingestion:** None	**Entanglement:** None	
Stressors to Physical Resources	**Air Quality:** None	**Sediments and Water Quality:** None		
Stressors to Human Resources	**Cultural Resources:** None	**Socioeconomic Resources:** Accessibility Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-water energy	
Military Expended Material	**Ingestible Material:** None **Non-Ingestible Material:** None	**Military Recoverable Material**	None	
Sonar and Other Transducer Bins	None			
In-Water Explosive Bins	None			
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement			
Assumptions Used for Analysis	For biological resource analysis, vessel noise and vessel strike are only analyzed for the periods while the submarines are surfaced, typically brief in nature. Mitigation measures related to vessel movement are only considered during the period of surfacing as well. For human resource stressor analysis, airborne acoustics, physical disturbance and strike and physical interactions are only analyzed for the periods while the submarine are surfaced, typically brief in nature.			

A.3.2.6.5 In-Port Maintenance Testing

Vessel Evaluation				
In-Port Maintenance Testing				
Short Description	Each combat system is tested to ensure they are functioning in a technically acceptable manner and are operationally ready to support at-sea testing.	**Typical Duration** 3 weeks		
Long Description	Each combat system is tested to ensure they are functioning in a technically acceptable manner and are operationally ready to support at-sea Combat System Ship Qualification Trial events. The ship's test plans and procedures, Maintenance Repair/Requirements Cards, and computerized planned maintenance system are used in establishing testing standards for each system and pieces of equipment. Ship's crew, under supervision of subject matter experts, complete all actions and receive remedial training where required. Trouble Observation Reports are written on noted discrepancies.			
Typical Components	**Platforms:** Amphibious warfare ships, surface combatants **Targets:** None **Systems being Trained/Tested:** Radar, low-energy lasers			
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety	**Typical Locations** **Range Complexes/Testing Ranges:** None	**Inshore Waters/Pierside:** Mayport, Florida Norfolk, Virginia	
Stressors to Biological Resources and Habitats	**Acoustic:** None **Explosives:** None	**Physical Disturbance and Strike:** None **Ingestion:** None	**Energy:** In-air electromagnetic devices **Entanglement:** None	
Stressors to Physical Resources	**Air Quality:** None	**Sediments and Water Quality:** None		
Stressors to Human Resources	**Cultural Resources:** None	**Socioeconomic Resources:** None	**Public Health and Safety:** In-air energy In-water energy	
Military Expended Material	**Ingestible Material:** None **Non-Ingestible Material:** None	**Military Recoverable Material**	None	
Sonar and Other Transducer Bins	None			
In-Water Explosive Bins	None			
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement			
Assumptions Used for Analysis	None			

A.3.2.6.6 Propulsion Testing

Vessel Evaluation				
Propulsion Testing				
Short Description	Ship is run at high speeds in various formations (straight-line and reciprocal paths).	**Typical Duration**	1 day	
Long Description	Propulsion testing is one part of the total sea trial activity. During this event, the ship is tested for maneuverability, including full power and endurance runs.			
Typical Components	**Platforms:** Amphibious warfare ships, fleet support ships, sea basing ships, surface combatants, small boats, specialized high speed vehicles **Targets:** None **Systems being Trained/Tested:** None			
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety	**Typical Locations**		
		Range Complexes/Testing Ranges: Gulf of Mexico Jacksonville Key West Navy Cherry Point Northeast Virginia Capes	**Inshore Waters/Pierside:** None	
Stressors to Biological Resources and Habitats	**Acoustic:** Vessel noise **Explosives:** None	**Physical Disturbance and Strike:** Vessel and in-water device strike **Ingestion:** None	**Energy:** In-air electromagnetic devices **Entanglement:** None	
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** None		
Stressors to Human Resources	**Cultural Resources:** None	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-air energy In-water energy	
Military Expended Material	**Ingestible Material:** None **Non-Ingestible Material:** None	**Military Recoverable Material**	None	
Sonar and Other Transducer Bins	None			
In-Water Explosive Bins	None			
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement			

Vessel Evaluation	
Propulsion Testing	
Assumptions Used for Analysis	Ships will not be conducting test constantly for the duration of the allotted time. Ships may not be traveling in a straight line. Ships will operate across the full spectrum of capable speeds. During surface combatant sea trials full-power runs are conducted for a total of 4 hours, and endurance runs are conducted for a total of 2 hours. Testing may occur near Pascagoula, Mississippi when in the Gulf of Mexico.

A.3.2.6.7 Signature Analysis Operations

Vessel Evaluation			
Signature Analysis Operations			
Short Description	Surface ship and submarine testing of electromagnetic, acoustic, optical, and radar signature measurements.	**Typical Duration**	Periodically over multiple days
Long Description	Signature analysis activities include electromagnetic, acoustic, optical, and radar signature measurements, recording, and post-run analyses of data of Navy surface and subsurface vessels. These activities include electromagnetic signature measurement, calibration, and detection of submarines, acoustic and magnetic signature detection of unmanned underwater vehicles and surface ships, radar, and optical detection of surface ships. Testing includes intelligence, surveillance, reconnaissance missions.		
Typical Components	**Platforms:** Moored platforms, submarines, support craft, shore based facility **Targets:** None **Systems being Trained/Tested:** Electromagnetic devices, acoustic modems, optical and radar systems, sonar systems		
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety	**Typical Locations** **Range Complexes/Testing Ranges:** Jacksonville South Florida Ocean Measurement Facility **Inshore Waters/Pierside:** None	
Stressors to Biological Resources and Habitats	**Acoustic:** Sonar and other transducers Vessel noise **Explosives:** None	**Physical Disturbance and Strike:** Vessel and in-water device strike Military expended material Seafloor devices **Ingestion:** Military expended materials – other than munitions	**Energy:** In-air electromagnetic devices **Entanglement:** Decelerators/parachutes Wires and cables
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** Metals Chemicals other than explosives Other materials	
Stressors to Human Resources	**Cultural Resources:** Physical disturbance and strike	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-air energy In-water energy
Military Expended Material	**Ingestible Material:** Decelerators/parachutes - small **Non-Ingestible Material:** Anchors-other, expendable bathythermographs, expendable bathythermograph wires, sonobuoys (non-explosive), sonobuoy wires	**Military Recoverable Material**	Anchors – other
Sonar and Other Transducer Bins	**Mid-Frequency:** MF9 MF10 **Low-Frequency:** LF4 LF6 LF5	**High-Frequency:** HF1 **Anti-Submarine Warfare:** ASW2	**Acoustic Modems:** M3

Vessel Evaluation		
Signature Analysis Operations		
In-Water Explosive Bins	None	
Procedural Mitigation Measures	**Acoustic Stressors:** *(Section 5.3.2)* Active sonar	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement
Assumptions Used for Analysis	None	

