DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 218

[Docket No. 230127–0029]

RIN 0648–BL77

Taking and Importing Marine Mammals; Taking Marine Mammals Incidental to Testing and Training Operations in the Eglin Gulf Test and Training Range

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Proposed rule; request for comments and information.

SUMMARY: NMFS has received a request from the U.S. Department of the Air Force (USAF) to take marine mammals incidental to testing and training military operations proposed to be conducted in the Eglin Gulf Test and Training Range (EGTTR) from 2023 to 2030 in the Gulf of Mexico. Pursuant to the Marine Mammal Protection Act (MMPA), NMFS is requesting comments on its proposal to issue regulations and subsequent Letter of Authorization (LOA) to the USAF to incidentally take marine mammals during the specified activities. NMFS will consider public comments prior to issuing any final rule and making final decisions on the issuance of the requested LOA. Agency responses to public comments will be summarized in the notice of the final decision in the final rule. The USAF's activities qualify as military readiness activities pursuant to the MMPA, as amended by the National Defense Authorization Act for Fiscal Year 2004 (2004 NDAA).

DATES: Comments and information must be received no later than March 9, 2023.

ADDRESSES: Submit all electronic public comments via the Federal e-Rulemaking Portal. Go to *https://www.regulations.gov* and enter NOAA–NMFS–2021–0064 in the Search box. Click on the ''Comment'' icon, complete the required fields, and enter or attach your comments.

Instructions: Comments sent by any other method, to any other address or individual, or received after the end of the comment period, may not be considered by NMFS. All comments received are a part of the public record and will generally be posted for public viewing on *www.regulations.gov* without change. All personal identifying information (*e.g.,* name, address), confidential business information, or otherwise sensitive information submitted voluntarily by the sender will be publicly accessible. NMFS will accept anonymous comments (enter ''N/A'' in the required fields if you wish to remain anonymous). Attachments to electronic comments will be accepted in Microsoft Word, Excel, or Adobe PDF file formats only.

A copy of the USAF's application and other supporting documents and documents cited herein may be obtained online at: *https://www.fisheries.noaa.gov/action/incidental-take-authorization-us-air-force-eglin-gulf-testing-and-training.* In case of problems accessing these documents, please use the contact listed here (see **FOR FURTHER INFORMATION CONTACT**).

FOR FURTHER INFORMATION CONTACT: Robert Pauline, Office of Protected Resources, NMFS, (301) 427–8401.

SUPPLEMENTARY INFORMATION:

Purpose of Regulatory Action

These proposed regulations, issued under the authority of the MMPA (16 U.S.C. 1361 *et seq.*), would provide the framework for authorizing the take of marine mammals incidental to the USAF's training and testing activities (which qualify as military readiness activities) from air-to-surface operations that involve firing live or inert munitions, including missiles, bombs, and gun ammunition, from aircraft at various types of targets on the water surface. Live munitions used in the EGTTR are set to detonate either in the air a few feet above the water, instantaneously upon contact with the water or target, or approximately 5 to 10 feet (ft) (1.5 to 3 meters (m)) below the water surface. There would also be training exercises for Navy divers that require the placement of small explosive charges by hand to disable live mines.

Eglin Air Force Base (AFB) would conduct operations in the existing Live Impact Area (LIA). In addition, the USAF is also proposing to create and use a new, separate LIA within the EGTTR that would be used for live missions in addition to the existing LIA. Referred to as the East LIA, it is located approximately 40 nautical miles (nmi)/(74 kilometers (km)) southeast of the existing LIA. (See Figure 1).

NMFS received an application from the USAF requesting 7-year regulations and an authorization to incidentally take individuals of multiple species of marine mammals (''USAF's rulemaking/LOA application'' or ''USAF's application''). Take is anticipated to occur by Level A and Level B harassment incidental to the USAF's training and testing activities, with no serious injury or mortality expected or proposed for authorization.

Background

The MMPA prohibits the take of marine mammals, with certain exceptions. Sections 101(a)(5)(A) and (D) of the MMPA direct the Secretary of Commerce (as delegated to NMFS) to allow, upon request, the incidental, but not intentional, taking of small numbers of marine mammals by U.S. citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region if certain findings are made and either regulations are issued or, if the taking is limited to harassment, a notice of a proposed authorization is provided to the public for review and the opportunity to submit comments.

An authorization for incidental takings shall be granted if NMFS finds that the taking will have a negligible impact on the species or stocks and will not have an unmitigable adverse impact on the availability of the species or stocks for taking for subsistence uses (where relevant). Further, NMFS must prescribe the permissible methods of taking and other means of effecting the least practicable adverse impact on the affected species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of such species or stocks for taking for certain subsistence uses (referred to in this rule as ''mitigation measures''). NMFS also must prescribe the requirements pertaining to the monitoring and reporting of such takings. The MMPA defines ''take'' to mean to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal. The Preliminary Analysis and Negligible Impact Determination section below discusses the definition of ''negligible impact.''

The NDAA for Fiscal Year 2004 (2004 NDAA) (Pub. L. 108–136) amended section 101(a)(5) of the MMPA to remove the ''small numbers'' and ''specified geographical region'' provisions indicated above and amended the definition of ''harassment'' as applied to a ''military readiness activity.'' The definition of harassment for military readiness activities (section 3(18)(B) of the MMPA) is: (i) Any act that injures or has the significant potential to injure a marine mammal or marine mammal stock in the wild (Level A Harassment); or (ii) Any act that disturbs or is likely to disturb a marine mammal or marine mammal stock in the wild by causing disruption of natural behavioral patterns, including, but not limited to, migration, surfacing, nursing, breeding, feeding, or sheltering, to a point where such behavioral patterns are abandoned or significantly altered (Level B harassment). In addition, the 2004 NDAA amended the MMPA as it relates to military readiness activities such that the least practicable adverse impact analysis shall include consideration of personnel safety, practicality of implementation, and impact on the effectiveness of the military readiness activity.

More recently, section 316 of the NDAA for Fiscal Year 2019 (2019 NDAA) (Pub. L. 115–232), signed on August 13, 2018, amended the MMPA to allow incidental take rules for military readiness activities under section 101(a)(5)(A) to be issued for up to 7 years. Prior to this amendment, all incidental take rules under section 101(a)(5)(A) were limited to 5 years.

National Environmental Policy Act

To comply with the National Environmental Policy Act of 1969 (NEPA; 42 U.S.C. 4321 *et seq.*) and NOAA Administrative Order (NAO) 216–6A, NMFS must evaluate our USAF's proposed activities and alternatives with respect to potential impacts on the human environment. Accordingly, NMFS plans to adopt the Eglin Gulf Test and Training Range Environmental Assessment (2022 REA) (USAF 2022), provided our independent evaluation of the document finds that it includes adequate information analyzing the effects on the human environment of issuing regulations and LOAs under the MMPA. NMFS is a cooperating agency on the 2022 REA and has worked with the USAF developing the document. The draft 2022 REA was made available for public comment on December 13, 2022 through January 28, 2023. We will review all comments submitted in response to the request for comments on the 2022 REA and in response to the request for comments on this proposed rule prior to concluding our NEPA process or making a final decision on this proposed rule for the issuance of regulations under the MMPA and any subsequent issuance of a Letter of Authorization (LOA) to the USAF to incidentally take marine mammals during the specified activities.

Summary of Request

On January 18, 2022, NMFS received an application from the USAF for authorization to take marine mammals by Level A and Level B harassment incidental to training and testing activities (categorized as military readiness activities) in the EGTTR for a period of 7 years. On June 17, 2022 NMFS received an adequate and complete application for missions that would include air-to-surface operations that involve firing live or inert munitions, including missiles, bombs, and gun ammunition from aircraft at targets on the water surface. The types of targets used vary by mission and primarily include stationary, remotely controlled, and towed boats, inflatable targets, and marker flares. Live munitions used in the EGTTR are set to detonate either in the air a few feet above the water surface (airburst detonation), instantaneously upon contact with the water or target (surface detonation), or approximately 5 to 10 feet (1.5 to 3 m) below the water surface (subsurface detonation). On July 17, 2022, we published a notice of receipt (NOR) of application in the **Federal Register** (87 FR 42711), requesting comments and information related to the USAF's request. The public comment period was open for 30 days. We reviewed and considered all comments and information received on the NOR in development of this proposed rule.

On February 8, 2018, NMFS promulgated a rulemaking and issued an LOA for takes of marine mammals incidental to Eglin AFB's training and testing operations in the EGTTR (83 FR 5545). Current EGTTR operations are authorized under the 2018 EGTTR LOA which will expire on February 12, 2023. Under this proposed rulemaking action, the EGTTR would continue to be used during the next mission period based on the maritime training and testing requirements of the various military units that use the EGTTR. The next mission period would span 7 years, from 2023 to 2030. Most operations during this period would be a continuation of the same operations conducted by the same military units during the previous mission period. There would, however, be an increase in the annual quantities of all general categories of munitions (bombs, missiles, and gun ammunition) under the USAF's proposed activities, except for live gun ammunition, which is proposed to be used less over the next mission period. The highest net explosive weight (NEW) of the munitions under the USAF's proposed activities would be 945 pounds (lb) (430 kilograms (kg), which was also the highest NEW for the previous mission period. Live missions proposed for the 2023–2030 period would be conducted in the existing Live Impact Area (LIA) within the EGTTR. Certain missions may also be conducted in the proposed East LIA, which would be a new, separate area within the EGTTR where live munitions would be used. The USAF's rulemaking/LOA application reflects the most up-to-date compilation of training and testing activities deemed necessary to accomplish military readiness requirements. EGTTR training and testing operations are critical for achieving military readiness and the overall goals of the National Defense Strategy. The regulations proposed in this action, if issued, would be effective for seven years, beginning from the date of issuance.

Description of the Proposed Activity

The USAF requests authorization to take marine mammals incidental to conducting training and testing activities. The USAF has determined that acoustic and explosives stressors are most likely to result in impacts on marine mammals that could qualify as take under the MMPA, and NMFS concurs with this determination. Eglin AFB proposes to conduct military aircraft missions within the EGTTR that involve the employment of multiple types of live (explosive) and inert (non-explosive) munitions (*i.e.,* missiles, bombs, and gun ammunition) against various surface targets. Munitions may be delivered by multiple types of aircraft including, but not limited to, fighter jets, bombers, and gunships.

Detailed descriptions of these activities are described in the Eglin Gulf Test and Training Range (EGTTR) Range Environmental Assessment (REA) (USAF 2022), currently under preparation as well as the USAF's rulemaking/LOA application. (*https://www.fisheries.noaa.gov/action/incidental-take-authorization-us-air-force-eglin-gulf-testing-and-training*). A summary of the proposed activities and are presented below.

Dates and Duration

The specified activities would occur at any time during the 7-year period of validity of the regulations. The proposed amount of training and testing activities are described in the Detailed Description of the Specified Activities section.

Geographical Region

The Eglin Military Complex encompasses approximately 724 square miles (1,825 km^2 of land in the Florida Panhandle and consists of the Eglin Reservation in Santa Rosa, Okaloosa, and Walton Counties, and property on Santa Rosa Island and Cape San Blas. The EGTTR is the airspace controlled by Eglin AFB over the Gulf of Mexico, beginning 3 nautical miles (nmi) (5.56

km) from shore, and the underlying Gulf of Mexico waters. The EGTTR extends southward and westward off the coast of Florida and encompasses approximately 102,000 nmi (349,850 km^2). It is subdivided into blocks of airspace that consist of Warning Areas W–155, W–151, W–470, W–168, and W–174 and Eglin Water Test Areas 1 through 6 (Figure 1). Most of the blocks are further subdivided into smaller airspace units for scheduling purposes (for example, W–151A, B, C, and D). Although Eglin AFB may use any portion of the EGTTR, the majority of training and testing operations proposed for the 2023–2030 mission period would occur in Warning Area W–151. The nearshore boundary of W–151 parallels much of the coastline of the Florida Panhandle and extends horizontally from 3 nmi (5.56 km) offshore to approximately 85 to 100 nmi (158 to185 km) to offshore, depending on the specific portion of its outer boundary. W–151 encompasses approximately 10,247 nmi^2 (35146 km^2) and includes water depths that range from approximately 5 to 720 m. The existing LIA, which is the portion of the EGTTR where the use of live munitions is currently authorized, lies mostly within W–151. The existing LIA encompasses approximately 940 nmi^2 (3,224 km^2 and includes water depths that range from approximately 30 to 145 m (Figure 2). This is where live munitions within the EGTTR are currently used in the existing LOA (83 FR 5545; February 8, 2018) and where the Gulf Range Armament Test Vessel (GRATV) is anchored. The GRATV remains anchored at a specific location during a given mission; however, it is mobile and relocated within the LIA based on mission needs.

The USAF's proposed activities provide for the creation of a new, separate area within the EGTTR that would be used for live missions in addition to the existing LIA. This area, herein referred to as the East LIA, would be located approximately 40 NM offshore of Eglin AFB property on Cape San Blas. Cape San Blas is located on St. Joseph Peninsula in Gulf County, Florida, approximately 90 mi (144 km) southeast of the Eglin Reservation. Eglin AFB facilities on Cape San Blas remotely support EGTTR operations via radar tracking, telemetry, and other functions. The proposed East LIA would be circular-shaped and have a radius of approximately 10 nmi (18.5 km) and a total area of approximately 314 NM^2. Water depths range from approximately 35 to 95 m. The general location of the proposed East LIA is shown in Figure 2. Establishment of the East LIA would allow Eglin AFB to maximize the flight range for large-footprint weapons and minimize the distance, time, and cost of deploying support vessels and targets. Based on these factors, the East LIA would allow testing of weapon systems and flight profiles that cannot be conducted within the constraints of the existing LIA.

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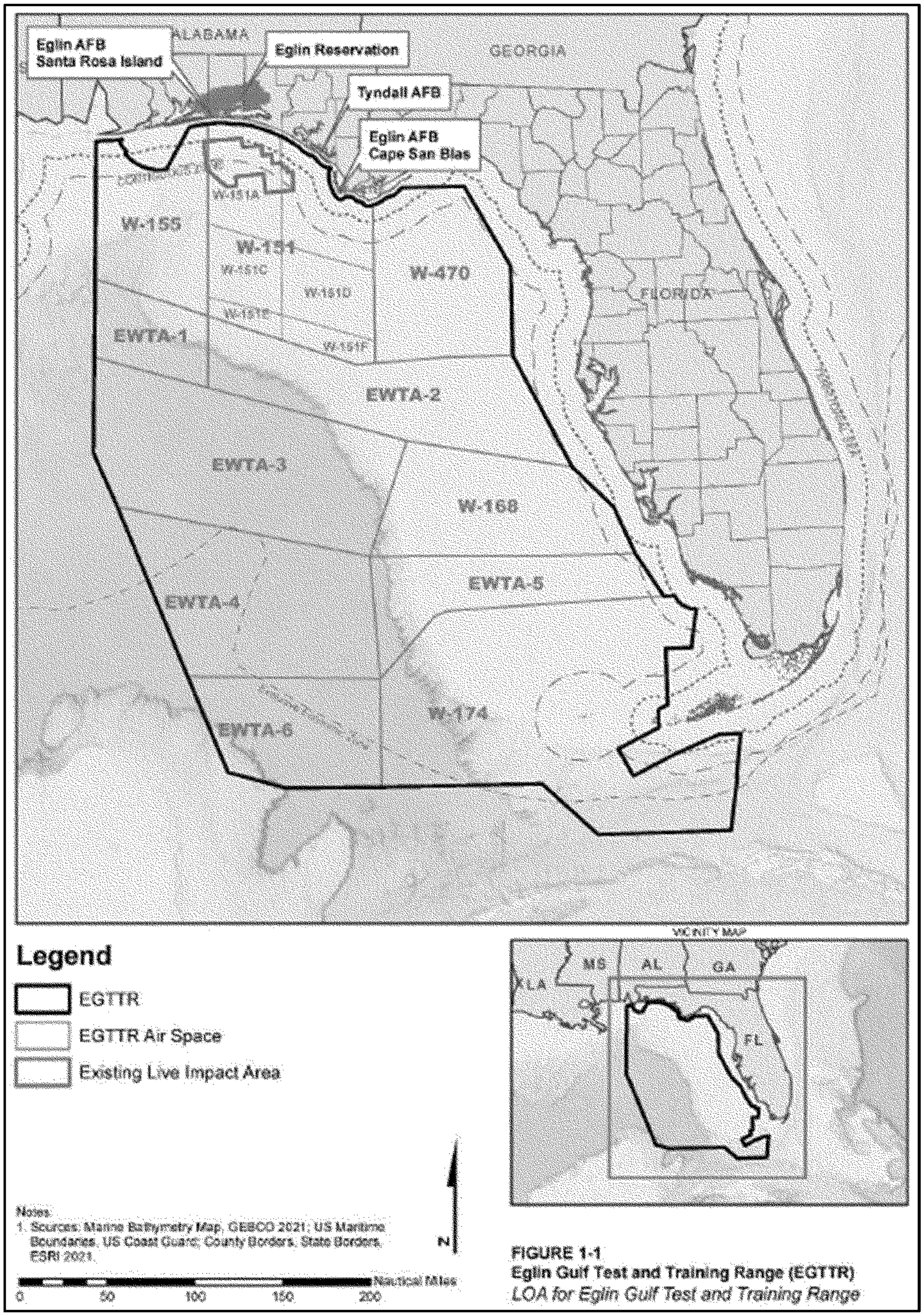