A.3.2.6.8 Surface Warfare Testing

Vessel Evaluation			
Surface Warfare Testing			
Short Description	Tests the capabilities of shipboard sensors to detect, track, and engage surface targets. Testing may include ships defending against surface targets using explosive and non-explosive rounds, gun system structural test firing and demonstration of the response to Call for Fire against land based targets (simulated by sea based locations).	**Typical Duration**	7 days
Long Description	Surface warfare events are gun weapons system tests conducted in a clear environment to demonstrate the capability of shipboard and remote (helicopter) sensors to detect and track surface or land based (simulated by sea based locations) targets and engage targets with simulated and live gun and missile firings. The event may qualify the ship's surface warfare gun capability to receive track data from the sensors, filter it, calculate ballistics, recommend aimpoint corrections (spots), generate gun orders, select ammunition properly for targets at differing ranges, and deliver surface direct fire on the surface or land based targets. Testing can also include structural test firing.		
Typical Components	**Platforms:** Support craft, surface combatants **Targets:** Electronic warfare targets, surface targets **Systems being Trained/Tested:** Gun systems, electronic warfare systems		
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety Weapons firing safety	**Typical Locations**	
		Range Complexes/Testing Ranges: Gulf of Mexico Jacksonville Key West Northeast Virginia Capes	**Inshore Waters/Pierside:** None
Stressors to Biological Resources and Habitats	**Acoustic:** Vessel noise Weapons noise **Explosives:** In-water explosives In-air explosives	**Physical Disturbance and Strike:** Vessel and in-water device strike Military expended material **Ingestion:** Military expended materials – munitions Military expended materials – other than munitions	**Energy:** In-air electromagnetic devices **Entanglement:** None
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** Metals Other materials Explosives and explosive byproducts Chemicals other than explosives	
Stressors to Human Resources	**Cultural Resources:** Physical disturbance and strike Explosives	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-air energy In-water energy

<table>
<tr><th colspan="4">Vessel Evaluation</th></tr>
<tr><th colspan="4">Surface Warfare Testing</th></tr>
<tr><td>Military Expended Material</td><td>Ingestible Material:
Large- and medium-caliber projectile (explosive) fragments, medium-caliber projectiles (non-explosive), missile (explosive) fragments, surface target (mobile and stationary) fragments

Non-Ingestible Material:
Large-caliber projectiles (non-explosive), missiles (non-explosive)</td><td>Military Recoverable Material</td><td>Surface target (mobile and stationary)</td></tr>
<tr><td>Sonar and Other Transducer Bins</td><td colspan="3">None</td></tr>
<tr><td>In-Water Explosive Bins</td><td colspan="3">E1 E5 E8</td></tr>
<tr><td>Procedural Mitigation Measures</td><td colspan="3">Acoustic Stressors: (Section 5.3.2)
Weapons firing

Physical Disturbance and Strike: (Section 5.3.4)
Vessel movement
Small-, medium-, and large-caliber non-explosive practice munitions
Non-explosive missiles and rockets

Explosive Stressors: (Section 5.3.3)
Explosive medium-caliber and large-caliber projectiles
Explosive missiles and rockets</td></tr>
<tr><td>Assumptions Used for Analysis</td><td colspan="3">Ships will not be conducting tests constantly for the duration of the allotted time.</td></tr>
</table>

A.3.2.6.9 Undersea Warfare Testing

Vessel Evaluation			
Undersea Warfare Testing			
Short Description	Ships demonstrate capability of countermeasure systems and underwater surveillance, weapons engagement and communications systems. This tests ships ability to detect, track, and engage undersea targets.	**Typical Duration**	Up to 10 days
Long Description	Undersea warfare events may be comprised of tracking and firing events or tests of hull-mounted sonar system capabilities to detect and avoid torpedo type targets. Tracking and firing events ensure the operability of the undersea warfare suite and its interface with the rotary wing helicopter. Tests include demonstrating the ability of the ship to search, detect and track a target and conduct attacks with exercise torpedoes. Detection and avoidance events may use surface craft and underwater platforms to test the capability of mid- and high-frequency acoustic sources. Subsurface moving targets, rocket and air-dropped weapons, sonobuoys, towed arrays and sub-surface torpedo-like devices may be used. Approximately 1 week of in-port training may precede the event.		
Typical Components	**Platforms:** Rotary-wing aircraft, submarines, support craft, surface combatants **Targets:** Sub-surface targets, surface targets **Systems being Trained/Tested:** Acoustic countermeasures, sonar systems, sonobuoys		
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety Aircraft safety	**Typical Locations**	
		Range Complexes/Testing Ranges: Gulf of Mexico Jacksonville Navy Cherry Point Northeast Virginia Capes South Florida Ocean Measurement Facility	**Inshore Waters/Pierside:** None
Stressors to Biological Resources and Habitats	**Acoustic:** Sonar and other transducers Aircraft noise Vessel noise **Explosives:** None	**Physical Disturbance and Strike:** Aircraft and aerial target strike Vessel and in-water device strike Military expended material **Ingestion:** Military expended materials – other than munitions	**Energy:** In-air electromagnetic devices **Entanglement:** Wires and cables Decelerators/parachutes
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** Metals Other materials	Chemicals other than explosives
Stressors to Human Resources	**Cultural Resources:** Physical disturbance and strike	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-air energy In-water energy

<table>
<tr><th colspan="6">Vessel Evaluation</th></tr>
<tr><th colspan="6">Undersea Warfare Testing</th></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
Decelerators/parachutes - small

Non-Ingestible Material:
Acoustic countermeasures, heavyweight torpedo accessories, guidance wires, lightweight torpedo accessories, sonobuoys (non-explosive), sonobuoy wires, surface target (stationary), sub-surface targets (mobile)</td><td>Military Recoverable Material</td><td colspan="2">Heavyweight torpedoes (non-explosive), lightweight torpedoes (explosive), surface target (stationary), sub-surface target (mobile)</td></tr>
<tr><td>Sonar and Other Transducer Bins</td><td colspan="2">Mid-Frequency:
MF1 MF5
MF1K MF9
MF4 MF10</td><td colspan="2">High-Frequency:
HF4 HF8

Anti-Submarine Warfare:
ASW3 ASW4</td><td>Torpedoes:
TORP1 TORP2</td></tr>
<tr><td>In-Water Explosive Bins</td><td colspan="5">None</td></tr>
<tr><td>Procedural Mitigation Measures</td><td colspan="3">Acoustic Stressors: (Section 5.3.2)
Active sonar</td><td colspan="2">Physical Disturbance and Strike: (Section 5.3.4)
Vessel movement</td></tr>
<tr><td>Assumptions Used for Analysis</td><td colspan="5">Five targets are utilized per event.
All sonobuoys have a parachute unless otherwise noted.
Ships will not be conducting test constantly during the duration of the allotted time.</td></tr>
</table>