Figure 1: Elgin Gulf Test and Training Range

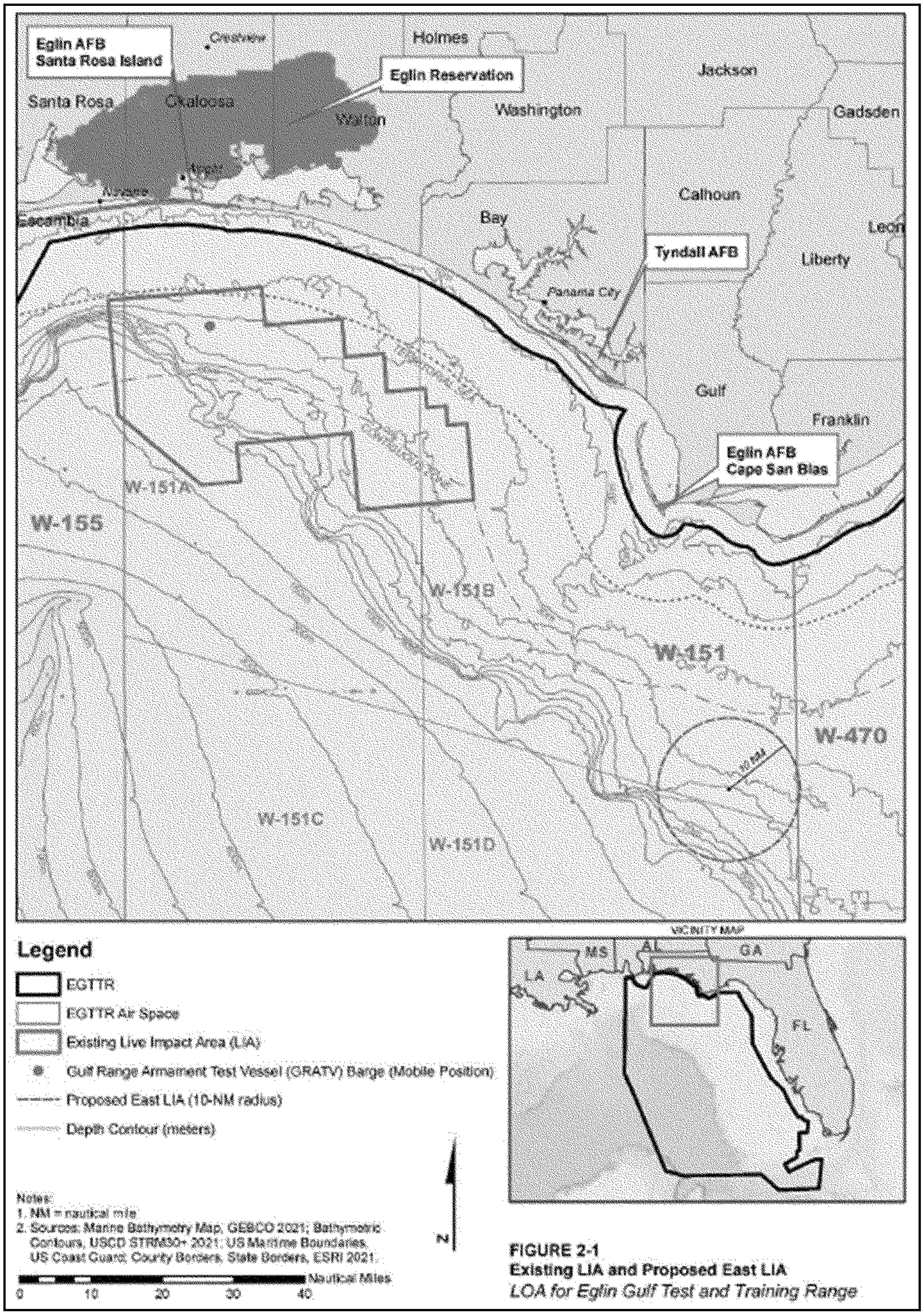

Figure 2: Existing LIA and Proposed East LIA

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Detailed Description of the Specified Activities

This section provides descriptions of each military user group's proposed EGTTR operations, as well as information regarding munitions proposed to be used during the operations. This information includes munition type, category, net explosive weight (NEW), detonation scenario, and annual quantity proposed to be expended in the EGTTR. NEW applies only to live munitions and is the total mass of the explosive substances in a given munition, without packaging, casings, bullets, or other non-explosive components of the munition. Note that for some munitions the warhead is removed and replaced with a telemetry package that tracks the munition's path and/or Flight Termination System (FTS) that ends the flight of the munition in a controlled manner. These munitions have been categorized as live munitions with NEWs that range from 0.30 to 0.70

lb (0.13 to 0.31 kg) While certain munitions with only FTS may be considered inert due to negligible NEW, those contained here are considered to be live with small amounts of NEW. The detonation scenario applies only to live munitions which are set to detonate in one of three ways: (1) in the air a few feet above the water surface, referred to as airburst or height of burst (HOB); (2) instantaneously upon contact with the water or target on the water surface; or (3) after a slight delay, up to 10 milliseconds, after impact, which would correspond to a subsurface detonation at a water depth of approximately 5 to 10 ft (1.5 to 3 m). Estimated take is only modeled for scenarios (2) and (3). The proposed annual expenditures of munitions are the quantities determined necessary to meet the mission requirements of the user groups.

Live missions proposed for the 2023–2030 period would be conducted in the existing LIA and potentially in the proposed East LIA, depending on the mission type and objectives. Live missions that involve only airburst or aerial target detonations would continue to be conducted in or outside the LIA in any portion of the EGTTR; such detonations have no appreciable effect on marine mammals because there is negligible transmission of pressure or acoustic energy across the air–water interface. Use of inert munitions and live air-to-surface gunnery operations would also continue to occur in or outside the LIA, subject to proposed mitigation and monitoring measures.

Eglin AFB proposes the following actions in the EGTTR which would be conducted in the existing LIA and potentially in the proposed East LIA, depending on the mission type and objectives:

(1) 53rd Weapons Evaluation Group missions that involve air-to-ground Weapons System Evaluation Program (WSEP) known as Combat Hammer which tests various types of munitions against small target boats and air-to-air missile testing known as Combat Archer;

(2) Continuation of the Air Force Special Operations Command (AFSOC) training missions in the EGTTR primarily involving air-to-surface gunnery, bomb, and missile exercises including AC–130 gunnery training, CV–22 training, and bomb and missile training;

(3) 96th Operations Group missions including AC–130 gunnery testing against floating marker targets on the water surface, MQ–9 air-to-surface testing, and 780th Test Squadron Precision Strike Weapons testing including air-launched cruise missile tests, air-to-air missile tests, Longbow and Joint Air-to-Ground Missile (JAGM) testing; Spike Non-Line-of-Sight (NLOS) air-to-surface missile testing, Patriot missile testing, Hypersonic Weapon Testing, sink at-sea live-fire training exercises (SINKEX), and testing using live and inert munitions against targets on the water surface; and

(4) Naval School Explosive Ordnance Disposal (NAVSCOLEOD) training missions that involve students diving and placing small explosive charges adjacent to inert mines.

53rd Weapons Evaluation Group

The 53rd Weapons Evaluation Group (53 WEG) conducts the USAF's air-to-ground Weapons System Evaluation Program (WSEP). The Combat Hammer program involves testing various types of live and inert munitions against small target boats. This testing is conducted to develop tactics, techniques, and procedures (TTP) to be used by USAF aircraft to counter small, maneuvering, hostile vessels. Combat Hammer missions proposed in the EGTTR for the 2023–2030 period would involve the use of several types of aircraft, including F–15, F–16, F–18, F–22, F–35, and A–10 fighter aircraft, AC–130 gunships, B–1, B–2, and B–52 bomber aircraft, and MQ–1 and MQ–9 drone aircraft. USAF, Air National Guard, and U.S. Navy units would support these missions. Live munitions would be deployed against static (anchored), remotely controlled, and towed targets. Static and remotely controlled targets would consist of stripped boat hulls with simulated systems and, in some cases, heat sources. Various types of live and inert munitions are used during Combat Hammer missions in the EGTTR, including missiles, bombs, and gun ammunition. Table 1 presents information on the munitions proposed for Combat Hammer missions in the EGTTR during the 2023–2030 period.

TABLE 1—PROPOSED MUNITIONS FOR WSEP COMBAT HAMMER MISSIONS IN THE EGTTR

Type	Category	Net explosive weight (lb)/(kg)	Destination scenario	Annual quantity
Live Munitions:				
AGR–20	Rocket	9.1 (4.1)	Surface	12
AGM–158D JASSM XR	Missile	240.26 (108.9)	Surface	4
AGM–158B JASSM ER	Missile	240.26 (108.9)	Surface	3
AGM–158A JASSM	Missile	240.26 (108.9)	Surface	3
AGM–65D	Missile	150 (68)	Surface	5
AGM–65G2	Missile	145 (65.7)	Surface	5
AGM–65H2	Missile	150 (68)	Surface	5
AGM–65K2	Missile	145 (65.7)	Surface	4
AGM–65L	Missile	150 (68)	Surface	5
AGM–114 N–6D with TM	Missile	29.1 (13.2)	Surface	4
AGM–114 N–4D with TM	Missile	29.94 (13.6)	Surface	4
AGM–114 R2 with TM (R10)	Missile	27.41 (12.4)	Surface	4
AGM–114 R–9E with TM (R11).	Missile	27.38 (12.4)	Surface	4
AGM–114Q with TM	Missile	20.16 (9.1)	Surface	4
CBU–105D	Bomb	108.6 (49.5)	HOB	8
GBU–53/B (GTV)	Bomb	0.34(0.1)[a]	HOB/Surface	8
GBU–39 SDB (GTV)	Bomb	0.39(0.1)[a]	Surface	4
AGM–88C w/FTS	Missile	0.70 (0.31)[a]	Surface	2
AGM–88B w/FTS	Missile	0.70 (0.31)[a]	Surface	2
AGM–88F w/FTS	Missile	0.70(0.31)[a]	Surface	2
AGM–88G w/FTS	Missile	0.70(0.31)[a]	Surface	2
AGM–179 JAGM	Missile	27.47(12.5)	Surface	4
GBU–69	Bomb	6.88 (3.1)	Surface	2
GBU–70	Bomb	6.88 (3.1)	Surface	4

TABLE 1—PROPOSED MUNITIONS FOR WSEP COMBAT HAMMER MISSIONS IN THE EGTTR—Continued

Type	Category	Net explosive weight (lb)/(kg)	Destination scenario	Annual quantity
AGM–176	Missile	8.14 (3.7)	Surface	4
GBU–54 KMU–572C/B	Bomb	193 (87.5)	Surface	4
GBU–54 KMU–572B/B	Bomb	193	Surface	4
PGU–43 (105 mm)	Gun Ammunition	4.7	Surface	100
Inert Munitions:				
ADM–160B MALD	Missile	N/A	N/A	4
ADM–160C MALD–J	Missile	N/A	N/A	4
ADM–160C–1 MALD–J	Missile	N/A	N/A	4
ADM–160D MALD–J	Missile	N/A	N/A	4
GBU–10	Bomb	N/A	N/A	8
GBU–12	Bomb	N/A	N/A	32
GBU–49	Bomb	N/A	N/A	16
GBU–24/B (84)	Bomb	N/A	N/A	16
GBU–24A/B (109)	Bomb	N/A	N/A	2
GBU–31B(v)1	Bomb	N/A	N/A	16
GBU–31C(v)1	Bomb	N/A	N/A	16
GBU–31B(v)3	Bomb	N/A	N/A	2
GBU–31C(v)3	Bomb	N/A	N/A	2
GBU–32C	Bomb	N/A	N/A	8
GBU–38B	Bomb	N/A	N/A	4
GBU–38C w/BDU–50 (No TM).	Bomb	N/A	N/A	4
GBU–38C	Bomb	N/A	N/A	10
GBU–54 KMU–572C/B	Bomb	N/A	N/A	4
GBU–54 KMU–572B/B	Bomb	N/A	N/A	4
GBU–69	Bomb	N/A	N/A	2
BDU–56A/B	Bomb	N/A	N/A	4
PGU–27 (20 mm)	Gun Ammunition	0.09 (0.04)	N/A	16,000
PGU–15 (30 mm)	Gun Ammunition	N/A	N/A	16,000
PGU–25 (25 mm)	Gun Ammunition	N/A	N/A	16,000
ALE–50	Decoy System	N/A	N/A	6

[a] Warhead replaced by FTS/TM. Identified NEW is for the FTS.

ADM = American Decoy Missile; AGM = Air-to-Ground Missile; ALE = Ammunition Loading Equipment; BDU = Bomb Dummy Unit; CBU = Cluster Bomb Unit; EGTTR = Eglin Gulf Test and Training Range; ER = Extended Range; FTS = Flight Termination System; GBU = Guided Bomb Unit; GTV = Guided Test Vehicle; HOB = height of burst; JAGM = Joint Air-to-Ground Missile; JASSM = Joint Air-to-Surface Standoff Missile; lb = pound(s); MALD = Miniature Air-Launched Decoy; mm = millimeter(s); N/A = not applicable; PGU = Projectile Gun Unit; SDB = Small-Diameter Bomb, TM = telemetry; WSEP = Weapons System Evaluation Program.

The Combat Archer program involves live air-to-air missile testing in the EGTTR. Combat Archer missions also include firing inert gun ammunition and releasing flares and chaff from aircraft. Air-to-air missile testing during these missions specifically involves firing live AIM–9 Sidewinder and AIM–120 Advanced Medium-Range Air-to-Air Missiles (AMRAAMs) at BOM–167 Subscale Aerial Targets and QF–16 Full-Scale Aerial Targets to evaluate the effectiveness of missile delivery techniques. Combat Archer missions involve the use of several types of fighter aircraft, including the F–15, F–16, F–18, F–22, F–35, and A–10. Table 2 presents information on the munitions proposed to be used during Combat Archer missions in the EGTTR.

TABLE 2—PROPOSED MUNITIONS FOR COMBAT ARCHER MISSIONS IN THE EGTTR

Type	Category	Net explosive weight (lb)/(kg)	Detonation scenario	Annual quantity
Live Munitions:				
AIM–120D	Missile	113.05 (51.3)	HOB	24
AIM–120C7	Missile	113.05 (51.3)	HOB	10
AIM–120C5/6	Missile	113.05 (51.3)	HOB	8
AIM–120C3	Missile	102.65 (46.5)	HOB	14
AIM–120C3	Missile	117.94 (63.5)	HOB/Surface	4
AIM–120B	Missile	102.65 (46.5)	HOB	18
AIM–9X Blk I	Missile	60.25 (27.3)	HOB	7
AIM–9X Blk I	Missile	67.9 (30.8)	HOB/Surface	10
AIM–9X Blk II	Missile	60.25 (27.3)	HOB	24
AIM–9M–9	Missile	60.55 (27.3)	HOB	90
Inert Munitions:				
AIM–260A JATM	Missile	N/A	N/A	4
PGU–27 (20 mm)	Gun Ammunition	N/A	N/A	80,000
PGU–23 (25 mm)	Gun Ammunition	N/A	N/A	6,000
MJU–7A/B Flare	Flare	N/A	N/A	1,800
R–188 Chaff	Chaff	N/A	N/A	6,000

TABLE 2—PROPOSED MUNITIONS FOR COMBAT ARCHER MISSIONS IN THE EGTTR—Continued

Type	Category	Net explosive weight (lb)/(kg)	Detonation scenario	Annual quantity
R–196 (T–1) Chaff	Chaff	N/A	N/A	1,500

AIM = Air Intercept Missile; EGTTR = Eglin Gulf Test and Training Range; HOB = height of burst; JATM = Joint Advanced Tactical Missile; lb = pound(s); MJU = Mobile Jettison Unit; mm = millimeter(s); N/A = not applicable; PGU = Projectile Gun Unit; WSEP = Weapons System Evaluation Program.

Air Force Special Operations Command Training

The Air Force Special Operations Command (AFSOC) proposes to continue conducting training missions during the 2023–2030 period. These missions primarily involve air-to-surface gunnery, bomb, and missile exercises. Gunnery training in the EGTTR involves firing live rounds from AC–130 gunships at targets on the water surface. Gun ammunition used for this training primarily includes 30-millimeter (mm) High Explosive (HE) and 105 mm HE rounds. A standard 105 mm HE round has a NEW of 4.7 lb. The Training Round (TR) variant of the 105 mm HE round, which has a NEW of 0.35 lb, is used by AFSOC for nighttime missions. This TR was developed to have less explosive material to minimize potential impacts to protected marine species, which could not be adequately surveyed at night by earlier aircraft instrumentation. Since the development of the 105 mm HE TR, AC–130s have been equipped with low-light electro-optical and infrared sensor systems that provide excellent night vision. Targets used for AC–130 gunnery training include Mark (Mk)-25 marine markers and inflatable targets. During each gunnery training mission, gun firing can last up to 90 minutes but typically lasts approximately 30 minutes. Live firing is continuous, with pauses usually lasting well under 1 minute and rarely up to 5 minutes. Table 3 presents information on the rounds proposed for AC–130 gunnery training by AFSOC.

TABLE 3—PROPOSED ROUNDS FOR AC–130 GUNNERY TRAINING IN THE EGTTR

Type	Net explosive weight (lb)/(kg)	Detonation scenario	Number of missions	Rounds per mission	Annual quantity
Daytime Missions:					
105 mm HE (FU)	4.7 (2.1)	Surface	25	30	750
30 mm HE	0.1 (0.04)			500	12,500
Nighttime Missions:					
105 mm HE (TR)	0.35 (0.2	Surface	45	30	1,350
30 mm HE	0.1 (0.04)			500	22,500
Total			70		37,100

EGTTR = Eglin Gulf Test and Training Range; FU = Full Up; HE = High Explosive; mm = millimeter(s); lb = pound(s); TR = Training Round.

The 8th Special Operations Squadron (8 SOS) under AFSOC conducts training in the EGTTR using the tiltrotor CV–22 Osprey. This training involves firing .50 caliber rounds from CV–22s at floating marker targets on the water surface. The .50 caliber rounds do not contain explosive material and, therefore, do not detonate. Flight procedures for CV–22 training are similar to those described for AC–130 gunnery training, except that CV–22 aircraft typically operate at much lower altitudes (100 to 1,000 feet (30.48 to 304.8 m) (AGL) than AC–130 gunships (6,000 to 20,000 feet (1,828 to6,96 m) AGL). Like AC–130 gunships, CV–22s are equipped with highly sophisticated electro-optical and infrared sensor systems that allow advanced detection capability during day and night. Table 4 presents information on the rounds proposed for CV–22 training missions.