A.3.2.6.10 Small Ship Shock Trial

<table>
<tr><th colspan="6">Vessel Evaluation</th></tr>
<tr><th colspan="6">Small Ship Shock Trial</th></tr>
<tr><td>Short Description</td><td colspan="3">Underwater detonations are used to test new ships or major upgrades.</td><td>Typical Duration</td><td>Typically over 4 weeks, with one detonation per week. However, smaller charges may be detonated on consecutive days.</td></tr>
<tr><td>Long Description</td><td colspan="5">Each new class (or major upgrade) of surface ships constructed for the Navy may undergo an at-sea shock trial. A shock trial is a series of underwater detonations that sends a shock wave through the ship's hull to simulate near misses during combat. A series of up to four underwater detonations per event will be conducted at various distances from the ship (charges are set closer to the ship as the trial progressives).</td></tr>
<tr><td>Typical Components</td><td colspan="5">Platforms: Support craft, surface combatants, fixed-wing aircraft, rotary-wing aircraft
Targets: None
Systems being Trained/Tested: None</td></tr>
<tr><td>Standard Operating Procedures (Section 2.3.3)</td><td colspan="2">Vessel safety
Aircraft safety</td><td colspan="3">Typical Locations
Range Complexes/Testing Ranges:
Jacksonville
Virginia Capes
Inshore Waters/Pierside:
None</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td colspan="2">Acoustic:
Vessel noise
Aircraft noise

Explosives:
In-water explosives</td><td colspan="2">Physical Disturbance and Strike:
Vessel and in-water device strike
Aircraft and aerial target strike
Military expended material

Ingestion:
Military expended materials – other than munitions</td><td>Energy:
In-air electromagnetic devices

Entanglement:
None</td></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="2">Air Quality:
Criteria air pollutants</td><td colspan="3">Sediments and Water Quality:
Explosives and explosive byproducts
Chemicals other than explosives
Other materials</td></tr>
<tr><td>Stressors to Human Resources</td><td colspan="5">None</td></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
Ship shock charge fragments

Non-Ingestible Material:
None</td><td>Military Recoverable Material</td><td colspan="2">None</td></tr>
<tr><td>Sonar and Other Transducer Bins</td><td colspan="5">None</td></tr>
<tr><td>In-Water Explosive Bins</td><td colspan="5">E16</td></tr>
<tr><td>Procedural Mitigation Measures</td><td colspan="3">Physical Disturbance and Strike: (Section 5.3.4)
Vessel Movement</td><td colspan="2">Explosive Stressors: (Section 5.3.3)
Ship shock trials</td></tr>
</table>

Vessel Evaluation	
Small Ship Shock Trial	
Assumptions Used for Analysis	Four charges are utilized per event Three events will occur during the 5-year period. Will occur in waters deeper than 650 ft. Modeling scenario: Four 10,000-lb. charges Stressors to human resources were not analyzed for this activity since it occurs greater than 12 NM from shore.

A.3.2.6.11 Submarine Sea Trials – Propulsion Testing

<table>
<tr><td colspan="5">Vessel Evaluation</td></tr>
<tr><td colspan="5">Submarine Sea Trials – Propulsion Testing</td></tr>
<tr><td>Short Description</td><td colspan="2">Submarine is run at high speeds in various formations, and at various depths.</td><td colspan="2">Typical Duration
Up to 5 days</td></tr>
<tr><td>Long Description</td><td colspan="4">Propulsion testing is one part of the total submarine sea trial activity. During this activity, submarines undergo a controlled deep dive to test depth, emergency surfacing, full-power operations, high speed turns, and extreme depth changes.</td></tr>
<tr><td>Typical Components</td><td colspan="4">Platforms: Submarines
Targets: None
Systems being Trained/Tested: None</td></tr>
<tr><td>Standard Operating Procedures (Section 2.3.3)</td><td>Vessel safety</td><td colspan="3">Typical Locations
Range Complexes/Testing Ranges:
Jacksonville
Northeast
Virginia Capes
Inshore Waters/Pierside:
None</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td colspan="4">Acoustic:
Vessel noise

Explosives:
None

Physical Disturbance and Strike:
Vessel and in-water device strike

Ingestion:
None

Energy:
None

Entanglement:
None</td></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="4">Air Quality:
None

Sediments and Water Quality:
None</td></tr>
<tr><td>Stressors to Human Resources</td><td colspan="4">Cultural Resources:
None

Socioeconomic Resources:
Accessibility
Physical disturbance and strike

Public Health and Safety:
Physical interactions
In-water energy</td></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
None

Non-Ingestible Material:
None</td><td>Military Recoverable Material</td><td>None</td></tr>
<tr><td>Sonar and Other Transducer Bins</td><td colspan="4">None</td></tr>
<tr><td>In-Water Explosive Bins</td><td colspan="4">None</td></tr>
<tr><td>Procedural Mitigation Measures</td><td colspan="4">Physical Disturbance and Strike: (Section 5.3.4)
Vessel movement</td></tr>
</table>

Vessel Evaluation	
Submarine Sea Trials – Propulsion Testing	
Assumptions Used for Analysis	Subs will not be conducting test constantly for the duration of the allotted time. Subs may not be traveling in a straight line. Subs will operate across the full spectrum of capable speeds. For biological resource analysis, vessel noise and vessel strike are only analyzed for the periods while the submarines are surfaced, typically brief in nature. Mitigation measures related to vessel movement are only considered during the period of surfacing as well. For human resource stressor analysis, airborne acoustics, physical disturbance and strike and physical interactions are only analyzed for the periods while the submarine are surfaced, typically brief in nature.