TABLE 4—PROPOSED ROUNDS FOR CV–22 TRAINING IN THE EGTTR

Type	Net explosive weight (lb)	Detonation scenario	Number of missions	Rounds per mission	Annual quantity
Daytime Missions:					
.50 Caliber	N/A	Surface	25	600	15,000
Nighttime Missions:					
.50 Caliber	N/A	Surface	25	600	15,000
Total				50	30,000

In addition to AC–130 gunnery and CV–22 training, AFSOC also conducts other air-to-surface training in the EGTTR using various types of bombs and missiles as shown in Table 5. This training is conducted primarily to develop TTPs and train strike aircraft to counter small moving boats. Munitions used for this training primarily include live AGM–176 Griffin missiles, live AGM–114 Hellfire missiles, and various types of live and inert bombs. These munitions are launched from various types of aircraft against small target boats, and they either detonate on impact with the target or at a programmed HOB.

TABLE 5—PROPOSED MUNITIONS FOR AFSOC BOMB AND MISSILE TRAINING IN THE EGTTR

Type	Category	Net explosive weight (lb)(kg)	Detonation scenario	Annual quantity
Live Munitions:				
AGM–176 Griffin	Missile	4.58 (2.1)	HOB	100
AGM–114R9E/R2 Hellfire.	Missile	20.0 (9.07)	HOB	70
2.75-inch Rocket (including APKWS).	Rocket	2.3 (1.0)	Surface	400
GBU–12	Bomb	198.0 (89.8)/298.0 (135.1)	Surface	30
Mk-81 (GP 250 lb)	Bomb	151.0 (98.4)	Surface	30
GBU–39 (SDB I)	Bomb	37.0 (16.7)	HOB	30
GBU–69	Bomb	36.0 (16.3)	HOB	40
Inert Munitions:				
.50 caliber	Gun Ammunition	N/A	N/A	30,000
GBU–12	Bomb	N/A	N/A	30
MkK–81 (GP 250 lb)	Bomb	N/A	N/A	30
BDU–50	Bomb	N/A	N/A	30
BDU–33	Bomb	N/A	N/A	50

AFSOC = Air Force Special Operations Command; AGM = Air-to-Ground Missile; APKWS = Advanced Precision Kill Weapon System; BDU = Bomb Dummy Unit; EGTTR = Eglin Gulf Test and Training Range; GBU = Guided Bomb Unit; GP = General Purpose; HOB = height of burst; lb = pound(s); Mk = Mark; N/A = not applicable; SDB = Small-Diameter Bomb.

96th Operations Group

Three units under the 96th Operations Group (96 OG) propose to conduct missions in the EGTTR during the 2023–2030 period: the 417th Flight Test Squadron (417 FLTS), the 96th Operational Support Squadron (96 OSS), and the 780th Test Squadron (780 TS).

The 417 FLTS proposes to continue conducting AC–130 testing in the EGTTR to evaluate the capabilities of the Precision Strike Package (PSP), Stand Off Precision Guided Munitions (SOPGM), and other systems on AC–13O aircraft. AC–130 gunnery testing is generally similar to activities previously described for AFSOC AC–130 gunnery training.

Table 6 presents information on the munitions proposed for AC–130 testing in the EGTTR during the 2023–2030 mission period.

TABLE 6—PROPOSED ROUNDS FOR AC–130 GUNNERY TESTING IN THE EGTTR

Type	Category	Net explosive weight (lb)/(kg)	Detonation scenario	Annual quantity
Live Munitions:				
AGM–176 Griffin	Missile	4.58 (2.1)	Surface	10
AGM–114 Hellfire	Missile	20.0 (9.1)	Surface	10
GBU–39 (SDB I)	Bomb	37.0 (16.8)	Surface	6
GBU–39 (LSDB)	Bomb	37.0 (16.8)	Surface	10
105 mm HE (FU)	Gun Ammunition	4.7 (2.1)	Surface	60
105 mm HE (TR)	Gun Ammunition	0.35 (0.2)	Surface	60
30 mm HE	Gun Ammunition	0.1 (0.1)	Surface	99

AGM = Air-to-Ground Missile; EGTTR = Eglin Gulf Test and Training Range; FU = Full Up; GBU = Guided Bomb Unit; HE = High Explosive; lb = pound(s); mm = millimeter(s); LSDB = Laser Small-Diameter Bomb; SDB = Small-Diameter Bomb; TR = Training Round.

The 96 OSS proposes to conduct air-to-surface testing in the EGTTR using assorted live missiles and live and inert precision-guided bombs to support testing requirements of the MQ–9 Reaper unmanned aerial vehicle (UAV) program. The proposed munitions would be tested for MQ–9 integration and would include captive carry and munitions employment tests. During munition employment tests, the proposed munitions would be launched from MQ–9 aircraft at various types of static and moving targets on the water surface. Table 7 presents information on the munitions proposed by the 96 OSS for MQ–9 testing in the EGTTR.

TABLE 7—PROPOSED MUNITIONS FOR MQ–9 TESTING IN THE EGTTR

Type	Category	Net explosive weight (lb)/(kg)	Detonation scenario	Annual quantity
Live Munitions:				
AGM–114R Hellfire	Missile	20.0 (9.1)	Surface	36
AIM–9X	Missile	7.9 (3.6)	HOB	1

TABLE 7—PROPOSED MUNITIONS FOR MQ–9 TESTING IN THE EGTTR—Continued

Type	Category	Net explosive weight (lb)/(kg)	Detonation scenario	Annual quantity
GBU–39B/B LSDB	Bomb	37.0 (16.8)	Surface	2
Inert Munitions:				
GBU–39B/B LSDB	Bomb	N/A	N/A	2
GBU–49	Bomb	N/A	N/A	10
GBU–48	Bomb	N/A	N/A	1

AGM = Air-to-Ground Missile; AIM = Air Intercept Missile; EGTTR = Eglin Gulf Test and Training Range; GBU = Guided Bomb Unit; lb = pound(s); LSDB = Laser Small-Diameter Bomb.

The 780 TS, the Air Force Life Cycle Management Center, and the U.S. Navy jointly conduct Precision Strike Weapons (PSW) test missions in the EGTTR. These missions use the AGM–158 JASSM and GBU–39 SDB precision-guided bomb. The JASSM is an air-launched cruise missile with a range of more than 200 nmi (370 km). During test missions, the JASSM would be launched from aircraft more than 200 nmi (370 km) from the target location at altitudes greater than 25,000 ft (7,620 m) km above ground level (AGL). The JASSM would cruise at altitudes greater than 12,000 ft (3,657 m) AGL for most of the flight profile until its terminal descent toward the target. The GBU–39 SDB is a precision-guided glide bomb with a range of more than 50 nmi (92.6 km). This bomb would be launched from aircraft more than 50 nmi (92.6 km) from the target location at altitudes greater than 5,000 ft (1,524 m) AGL. The bomb would travel via a non-powered glide to the intended target. Instrumentation in the bomb self-controls the bomb's flight path. Live JASSMs would detonate at a HOB of approximately 5 ft (0.30 m); however, these detonations are assumed to occur at the surface for the impact analysis. The SDBs would detonate either at a HOB of approximately 7 to 14 ft (2.1 to 4.2 m) or upon impact with the target (surface). For simultaneous SDB launches, two SDBs would be launched from the same aircraft at approximately the same time to strike the same target. The SDBs would strike the target within approximately 5 seconds or less of each other. Such detonations would be considered a single event, with the associated NEW being doubled for a conservative impact analysis.

Two types of targets are typically used for PSW tests: Container Express (CONEX) targets and hopper barge targets. CONEX targets typically consist of up to five CONEX containers strapped, braced, and welded together to form a single structure. A hopper barge is a common type of barge that cannot move itself; a typical hopper barge measures approximately 30 ft (9.1 m) by 12 ft (3.6 m) by 125 ft (38.1 m).

Other SDB tests in the EGTTR during the 2023–2030 mission period may include operational testing of the GBU–53 (SDB II). These tests may involve live and inert testing of the munition against target boats.

Table 8 presents information on the munitions proposed for PSW missions in the EGTTR during the 2023–2030 period.

TABLE 8—PROPOSED MUNITIONS FOR PRECISION STRIKE WEAPON MISSIONS

Type	Category	Net explosive weight (lb)/(kg)	Detonation scenario	Annual quantity
Live Munitions:				
AGM–158 (JASSM)	Missile	240.26 (108.9)	Surface	2
GBU–39 (SDB I)	Bomb	37.0 (16.8)	HOB/Surface	2
GBU–39 (SDB I) Simultaneous Launch[a].	Bomb	74.0 (33.35)	HOB/Surface	2
GBU–53 (SDB II)	Bomb	22.84 (10.4)	HOB/Surface	2
Inert Munitions:				
AGM–158 (JASSM)	Missile	N/A	N/A	4
GBU–39 (SDB I)	Bomb	N/A	N/A	4
GBU–39 (SDB I) Simultaneous Launch.	Bomb	N/A	N/A	4
GBU–53 (SDB II)	Bomb	N/A	N/A	1

[a] NEW is doubled for simultaneous launch.