A.3.2.7 Submarine Sea Trials – Weapons System Testing

<table>
<tr><th colspan="5">Vessel Evaluation</th></tr>
<tr><th colspan="5">Submarine Sea Trials – Weapons System Testing</th></tr>
<tr><td>Short Description</td><td colspan="2">Submarine weapons and sonar systems are tested at-sea to meet the integrated combat system certification requirements.</td><td colspan="2">Typical Duration
Up to 7 days</td></tr>
<tr><td>Long Description</td><td colspan="4">Submarine weapons and sonar systems are tested at-sea to meet the integrated combat system certification requirements. This test involves subjecting the integrated combat system through rigorous testing which consists of passive and active sonar activities, launching "water slugs" and exercise torpedoes.</td></tr>
<tr><td>Typical Components</td><td colspan="4">Platforms: Moored platforms, submarines, support craft
Targets: Sub-surface targets
Systems being Trained/Tested: Acoustic modems, sonar systems, underwater communication systems</td></tr>
<tr><td>Standard Operating Procedures
(Section 2.3.3)</td><td colspan="2">Vessel safety
Weapons firing safety</td><td colspan="2">Typical Locations
Range Complexes/Testing Ranges:
Gulf of Mexico
Jacksonville
Northeast
Virginia Capes
South Florida Ocean Measurement Facility
Offshore of Fort Pierce, Florida
Inshore Waters/Pierside:
None</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td colspan="4">Acoustic:
Sonar and other transducers
Vessel noise
Explosives:
None
Physical Disturbance and Strike:
Vessel and in-water device strike
Military expended material
Ingestion:
None
Energy:
None
Entanglement:
Wires and cables</td></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="4">Air Quality:
Criteria air pollutants
Sediments and Water Quality:
Chemicals other than explosives
Metals Other materials</td></tr>
<tr><td>Stressors to Human Resources</td><td colspan="4">Cultural Resources:
Physical disturbance and strike
Socioeconomic Resources:
Accessibility
Physical disturbance and strike
Public Health and Safety:
Physical interactions
In-water energy</td></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
None
Non-Ingestible Material:
Heavyweight torpedo accessories, guidance wire</td><td>Military Recoverable Material</td><td>Heavyweight torpedoes (non-explosive), sub-surface target (mobile)</td></tr>
<tr><td>Sonar and Other Transducer Bins</td><td colspan="4">Mid-Frequency:
MF3 MF10
MF9
High-Frequency:
HF1
Torpedoes:
TORP2
Acoustic Modems:
M3</td></tr>
</table>

Vessel Evaluation		
Submarine Sea Trials – Weapons System Testing		
In-Water Explosive Bins	None	
Procedural Mitigation Measures	**Acoustic Stressors:** *(Section 5.3.2)* Active sonar	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement
Assumptions Used for Analysis	Submarines will not be conducting test constantly for the duration of the allotted time.	

A.3.2.7.1 Total Ship Survivability Trials

Vessel Evaluation			
Total Ship Survivability Trials			
Short Description	Series of simulated "realistic" weapon hit scenarios with resulting damage and recoverability exercises against an aircraft carrier.	**Typical Duration**	5 days, happening once over a 5-year period.
Long Description	Each new class (or major upgrade) of surface ships constructed for the Navy will undergo an at-sea Total Ship Survivability Trial (TSST). A TSST is a series of realistic weapon hit scenarios. Each scenario simulates a weapon hit, resulting damage, and a subsequent tactical threat during which ship's force attempts to maintain or restore mission capability by containing and controlling the simulated damage, treat crew casualties, and continues to fight. The TSST has been described as being "as close as we can safely get to an actual hit." The goal of the TSST is to demonstrate that the inherent ship design and procedures provide the crew the ability to realign, repair, and contain damage following a simulated weapon hit. It's important to note that the TSST is not a crew assessment. It does not evaluate crew proficiency or training nor does it qualify equipment.		
Typical Components	**Platforms:** Aircraft carriers **Targets:** None **Systems being Trained/Tested:** None		
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety	**Typical Locations** **Range Complexes/Testing Ranges:** Jacksonville Virginia Capes	**Inshore Waters/Pierside:** None
Stressors to Biological Resources and Habitats	**Acoustic:** Vessel noise **Explosives:** None	**Physical Disturbance and Strike:** Vessel and in-water device strike **Ingestion:** None	**Energy:** In-air electromagnetic devices **Entanglement:** None
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** None	
Stressors to Human Resources	**Cultural Resources:** None	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-air energy In-water energy
Military Expended Material	**Ingestible Material:** None **Non-Ingestible Material:** None	**Military Recoverable Material**	None
Sonar and Other Transducer Bins	None		
In-Water Explosive Bins	None		
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement		

Vessel Evaluation	
Total Ship Survivability Trials	
Assumptions Used for Analysis	None

A.3.2.7.2 Vessel Signature Evaluation

<table>
<tr><th colspan="6">Vessel Evaluation</th></tr>
<tr><th colspan="6">Vessel Signature Evaluation</th></tr>
<tr><td>Short Description</td><td colspan="3">Surface ship, submarine and auxiliary system signature assessments. This may include electronic, radar, acoustic, infrared and magnetic signatures.</td><td colspan="2">Typical Duration
Typically 1-5 days, up to 20 days depending on the test being conducted</td></tr>
<tr><td>Long Description</td><td colspan="5">Radar cross signature testing of surface ships and submarines is accomplished on new ships and periodically throughout a ship’s life cycle to measure how detectable the ship is to radar. For example, Assessment Identification of Mine Susceptibility assessments are passive electromagnetic and acoustic measurements performed on mine countermeasure ships and on the Littoral Combat Ship mine countermeasure modules (i.e., auxiliary systems) to determine their mine susceptibility using seafloor deployed magnetometers and hydrophones, and a ship-board global positioning sensor tracking system. Signature testing of all surface ships and submarines verifies that each vessel’s signature is within specifications, and may include the use of helicopter-deployed instrumentation, ship-mounted safety and navigation systems, fathometers, tracking devices, radar systems, and underwater communications equipment. Also included in this activity is the Shipboard Electronic Systems Evaluation Facility which conducts measurements of antenna radiation patterns, Federal Aviation Administration identification of Friend or Foe systems, and Tactical Air Navigation Systems.</td></tr>
<tr><td>Typical Components</td><td colspan="5">Platforms: Aircraft carriers, amphibious warfare ships, fixed wing aircraft, rotary-wing aircraft, sea basing ships, small boats, special mission ships, specialized high speed vehicles, submarines, support craft, surface combatants
Targets: None
Systems being Trained/Tested: Radar systems, electromagnetic devices</td></tr>
<tr><td>Standard Operating Procedures (Section 2.3.3)</td><td colspan="2">Vessel safety
Aircraft safety</td><td colspan="3">Typical Locations
Range Complexes/Testing Ranges:
Gulf of Mexico
Jacksonville
Virginia Capes
Inshore Waters/Pierside:
Joint Expeditionary Base Little Creek, Virginia</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td colspan="2">Acoustic:
Sonar and other transducers
Aircraft noise
Vessel noise

Explosives:
None</td><td colspan="2">Physical Disturbance and Strike:
Aircraft and aerial target strike
Vessel and in-water device strike

Ingestion:
None</td><td>Energy:
In-water electromagnetic devices
In-air electromagnetic devices</td></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="2">Air Quality:
Criteria air pollutants</td><td colspan="3">Sediments and Water Quality:
None</td></tr>
<tr><td>Stressors to Human Resources</td><td>Cultural Resources:
None</td><td colspan="2">Socioeconomic Resources:
Accessibility
Airborne acoustics
Physical disturbance and strike</td><td>Public Health and Safety:
Physical interactions
In-air energy
In-water energy</td></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
None

Non-Ingestible Material:
None</td><td>Military Recoverable Material</td><td colspan="2">None</td></tr>
</table>

Vessel Evaluation	
Vessel Signature Evaluation	
Sonar and Other Transducer Bins	None
In-Water Explosive Bins	None
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement
Assumptions Used for Analysis	None

A.3.2.8 Other Testing

A.3.2.8.1 Chemical and Biological Simulant Testing

Other Testing Activities			
Chemical and Biological Simulant Testing			
Short Description	Chemical-biological agent simulants are deployed against surface ships.	**Typical Duration**	3 days
Long Description	The capabilities of surface ship defense systems to detect and protect in the event of chemical and biological attacks are tested. Testing involves the deployment of harmless compounds (i.e., simulants) as substitutes for chemical and biological warfare agents. Because chemical and biological warfare agents remain a security threat, the Department of Defense uses relatively harmless compounds (simulants) as substitutes for chemical and biological warfare agents to test equipment intended to detect their presence. Chemical and biological agent detectors monitor for the presence of chemical and biological warfare agents and protect military personnel and civilians from the threat of exposure to these agents. The simulants trigger a response by sensors in the detection equipment without irritating or injuring personnel involved in testing detectors. Navy Chemical Agent Simulant 82 (commonly referred to as NCAS-82), glacial acetic acid, triethyl phosphate, sulfur hexafluoride, 1,1,1,2 tetrafluoroethane (a refrigerant commonly known as R134), and 1,1-difluoroethane (a refrigerant commonly known as R-152a) are also referred to as gaseous simulants and can be released in smaller quantities in conjunction with glacial acetic acid or triethyl phosphate releases. The types of biological simulants that may be used include spore-forming bacteria, non-spore-forming bacteria, ovalbumin, bacteriophage MS2, and *Aspergillus niger*. The simulants are generally dispersed by hand at the detector or by aircraft as a fine mist or aerosol.		
Typical Components	**Platforms:** Fixed-wing aircraft, surface combatants **Targets:** None **Systems being Trained/Tested:** None		
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety Aircraft safety	**Typical Locations**	
		Range Complexes/Testing Ranges: Jacksonville Navy Cherry Point Northeast Virginia Capes	**Inshore Waters/Pierside:** None
Stressors to Biological Resources and Habitats	**Acoustic:** Aircraft noise Vessel noise **Explosives:** None	**Physical Disturbance and Strike:** Aircraft and aerial target strike Vessel and in-water device strike **Ingestion:** None	**Energy:** In-air electromagnetic devices **Entanglement:** None
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** Chemicals other than explosives	
Stressors to Human Resources	**Cultural Resources:** None	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-air energy In-water energy
Military Expended Material	**Ingestible Material:** None **Non-Ingestible Material:** None	**Military Recoverable Material**	None

Other Testing Activities	
Chemical and Biological Simulant Testing	
Sonar and Other Transducer Bins	None
In-Water Explosive Bins	None
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement
Assumptions Used for Analysis	Examples of chemical simulants include glacial acetic acid and triethyl phosphate. Examples of biological simulants are spore-forming bacteria, non-spore-forming bacteria, the protein ovalbumin, MS2 bacteriophages, and the fungus *Aspergillus niger.*

A.3.2.8.2 Insertion/Extraction

Other Testing Activities				
Insertion/Extraction				
Short Description	Testing of submersibles capable of inserting and extracting personnel and payloads into denied areas from strategic distances.	**Typical Duration**	Up to 30 days	
Long Description	Testing of submersibles capable of inserting and extracting personnel and payloads into denied areas from strategic distances. Testing could include the use of forces deployed from submerged submarines while at sea.			
Typical Components	**Platforms:** Submarines **Targets:** None **Systems being Trained/Tested:** Submersibles, sonar systems, acoustic modems			
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety	**Typical Locations**		
		Range Complexes/Testing Ranges: Key West Naval Surface Warfare Center, Panama City Division	**Inshore Waters/Pierside:** None	
Stressors to Biological Resources and Habitats	**Acoustic:** Sonar and other transducers Vessel noise **Explosives:** None	**Physical Disturbance and Strike:** Vessel and in-water device strike **Ingestion:** None	**Energy:** None **Entanglement:** None	
Stressors to Physical Resources	**Air Quality:** None	**Sediments and Water Quality:** None		
Stressors to Human Resources	**Cultural Resources:** None	**Socioeconomic Resources:** Accessibility Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-water energy	
Military Expended Material	**Ingestible Material:** None **Non-Ingestible Material:** None	**Military Recoverable Material**	None	
Sonar and Other Transducer Bins	**Mid-Frequency:** MF9	**Acoustic Modems:** M3		
In-Water Explosive Bins	None			
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement			

Other Testing Activities	
Insertion/Extraction	
Assumptions Used for Analysis	Test will not occur constantly throughout duration of allotted time. For biological resource analysis, vessel noise and vessel strike are only analyzed for the periods while the submarines are surfaced, typically brief in nature. Mitigation measures related to vessel movement are only considered during the period of surfacing as well. For human resource stressor analysis, airborne acoustics, physical disturbance and strike and physical interactions are only analyzed for the periods while the submarine are surfaced, typically brief in nature.

A.3.2.8.3 Line Charge Testing

Other Testing Activities				
Line Charge Testing				
Short Description	Surface vessels deploy line charges to test the capability to safely clear an area for expeditionary forces.	**Typical Duration**	1 day	
Long Description	Line charges are tested to verify the capability to safely clear surf zone areas for sea-based expeditionary operations. Testing is performed on various surf zone clearing systems that use either line charges or explosive arrays to neutralize mine threats. This is a systems development test and only assesses the in-water components of testing. Line charges consist of a 350-ft. detonation cord with explosives lined from one end to the other end in a series of 5-lb. increments.			
Typical Components	**Platforms:** Moored platforms, support craft **Targets:** None **Systems being Trained/Tested:** Submersibles			
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety	**Typical Locations**		
		Range Complexes/Testing Ranges: Naval Surface Warfare Center, Panama City Division	**Inshore Waters/Pierside:** None	
Stressors to Biological Resources and Habitats	**Acoustic:** Vessel noise **Explosives:** In-water explosives	**Physical Disturbance and Strike:** Vessel and in-water device strike Military expended material **Ingestion:** Military expended materials – other than munitions	**Energy:** None **Entanglement:** None	
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** Explosives and explosive byproducts Chemicals other than explosives Other materials		
Stressors to Human Resources	**Cultural Resources:** Physical disturbance and strike Explosives	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-water energy	
Military Expended Material	**Ingestible Material:** Line charge fragments **Non-Ingestible Material:** None	**Military Recoverable Material**	None	
Sonar and Other Transducer Bins	None			
In-Water Explosive Bins	E14			
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement	**Explosive Stressors:** *(Section 5.3.3)* Line charge testing		

Other Testing Activities	
Line Charge Testing	
Assumptions Used for Analysis	Test will not occur constantly over the duration of the allotted time.