AGM = Air-to-Ground Missile; EGTTR = Eglin Gulf Test and Training Range; GBU = Guided Bomb Unit; HOB = height of burst; JASSM = Joint Air-to-Surface Standoff Missile; lb = pound(s); N/A = not applicable; SDB = Small-Diameter Bomb.

The 780 TS, along with the Air Force Life Cycle Management Center and U.S. Navy, propose to jointly conduct air-to-air missile testing in the EGTTR. These missions would involve the use of the AIM–260A Joint Advanced Tactical Missile (JATM), AIM–9X Sidewinder, and AIM–120 AMRAAM missiles; all missiles used in these tests would be inert. Table 9 presents information on the munitions proposed for air-to-air missile testing missions in the EGTTR during the 2023–2030 mission period.

TABLE 9—PROPOSED MUNITIONS FOR AIR-TO-AIR MISSILE TESTING IN THE EGTTR

Type	Category	Net explosive weight (lb)	Detonation scenario	Annual quantity
AIM–260 JATM—Inert	Missile	N/A	N/A	6
AIM–9X—Inert	Missile	N/A	N/A	10
AIM–120 AMRAAM—Inert	Missile	N/A	N/A	15

AIM = Air Intercept Missile; AMRAAM = Advanced Medium-Range Air-to-Air Missile; EGTTR = Eglin Gulf Test and Training Range; lb = pound(s); JATM = Joint Advanced Tactical Missile; N/A = not applicable.

The 780 TS proposes to test the ability of the AGM–114L Longbow missile and AGM–179A Joint Air-to-Ground Missile (JAGM) missile to track and impact moving target boats in the EGTTR as shown in Table 10. These missiles are typically launched from an AH–64D Apache helicopter. The test targets would be remotely controlled boats, including the 25-foot High-Speed Maneuverable Surface Target (HSMST) (foam filled) and 41-foot (12.5 m) Coast Guard Utility Boat (metal hull). The missiles would be launched approximately 0.9 to 4.3 nmi (1.7 to 7.9 km) from the targets.

TABLE 10—PROPOSED MUNITIONS FOR LONGBOW AND JAGM MISSILE TESTING IN THE EGTTR

Type	Category	Net explosive weight (lb)/(kg)	Detonation scenario	Annual quantity
AGM–114L Longbow	Missile	35.95 (16.3)	HOB	6
AGM–179A JAGM	Missile	27.47 (11.1)	HOB	8

AGM = Air-to-Ground Missile; EGTTR = Eglin Gulf Test and Training Range; HOB = height of burst; JAGM = Joint Air-to-Ground Missile; lb = pound(s).

The 780 TS proposes to test the Spike Non-Line-of-Sight (NLOS) air-to-surface tactical missile system against static and moving target boats in the EGTTR in support of the U.S. Army's initiative to incorporate the Spike NLOS missile system onto the AH–64E Apache helicopter. These missiles shown in Table 11 would be launched from an AH–64D Apache helicopter and the test targets would include foam-filled fiberglass boats approximately 25 ft (7.62 m) in length that are either anchored or towed by a remotely controlled (HSMST).

TABLE 11—PROPOSED MUNITIONS FOR NLOS SPIKE MISSILE TESTING IN THE EGTTR

Type	Category	Net explosive weight (lb)/(kg)	Detonation scenario	Annual quantity
Spike NLOS	Missile	34.08 (14.5)	Surface	3

The 780 TS proposes to conduct surface-to-air testing of Patriot Advanced Capability (PAC)–2 and PAC–3 missiles in the EGTTR. These missiles are expected to be fired from the A–15 launch site on Santa Rosa Island at drones in the EGTTR. Detailed operational data for this testing are not yet available. Standard inventory missiles would be used and up to eight PAC–2 tests and two PAC–3 tests per year are proposed as shown in Table 12.

TABLE 12—PROPOSED MUNITIONS FOR PATRIOT MISSILE TESTING IN THE EGTTR

Type	Category	Net explosive weight (lb)/(kg)	Detonation scenario	Annual quantity
PAC–2	Missile	[a]145.0 (65.7)	N/A (drone target)	8
PAC–3	Missile	[a]145.0 (65.7)	N/A (drone target)	2

[a] Assumed for impact analysis.

Hypersonic weapons are capable of traveling at least five times the speed of sound, referred to as Mach 5. While conventional weapons typically rely on explosive warheads to inflict damage on a target, hypersonic weapons typically rely on kinetic energy from high-velocity impact to inflict damage on targets. For the purpose of assessing impacts, the kinetic energy of a hypersonic weapon may be correlated to energy release in units of feet-lb or trinitrotoluene (TNT) equivalency.

The 780 TS supports several hypersonic weapon programs, including the Hypersonic Attack Cruise Missile (HACM) and Precision Strike Missile (PrSM) programs, which are presented in Table 13.

HACM is a developmental air-breathing hypersonic cruise missile that uses scramjet technology for propulsion. This weapon would air-launched. The 780 TS proposes to conduct HACM testing, which would involve air launches through a north-south corridor within the EGTTR to a target location on the water surface. The dimensions and orientation of the test flight corridor within the EGTTR for HACM tests are to be determined; the flight corridor is preliminarily expected to be 300 to 400 nmi (555 to 740 km) in total length. Live HACMs would be fired from the southern portion of the EGTTR into either the existing LIA or proposed East LIA. Up to two live HACMs per year are proposed to be tested in the EGTTR during the 2023–2030 mission period.

The PrSM is being developed by the U.S. Army as a surface-to-surface, long-range, precision-strike guided missile to be fired from the M270A1 Multiple Launch Rocket System and the M142 High Mobility Artillery Rocket System. The 780 TS in coordination with the U.S. Army proposes to conduct PrSM testing in the EGTTR. Some PrSM testing is expected to involve surface launches of the PrSM from the A–15 launch site on Santa Rosa Island. The dimensions and orientation of the test flight corridor within the EGTTR for PrSM tests are to be determined; the flight corridor is preliminarily expected to be 162 to 270 nmi (300 to 500 km) in total length. For tests that involve a live warhead on the PrSM, the PrSM would be preset to detonate at a specific height above the water surface (HOB/airburst) and could occur in any portion of the EGTTR. Any surface strikes proposed with live PrSMs would be required to be in the existing LIA or proposed East LIA. Like inert HACM tests, inert PrSM tests could occur in any portion of the EGTTR, except between the 100-m and 400-m isobaths to prevent impacts to the Rice's whale.

TABLE 13—PROPOSED MUNITIONS FOR HYPERSONIC WEAPON TESTING IN THE EGTTR

Type	Category	Net explosive weight (lb)/(kg)	Detonation scenario	Annual quantity
Live Munitions:				
HACM	Hypersonic Weapon	[a]350 (158.7)	Surface	2
PrSM	Hypersonic Weapon	[a]46 (158.7)	HOB	2
Inert Munitions:				
PrSM—Inert	Hypersonic Weapon	N/A	N/A	2

[a] Net explosive weight at impact/detonation.

The 780 TS, in coordination with the Air Force Research Laboratory, proposes to conduct SINKEX testing in the EGTTR. SINKEX exercises would involve the sinking of vessels, typically 200–400 ft (61 –122 m) in length, in the existing LIA. The types of munitions that would be used for SINKEX testing is controlled information and, therefore, not identified (Table 14).

TABLE 14—PROPOSED SINKEX EXERCISES IN THE EGTTR

Type	Category	Net explosive weight (lb)	Detonation scenario	Annual quantity
SINKEX	Vessel Sinking Exercise	Not Available	Not Available	2

The 780 TS plans to lead or support other types of testing in the EGTTR as shown in Table 15. These missions would primarily include testing live and inert munitions against targets on the water surface, such as boats and barges. Some of the tests would involve munitions with NEWs of up to 945 lb, which is the highest NEW associated with the munitions analyzed in this LOA application.

TABLE 15—PROPOSED MUNITIONS FOR OTHER 780 TEST SQUADRON TESTING IN THE EGTTR

Type	Category	Net explosive weight (lb)/(kg)	Detonation scenario	Target type	Annual quantity
Live Munitions:					
GBU–10, 24, or 31 (QUICKSINK).	Bomb	945 (428.5)	Subsurface	TBD	4 to 8
2,000 lb bomb with JDAM kit.	Bomb	945 (428.5) or less	HOB	TBD	2
Inert GBU–39 (LSDB). with live fuze	Bomb	0.4 (0.2)	HOB/Surface	Small Boat	4
Inert GBU–53 (SDB II). with live fuze	Bomb	0.4 (0.2)	HOB/Surface	Small Boat	4
Inert Munitions:					
SiAW AARGM–ER.	Missile	N/A	N/A	TBD	7
Multipurpose Booster	Booster	N/A	N/A	TBD	1
JDAM ER	Bomb	N/A	N/A	Water Surface and Barge.	3

TABLE 15—PROPOSED MUNITIONS FOR OTHER 780 TEST SQUADRON TESTING IN THE EGTTR—Continued

Type	Category	Net explosive weight (lb)/(kg)	Detonation scenario	Target type	Annual quantity
Navy HAAWC	Torpedo	N/A	N/A	Water Surface	2

AARGM–ER = Advanced Anti-Radiation Guided Missile—Extended Range; EGTTR = Eglin Gulf Test and Training Range; Guided Bomb Unit; HOB = height of burst; HAAWC = High Altitude Anti-Submarine Warfare Weapon Capability; JDAM = Joint Direct Attack Munition; lb = pound(s); LSDB = Laser Small-Diameter Bomb; N/A = not applicable; SDB = Small-Diameter Bomb; SiAW = Stand-in Attack Weapon; TBD = to be determined.