A.3.2.8.4 Acoustic Component Testing

Other Testing Activities			
Acoustic Component Testing			
Short Description	Various surface vessels, moored equipment, and materials are tested to evaluate performance in the marine environment.	**Typical Duration**	1 day to multiple months
Long Description	Various surface activities utilizing the marine environment for testing and evaluation. Sample projects include buoy deployments, vessel entanglement systems, materials testing, and renewable energy devices. Other surface operations involve manned and unmanned surface vehicles. Miscellaneous types of equipment are deployed, including temperature, humidity, magnetic, acoustic, optical, and air quality instrumentation to measure, record, and analyze system effectiveness, dependability, operational parameters, and durability. Surface operations utilize a variety of vessels for deployment of test equipment and for the monitoring of the air, surface, subsurface.		
Typical Components	**Platforms:** Unmanned aerial systems, unmanned surface vehicles, unmanned underwater vehicles **Targets:** None **Systems being Trained/Tested:** Sonar systems, underwater communication systems		
Standard Operating Procedures *(Section 2.3.3)*	Unmanned aerial, surface, and subsurface vehicle safety	**Typical Locations** **Range Complexes/Testing Ranges:** South Florida Ocean Measurement Facility	**Inshore Waters/Pierside:** None
Stressors to Biological Resources and Habitats	**Acoustic:** Sonar and other transducers Vessel noise **Explosives:** None	**Physical Disturbance and Strike:** Aircraft and aerial target strike Vessel and in-water device strike **Ingestion:** None	**Energy:** None **Entanglement:** None
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** None	
Stressors to Human Resources	**Cultural Resources:** None	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-water energy
Military Expended Material	**Ingestible Material:** None **Non-Ingestible Material:** None	**Military Recoverable Material**	None
Sonar and Other Transducer Bins	**Low-Frequency:** LF5 **Mid-Frequency:** MF9	**Forward-Looking Sonar:** FLS2 **High-Frequency:** HF5 HF7	**Synthetic Aperture Sonars:** SAS2
In-Water Explosive Bins	None		

Other Testing Activities		
Acoustic Component Testing		
Procedural Mitigation Measures	**Acoustic Stressors:** *(Section 5.3.2)* Active sonar	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement
Assumptions Used for Analysis	None	

A.3.2.8.5 Non-Acoustic Component Testing

Other Testing Activities			
Non-Acoustic Component Testing			
Short Description	Testing of towed or floating buoys for communications through radio-frequencies or two-way optical communications between an aircraft and underwater system(s).	**Typical Duration**	3 days (4 hours per day for 3 days)
Long Description	Testing associated with radio frequency communications could occur from towed antennas from surface vessels, from single-transmit buoys released from submarines, or tethered buoys from submarines for two-way communication. Optical communications tests may include communication between helicopter or fixed wing aircraft and manned or unmanned underwater systems, and may also include ground truth sensors mounted on surface craft.		
Typical Components	**Platforms:** Navy ships, small boats, rotary-wing aircraft unmanned underwater vehicles, manned underwater vehicles **Targets:** None **Systems being Trained/Tested:** Communication systems		
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety Aircraft safety Unmanned aerial, surface, and subsurface vehicle safety	**Typical Locations** **Range Complexes/Testing Ranges:** Gulf of Mexico Virginia Capes	**Inshore Waters/Pierside:** None
Stressors to Biological Resources and Habitats	**Acoustic:** Aircraft noise Vessel noise **Explosives:** None	**Physical Disturbance and Strike:** Aircraft and aerial target strike Vessel and in-water device strike **Ingestion:** None	**Energy:** In-air electromagnetic devices **Entanglement:** None
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** None	
Stressors to Human Resources	**Cultural Resources:** None	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-air energy In-water energy
Military Expended Material	**Ingestible Material:** None **Non-Ingestible Material:** None	**Military Recoverable Material**	None
Sonar and Other Transducer Bins	None		
In-Water Explosive Bins	None		
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel Movement		
Assumptions Used for Analysis	None		

A.3.2.8.6 Payload Deployer Testing

Other Testing Activities			
Payload Deployer Testing			
Short Description	Launcher systems are tested to evaluate performance.	**Typical Duration**	1-5 days
Long Description	Testing is conducted to evaluate the performance of current or future launchers, which are used to deploy objects (e.g., torpedoes, decoys, countermeasures, sensors, unmanned underwater vehicles, and unmanned aerial vehicles). These tests may be performed from a fixed location or a mobile platform. The objects deployed may be operational equipment or mock equipment that is instrumented to evaluate the performance of the launcher system. Various methods may be employed to launch test items. The test items are typically recovered after the test and are usually equipped with an acoustic locator to aid in their recovery.		
Typical Components	**Platforms:** In-water structures, specialized high-speed vehicles, support craft, surface combatants, unmanned surface vehicles, unmanned underwater vehicles **Targets:** None **Systems being Trained/Tested:** None		
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety Unmanned aerial, surface, and subsurface vehicle safety	**Typical Locations** **Range Complexes/Testing Ranges:** Gulf of Mexico Northeast Naval Undersea Warfare Center Division, Newport	**Inshore Waters/Pierside:** None
Stressors to Biological Resources and Habitats	**Acoustic:** Vessel noise **Explosives:** None	**Physical Disturbance and Strike:** Vessel and in-water device strike Military expended material **Ingestion:** Military expended materials – other than munitions	**Energy:** In-air electromagnetic devices **Entanglement:** Wires and cables
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** Metals Other materials	
Stressors to Human Resources	**Cultural Resources:** Physical disturbance and strike	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-air energy In-water energy
Military Expended Material	**Ingestible Material:** End caps and pistons – non chaff and flare **Non-Ingestible Material:** Concrete slugs, heavyweight torpedo accessories, lightweight torpedo accessories, sabots, guidance wires	**Military Recoverable Material**	Heavyweight torpedoes (non-explosive), lightweight torpedoes (non-explosive)
Sonar and Other Transducer Bins	None		

Other Testing Activities	
Payload Deployer Testing	
In-Water Explosive Bins	None
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement
Assumptions Used for Analysis	Instrumented operational equipment or mock equipment will be recovered. Ships will not be conducting test constantly for the duration of the allotted time. Any acoustic sources used during this activity would be de minimis and not quantitatively analyzed and, therefore, are not included under systems. When chaff is used, 36 concrete slugs per event are expended. Other components associated with chaff and flare use are not expected to float and would sink to the seafloor.

A.3.2.8.7 Semi-Stationary Equipment Testing

<table>
<tr><th colspan="6">Other Testing Activities</th></tr>
<tr><th colspan="6">Semi-Stationary Equipment Testing</th></tr>
<tr><td>Short Description</td><td colspan="3">Semi-stationary equipment (e.g., hydrophones) is deployed to determine functionality.</td><td>Typical Duration</td><td>From 20 minutes to multiple days</td></tr>
<tr><td>Long Description</td><td colspan="5">Semi-stationary equipment testing is performed from a fixed site, suspended over the side of a boat, moored to the bottom, suspended in the water column, or on the surface. Examples of semi-stationary equipment include moored hydrophones (i.e., devices to listen to underwater sound), line arrays (i.e., multiple hydrophones) deployed on the ocean bottom, acoustic countermeasures, a moored oceanographic sensor that moves vertically through the water column, and sonobuoys (i.e., expendable sonar systems). Some units produce sound in the water (e.g., acoustic countermeasures), while others only listen (e.g., passive sonobuoys, vector sensors that measure particle motion). Some tests could require deployment in an area that provides opportunistic data collection (e.g., placing a hydrophone near a shipping lane to collect shipping noise data), or with specific geographic or oceanographic requirements.</td></tr>
<tr><td>Typical Components</td><td colspan="5">Platforms: : In-water structures, moored platforms, shore based facility, support craft
Targets: Air targets, electronic warfare targets, land targets, sub-surface targets, surface targets
Systems being Trained/Tested: Air gun systems, acoustic countermeasures, sonar systems, underwater communication systems</td></tr>
<tr><td>Standard Operating Procedures
(Section 2.3.3)</td><td colspan="2">Vessel safety
Towed in-water device safety</td><td colspan="3">Typical Locations
Range Complexes/Testing Ranges:
Naval Surface Warfare Center, Panama City Division
Naval Undersea Warfare Center Division, Newport
Inshore Waters/Pierside:
Newport, Rhode Island</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td colspan="2">Acoustic:
Vessel noise
Sonar and other transducers

Explosives:
None</td><td colspan="2">Physical Disturbance and Strike:
Vessel and in-water device strike
Military expended material

Ingestion:
None</td><td>Energy:
In-water electromagnetic devices

Entanglement:
None</td></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="5">Air Quality:
Criteria air pollutants
Sediments and Water Quality:
Metals Other materials</td></tr>
<tr><td>Stressors to Human Resources</td><td>Cultural Resources:
Physical disturbance and strike</td><td colspan="2">Socioeconomic Resources:
Accessibility
Airborne acoustics
Physical disturbance and strike</td><td colspan="2">Public Health and Safety:
Physical interactions
In-air energy
In-water energy</td></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
None

Non-Ingestible Material:
Acoustic countermeasures, sub-surface (mobile and stationary) targets, surface (mobile and stationary) targets</td><td>Military Recoverable Material</td><td colspan="2">Air target (drone), sub-surface (mobile and stationary) targets, surface (mobile and stationary) targets</td></tr>
</table>

Other Testing Activities						
Semi-Stationary Equipment Testing						
Sonar and Other Transducer Bins	**Low-Frequency:**		**Anti-Submarine Warfare:**		**Swimmer Defense:**	
	LF4	LF5	ASW3	ASW4	SD1	SD2
	Mid-Frequency:		**High-Frequency:**		**Air Gun:**	
	MF9	MF10	HF5	HF6	AG	
In-Water Explosive Bins	None					
Procedural Mitigation Measures	**Acoustic Stressors:** *(Section 5.3.2)* Active sonar Air guns			**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement		
Assumptions Used for Analysis	None					

A.3.2.8.8 Towed Equipment Testing

Other Testing Activities				
Towed Equipment Testing				
Short Description	Surface vessels or unmanned surface vehicles deploy and tow equipment to determine functionality of towed systems.	**Typical Duration**	Typically 2-8 hours	
Long Description	Testing is conducted on equipment to evaluate hydrodynamic characteristics and control of a tow body, test fully functional items, or test a particular aspect of a system utilizing a mock-up of a functional item. A typical test operation for towed equipment testing involves a deployment, use, and recover scenario that requires range or commercial craft support. This equipment may be deployed from and towed by range craft or unmanned surface vehicles. The towed item may be underwater or floating on the surface. Equipment may be acoustically active or produce radio frequency transmissions.			
Typical Components	**Platforms:** Support craft, unmanned surface vehicles **Targets:** Sub-surface targets **Systems being Trained/Tested:** Sonar systems, underwater communication systems			
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety Unmanned aerial, surface, and subsurface vehicle safety Towed in-water device safety	**Typical Locations**	**Range Complexes/Testing Ranges:** Naval Undersea Warfare Center Division, Newport	**Inshore Waters/Pierside:** None
Stressors to Biological Resources and Habitats	**Acoustic:** Sonar and other transducers Vessel noise **Explosives:** None	**Physical Disturbance and Strike:** Vessel and in-water device strike Seafloor devices Military expended material **Ingestion:** None	**Energy:** None **Entanglement:** None	
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** Metals Other materials		
Stressors to Human Resources	**Cultural Resources:** Physical disturbance and strike	**Socioeconomic Resources:** Physical disturbance and strike Airborne acoustics Accessibility	**Public Health and Safety:** Physical interactions In-water energy	
Military Expended Material	**Ingestible Material:** None **Non-Ingestible Material:** Mine shapes (non-explosive), sub-surface target (stationary)	**Military Recoverable Material**	Mine shapes (non-explosive), sub-surface target (stationary)	
Sonar and Other Transducer Bins	**Low-Frequency:** LF4	**Mid-Frequency:** MF9	**High-Frequency:** HF6	
In-Water Explosive Bins	None			

Other Testing Activities		
Towed Equipment Testing		
Procedural Mitigation Measures	**Acoustic Stressors:** *(Section 5.3.2)* Active sonar	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement Towed in-water devices
Assumptions Used for Analysis	None	

A.3.3 OFFICE OF NAVAL RESEARCH TESTING ACTIVITIES

A.3.3.1 Acoustic and Oceanographic Science and Technology

A.3.3.1.1 Acoustic and Oceanographic Research

<table>
<tr><th colspan="6">Acoustic and Oceanographic Science and Technology</th></tr>
<tr><th colspan="6">Acoustic and Oceanographic Research</th></tr>
<tr><td>Short Description</td><td colspan="3">Research using active transmissions from sources deployed from ships, aircraft, and unmanned underwater vehicles. Research sources can be used as proxies for current and future Navy systems.</td><td>Typical Duration</td><td>Up to 14 days</td></tr>
<tr><td>Long Description</td><td colspan="5">Active acoustic transmissions used for engineering tests of acoustic sources, validation of ocean acoustic models, tests of signal processing algorithms, and characterization of acoustic interactions with the ocean bottom, fish and ocean surface. Standard oceanographic research sensing (acoustic Doppler current profiler, fathometer-like systems) also to be employed.</td></tr>
<tr><td>Typical Components</td><td colspan="5">Platforms: Special mission ships, unmanned underwater vehicles, fixed-wing aircraft
Targets: Sub-surface targets
Systems being Trained/Tested: Air guns, sonar systems, sonobuoys, underwater communication systems, low-power lasers</td></tr>
<tr><td>Standard Operating Procedures (Section 2.3.3)</td><td colspan="2">Aircraft safety
Vessel safety
Unmanned aerial, surface, and subsurface vehicle safety</td><td colspan="3">Typical Locations
Range Complexes/Testing Ranges:
Gulf of Mexico
Northeast
Virginia Capes
Inshore Waters/Pierside:
None</td></tr>
<tr><td>Stressors to Biological Resources and Habitats</td><td colspan="2">Acoustic:
Sonar and other transducers
Vessel noise
Aircraft noise