The 96 OG proposes to continue expending approximately nine inert bombs a year in the EGTTR for testing purposes. The bombs are expected to be up to 2,000 lb (907 kg) in total weight. For the impact analysis, the bombs to be used by the 96 OG in the EGTTR during the 2023–2030 mission period are assumed to be Mk–84 2,000 lb (907 kg) General Purpose (GP) inert bombs (Table 16).

TABLE 16—PROPOSED MUNITIONS FOR INERT BOMB TESTING IN THE EGTTR

Type	Category	Net explosive weight (lb)	Detonation scenario	Annual quantity
Mk-84 (GP 2,000 lb) [a]	Bomb	N/A	N/A	9

[a]Assumed for impact analysis.
EGTTR = Eglin Gulf Test and Training Range; GP = General Purpose; lb = pound(s); Mk = Mark; N/A = not applicable.

Naval School Explosive Ordnance Disposal (NAVSCOLEOD)

NAVSCOLEOD proposes to conduct training missions in the EGTTR which would include Countermeasures (MCM) exercises to teach NAVSCOLEOD students techniques for neutralizing mines underwater (Table 17). Underwater MCM training exercises are conducted in nearshore waters and primarily involve diving and placing small explosive charges adjacent to inert mines by hand; the detonation of such charges disables live mines. NAVSCOLEOD training is conducted offshore of Santa Rosa Island and in other locations and has not yet extended into the EGTTR. NAVSCOLEOD training proposed for the 2023–2030 mission period would extend approximately 5 nmi (9.26 km) offshore of Santa Rosa Island, in the EGTTR. Up to 8 MCM training missions would be conducted annually in the EGTTR during the 2023–2030 period. Each mission would involve 4 underwater detonations of charges hand placed adjacent to inert mines, for a total of 32 annual detonations. The MCM neutralization charges consist of C–4 explosives, detonation cord, non-electric blasting caps, time fuzes, and fuze igniters; each charge has a NEW of approximately 20 lb. (9.07 kg). During each mission, with a maximum of 4 charges, would detonate with a delay no greater than 20 minutes between shots. After the final detonation, or a delay greater than 20 minutes, a 30-minute environmental observation would be conducted. Additionally, NAVSCOLEOD proposes to conduct up to 80 floating mine training missions, which would involve detonations of charges on the water surface; these charges would have a NEW of approximately 5 lb (2.3 kg). All NAVSCOLEOD missions would occur only during daylight hours.

TABLE 17—PROPOSED MUNITIONS FOR NAVSCOLEOD TRAINING IN THE EGTTR

Type	Category	Net Explosive weight (lb)/(kg)	Detonation scenario	Annual quantity
Underwater Mine Charge	Charge	[a]20 (9.1)	Subsurface	32
Floating Mine Charge	Charge	[a]5 (2.3)	Surface	80

[a] Estimated

Description of Stressors

The USAF uses the EGTTR for training purposes and for testing of a variety of weapon systems described in this proposed rule. All of the weapons systems considered likely to cause the take of marine mammals involve explosive detonations. Training and testing with these systems may introduce acoustic (sound) energy or shock waves from explosives into the environment. The following section describes explosives detonated at or just below the surface of the water within the EGTTR. Because of the complexity of analyzing sound propagation in the ocean environment, the USAF relied on acoustic models in its environmental analyses and rulemaking/LOA application that considered sound source characteristics and conditions across the EGTTR.

Explosive detonations at the water surface send a shock wave and sound energy through the water and can release gaseous by-products, create an oscillating bubble, or cause a plume of water to shoot up from the water surface. When an air-to-surface munition impacts the water, some of the kinetic energy displaces water in the formation of an impact ''crater'' in the water, some of the kinetic energy is transmitted from the impact point as underwater acoustic energy in a pressure impulse, and the remaining kinetic energy is retained by the munition continuing to move through the water. Following impact, the warhead of a live munition detonates at or slightly below the water surface. The warhead detonation converts explosive material into gas, further displacing water through the rapid creation of a gas bubble in the water, and creates a much larger pressure wave than the pressure wave created by the impact. These impulse pressure waves radiate from the impact point at the speed of sound in water, roughly 1,500 m per second. If the detonation is sufficiently deep, the gas bubble goes through a series of expansions and contractions, with each cycle being of successively lower energy. When detonations occur below but near the water surface, the initial gas bubble reaches the surface and causes venting, which also dissipates energy through the ejection of water and release of detonation gases into the atmosphere. When a detonation occurs below the water surface after the impact crater has fully or partially closed, water can be violently ejected upward by the pressure impulse and through venting of the gas bubble formed by the detonation.

With radii of up to 15 m, the gas bubbles that would be generated by EGTTR munition detonations would be larger than the depth of detonation but much smaller than the water depth, so all munitions analyzed are considered to fully vent to the surface without forming underwater bubble expansion and contraction cycles. When detonations occur at the water surface, a large portion of the energy and gases that would otherwise form a detonation bubble are reflected upward from the water. Likewise, when a shallow detonation occurs below the water surface but prior to the impact crater closing, considerable energy is reflected upward from the water. As a conservative assumption, no energy losses from surface effects are included in the acoustic model.

The impulsive pressure waves generated by munition impact and warhead detonation radiate spherically and are reflected between the water surface and the sea bottom. There is generally some attenuation of the pressure waves by the sea bottom but relatively little attenuation of the pressure waves by the water surface. As a conservative assumption, the water surface is assumed to be flat (no waves) to allow for maximum reflectivity. Additionally, is it assumed that all detonations occur in the water and none of the detonations occur above the water surface when a munition impacts a target. This conservative assumption implies that all munition energy is imparted to the water rather than the intended targets. The potential impacts of exposure to explosive detonations are discussed in detail in the Potential Effects of Specified Activities on Marine Mammals and their Habitat section.

Description of Marine Mammals in the Area of the Specified Activities

Table 18 lists all species or stocks for which take is expected and proposed to be authorized for this activity, and summarizes information related to the population or stock, including regulatory status under the MMPA and Endangered Species Act (ESA) and potential biological removal (PBR), where known. PBR is defined by the MMPA as the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population (as described in NMFS' SARs). While no serious injury or mortality is expected to occur, PBR and annual serious injury and mortality from anthropogenic sources are included here as gross indicators of the status of the species or stocks and other threats.

Marine mammal abundance estimates presented in this document represent the total number of individuals that make up a given stock or the total number estimated within a particular study or survey area. NMFS' stock abundance estimates for most species represent the total estimate of individuals within the geographic area, if known, that comprises that stock. For some species, this geographic area may extend beyond U.S. waters. All stocks managed under the MMPA in this region are assessed in NMFS' 2021 U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessment (Hayes *et al.* 2022; *https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports*). All values presented in Table 18 are the most recent available at the time of publication and are available online at: *www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessments*).

TABLE 18—MARINE MAMMALS POTENTIALLY PRESENT IN THE SPECIFIED GEOGRAPHICAL REGION

Common name	Scientific name	Stock	ESA/ MMPA status; strategic (Y/N) [1]	NMFS stock abundance (CV, N_{min}, most recent abundance survey) [2]	PBR	Annual M/SI [3]
Order Cetartiodactyla—Cetacea—Superfamily Mysticeti (baleen whales)						
Family Balaenopteridae (rorquals):						
Rice's whale [4]	*Balaenoptera ricei*	Gulf of Mexico	E/D; Y	51 (0.50; 34; 2017–18)	0.1	0.5
Superfamily Odontoceti (toothed whales, dolphins, and porpoises)						
Family Delphinidae:						
Common bottlenose dolphin	*Tursiops 939runcates truncatus*	Northern GOM Continental Shelf.	-; N	63,280 (0.11; 57,917; 2018).	556	65
Atlantic spotted dolphin	*Stenella frontalis*	GOM	-; N	21,506 (0.26; 17,339; 2017–18).	166	36

[1] ESA status: Endangered/MMPA status: Depleted (D). A dash (-) indicates that the species is not listed under the ESA or designated as depleted under the MMPA. Under the MMPA, a strategic stock is one for which the level of direct human-caused mortality exceeds PBR or which is determined to be declining and likely to be listed under the ESA within the foreseeable future. Any species or stock listed under the ESA is automatically designated under the MMPA as depleted and as a strategic stock.

[2] NMFS marine mammal stock assessment reports online at: *www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessments.* CV is coefficient of variation; N_{min} is the minimum estimate of stock abundance.