Explosives:
In-water explosives</td><td colspan="2">Physical Disturbance and Strike:
Aircraft and aerial target strike
Vessel and in-water device strike
Military expended materials
Seafloor devices

Ingestion:
Military expended materials – other than munitions</td><td>Energy:
In-air electromagnetic devices

Entanglement:
Decelerators/parachutes
Wires and cables</td></tr>
<tr><td>Stressors to Physical Resources</td><td colspan="2">Air Quality:
Criteria air pollutants</td><td colspan="3">Sediments and Water Quality:
Explosives Metals
Chemicals Other materials</td></tr>
<tr><td>Stressors to Human Resources</td><td>Cultural Resources:
Physical disturbance and strike
Explosives</td><td>Socioeconomic Resources:
Accessibility
Airborne acoustics
Physical disturbance and strike</td><td colspan="3">Public Health and Safety:
Physical interactions
In-air energy
In-water energy</td></tr>
<tr><td>Military Expended Material</td><td colspan="2">Ingestible Material:
Buoy (explosive) fragments, Decelerators/parachutes - Small

Non-Ingestible Material:
Sonobuoys (non-explosive), sonobuoy wires, expended bathythermograph, expended bathythermograph wires, anchor-other</td><td>Military Recoverable Material</td><td colspan="2">Anchors – Other, subsurface targets (stationary)</td></tr>
</table>

Acoustic and Oceanographic Science and Technology			
Acoustic and Oceanographic Research			
Sonar and Other Transducer Bins	**Low-Frequency:** LF3 LF5 LF4	**Mid-Frequency:** MF8 MF9 **Anti-Submarine Warfare:** ASW2	**Air Gun:** AG **Broadband:** BB4
In-Water Explosive Bins	E3		
Procedural Mitigation Measures	**Acoustic Stressors:** *(Section 5.3.2)* Active sonar Air guns	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement **Explosive Stressors:** *(Section 5.3.3)* Explosive mine countermeasure and neutralization activities	
Assumptions Used for Analysis	None		

A.3.3.1.2 Emerging Mine Countermeasure Technology Research

Acoustic and Oceanographic Science and Technology			
Emerging Mine Countermeasure Technology Research			
Short Description	Test involves the use of broadband acoustic sources on unmanned underwater vehicles.	**Typical Duration**	Up to 14 days
Long Description	Mine countermeasure system testing on unmanned underwater vehicles to take place offshore and in coastal waters. Broadband acoustic sources on unmanned underwater vehicles will use downward directed acoustic transmissions to characterize the ocean bottom. Inert objects will be placed on the bottom to test system performance.		
Typical Components	**Platforms:** Special mission ships, unmanned underwater vehicles **Targets:** Mine shapes **Systems being Trained/Tested:** Sonar systems		
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety Unmanned aerial, surface, and subsurface vehicle safety	**Typical Locations** **Range Complexes/Testing Ranges:** Jacksonville Northeast Virginia Capes	**Inshore Waters/Pierside:** None
Stressors to Biological Resources and Habitats	**Acoustic:** Sonar and other transducers Vessel noise **Explosives:** None	**Physical Disturbance and Strike:** Vessel and in-water device strike Military expended material Seafloor device **Ingestion:** None	**Energy:** In-air electromagnetic devices **Entanglement:** None
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** Other materials	
Stressors to Human Resources	**Cultural Resources:** Physical disturbance and strike	**Socioeconomic Resources:** Accessibility Airborne acoustics Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-air energy In-water energy
Military Expended Material	**Ingestible Material:** None **Non-Ingestible Material:** Anchor - other	**Military Recoverable Material**	Mine shapes (non-explosive)
Sonar and Other Transducer Bins	**Broadband:** BB1 BB2		
In-Water Explosive Bins	None		
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement		
Assumptions Used for Analysis	None		

A.3.3.1.3 Large Displacement Unmanned Underwater Vehicle Testing

Acoustic and Oceanographic Science and Technology				
Large Displacement Unmanned Undersea Vehicle Testing				
Short Description	Autonomy testing and environmental data collection with Large Displacement Unmanned Undersea Vehicles (Innovative Navy Prototype).	**Typical Duration**	Up to 60 days per deployment	
Long Description	Large Displacement Unmanned Undersea Vehicle Innovative Navy Prototype (LDUUV INP) testing includes launch, autonomous transit (up to 60 days), environmental data collection (e.g., bathymetry, water column properties, ocean surface properties) and retrieval. LDUUV INP testing throughout the study area will include de minimis acoustic sources (modems, imaging sonars and fathometers) for safe navigation and data collection.			
Typical Components	**Platforms:** Unmanned underwater vehicles **Targets:** Sub-surface targets **Systems being Trained/Tested:** Undersea vehicles, environmental data collection systems			
Standard Operating Procedures *(Section 2.3.3)*	Vessel safety Unmanned aerial, surface, and subsurface vehicle safety	**Typical Locations** **Range Complexes/Testing Ranges:** Gulf of Mexico Jacksonville Navy Cherry Point Northeast Virginia Capes	**Inshore Waters/Pierside:** None	
Stressors to Biological Resources and Habitats	**Acoustic:** Vessel noise **Explosives:** None	**Physical Disturbance and Strike:** Vessel and in-water device strike Military expended material **Ingestion:** None	**Energy:** None **Entanglement:** None	
Stressors to Physical Resources	**Air Quality:** Criteria air pollutants	**Sediments and Water Quality:** Other materials		
Stressors to Human Resources	**Cultural Resources:** Physical disturbance and strike	**Socioeconomic Resources:** Accessibility Physical disturbance and strike	**Public Health and Safety:** Physical interactions In-water energy	
Military Expended Material	**Ingestible Material:** None **Non-Ingestible Material:** Subsurface targets (stationary)	**Military Recoverable Material**	Subsurface targets (stationary)	
Sonar and Other Transducer Bins	None			
In-Water Explosive Bins	None			
Procedural Mitigation Measures	**Physical Disturbance and Strike:** *(Section 5.3.4)* Vessel movement			
Assumptions Used for Analysis	Any acoustic sources used during this activity would be de minimis and not quantitatively analyzed and therefore are not included under systems.			

This page intentionally left blank.