[3] These values, found in NMFS' SARs, represent annual levels of human-caused mortality (M) plus serious injury (SI) from all sources combined (*e.g.,* commercial fisheries, ship strike). These values are generally considered minimums because, among other reasons, not all fisheries that could interact with a particular stock are observed and/or observer coverage is very low, and, for some stocks (such as the Atlantic spotted dolphin and continental shelf stock of bottlenose dolphin), no estimate for injury due to the *Deepwater Horizon* oil spill has been included. See SARs for further discussion.

[4] The 2021 final rule refers to the Gulf of Mexico (GOM) Bryde's whale (*Balaenoptera edeni*). These whales were subsequently described as a new species, Rice's whale (*Balaenoptera ricei*) (Rosel *et al.,* 2021).

As indicated above, all three species (with three managed stocks) in Table 18 temporally and spatially co-occur with the activity to the degree that take is reasonably likely to occur. These species are generally categorized into those species that occur over the continental shelf, which is typically considered to extend from shore to the 200-m (656-ft) isobath, and those species that occur beyond the continental shelf break in waters deeper than 200 m. Since water depths range from approximately 30 to 145 m in the existing LIA and from approximately 35 to 95 m in the proposed new East LIA, most of EGTTR activities would occur in waters over the continental shelf. Any live munitions would be set to detonate above the water surface if used outside the LIA beyond the 200-m isobath. Airburst detonations are not considered to affect marine mammals because there is little transmission of pressure or sound energy across the air-water interface. For these reasons, only cetacean species that predominantly occur landward of the 200-m isobath are carried forward in the analysis. These species include common bottlenose dolphin, Atlantic spotted dolphin, and Rice's whale.

Common Bottlenose Dolphin

The common bottlenose dolphin is abundant in the northeastern Gulf from inshore to upper continental slope waters less than 1,000 m deep (Mullin and Fulling 2004). It is the most common cetacean species found in the coastal waters of the Gulf of Mexico. Genetically distinct coastal and offshore ecotypes of the bottlenose dolphin occur in the Gulf of Mexico and in other locations (Hoelzel *et al.* 1998). A total of 36 common bottlenose dolphin stocks have been identified in the northern Gulf of Mexico including coastal, continental shelf, and oceanic stocks, as well as 31 bay, sound, and estuarine stocks (Waring *et al.* 2016). Stocks that may be found near or within the EGTTR include the Gulf of Mexico Northern Coastal, Northern Gulf of Mexico Continental Shelf, and Northern Gulf of Mexico Oceanic stocks, in addition to three inshore stocks, which include the Choctawhatchee Bay, Pensacola/East Bay, and St. Andrew Bay stocks. However, the designated inshore stock areas are landward of the EGTTR boundary; therefore, individuals from these stocks are not anticipated to be exposed to or affected by EGTTR operations. The Gulf of Mexico Northern Coastal Stock inhabits waters from shore to the 20-m (65-ft) isobath and, therefore, has potential to occur within the EGTTR, which starts at 3 nmi (5.5 km) offshore, where water depths can be 20 m or slightly less. However, given that most EGTTR operations would occur in either the existing LIA, where water depths range from approximately 30 to 145 m, or in the proposed East LIA, where water depths range from approximately 35 to 85 m, EGTTR operations are expected to have no appreciable effect on this stock. The Northern Gulf of Mexico Continental Shelf Stock inhabits waters that are 20 to 200 m deep and, therefore, is expected to be the primary bottlenose dolphin stock that occurs in the existing LIA. The Northern Gulf of Mexico Oceanic Stock inhabits waters deeper than 200 m and, therefore, is not expected to be exposed to or affected by EGGTR operations in either LIA.

The bottlenose dolphin reaches a length ranging from about 6 to 13 ft (1.8 to 3.9 m) and a weight ranging from about 300 to 1,400 lb (136 to 635 kg). The diet of bottlenose dolphins consists primarily of fish, squid, and crustaceans. They hunt for prey using a variety of techniques individually and cooperatively. For example, they may work as a group to herd and trap fish as well as use high-frequency echolocation, to catch prey.

Atlantic Spotted Dolphin

The Atlantic spotted dolphin occurs throughout the Atlantic Ocean and the Gulf of Mexico. There is a single stock of the Atlantic spotted dolphin in U.S. Gulf waters, which is the Northern Gulf of Mexico Stock. Animals occur primarily from continental shelf waters of 10–200 m deep to slope waters <500 m deep and were spotted in all seasons during aerial and vessel surveys of the northern Gulf of Mexico (*i.e.,* U.S. Gulf of Mexico; Hansen *et al.* 1996; Mullin and Hoggard 2000; Fulling *et al.* 2003; Mullin and Fulling 2004; Maze-Foley and Mullin 2006). Atlantic spotted dolphins are about 5 to 7.5 ft (1.5 to 2.3 m) long and weigh about 220 to 315 lb (99.8 to 142.8 kg). Their diet consists primarily of small fish, invertebrates, and cephalopods, which they catch using a variety of techniques including echolocation. Atlantic spotted dolphins are social animals and form groups of up to 200 individuals. Most groups consist of fewer than 50 individuals, and in coastal waters groups typically consist of 5 to 15 individuals (NMFS 2021b).

Rice's Whale

The Gulf of Mexico Bryde's whale was listed as endangered throughout its entire range on April 15, 2019, under the Endangered Species Act (ESA). Based on genetic analyses and new morphological information NOAA Fisheries recently revised the common and scientific names to recognize this new species (*Balaenoptera ricei*) as being separate from other Bryde's whale populations (86 FR 47022; August 21, 2021). Rosel and Wilcox (2014) first identified a new, evolutionarily distinct lineage of whale in the Gulf of Mexico. Genetic analysis of whales sampled in the northeastern Gulf of Mexico revealed that this population is evolutionarily distinct from all other whales within the Bryde's whale complex and all other known balaenopterid species (Rosel and Wilcox 2014).

The Rice's whale is the only year-round resident baleen whale species in the Gulf of Mexico. Rosel *et.al.* (2021) reported that based on a compilation of sighting and stranding data from 1992 to 2019, the primary habitat of the Rice's whale is the northeastern Gulf of Mexico, particularly the De Soto Canyon area, at water depths of 150 to 410 m.

Biologically Important Areas (BIAs) include areas of known importance for reproduction, feeding, or migration, or areas where small and resident populations are known to occur (Van Parijs, 2015). Unlike ESA critical habitat, these areas are not formally designated pursuant to any statute or law but are a compilation of the best available science intended to inform impact and mitigation analyses. In 2015, a year round small and resident population BIA for Bryde's whales (later designated as Rice's whales) was identified from the De Soto Canyon along the shelf break to the southeast (LaBrecque *et al.* 2015). The 23,559 km^2 BIA covers waters between 100 and 300 m deep from approximately south of Pensacola to approximately west of Fort Myers, FL (LaBrecque *et al.* 2015). The deepest location where a Rice's whale has been sighted is 408 m (Rosel *et al.* 2021). Habitat for the Rice's whale is currently considered by NMFS to be primarily within the depth range of 100 to 400 m in this part of the Gulf of Mexico (NMFS 2016, 2020a), and in 2019 NMFS delineated a Core Distribution Area (*https://www.fisheries.noaa.gov/resource/map/rices-whale-core-distribution-area-map-gis-data*) based on visual and tag data available through 2019. No critical habitat has yet been designated for the species, and no recovery plan has yet been developed.

The Rice's whale is a medium-sized baleen whale. To date, the largest verified Rice's whale to strand was a lactating female about 12.65 m long; the largest male was 11.26 m (Rosel *et al.* 2021). Little is known about their foraging ecology and diet. However, data from two Rice's whales suggest they may mostly forage at or near the seafloor.

Unusual Mortality Events (UMEs)

An UME is defined under Section 410(6) of the MMPA as a stranding that is unexpected; it involves a significant die-off of any marine mammal population and demands immediate response. There are currently no UMEs with ongoing investigations in the EGTTR. There was a UME for bottlenose dolphins that was active beginning in February 2019 and closing in November of the same year that included the northern Gulf of Mexico. Dolphins developed lesions that were thought to be caused by exposure to low salinity water stemming from extreme freshwater discharge. This UME is closed.

Marine Mammal Hearing

Hearing is the most important sensory modality for marine mammals underwater, and exposure to anthropogenic sound can have deleterious effects. To appropriately assess the potential effects of exposure to sound, it is necessary to understand the frequency ranges marine mammals are able to hear. Not all marine mammal species have equal hearing capabilities (*e.g.,* Richardson *et al.,* 1995; Wartzok and Ketten, 1999; Au and Hastings, 2008). To reflect this, Southall *et al.* (2007, 2019) recommended that marine mammals be divided into hearing groups based on directly measured (behavioral or auditory evoked potential techniques) or estimated hearing ranges (behavioral response data, anatomical modeling, etc.). Note that no direct measurements of hearing ability have been successfully completed for mysticetes (*i.e.,* low-frequency cetaceans). Subsequently, NMFS (2018) described generalized hearing ranges for these marine mammal hearing groups. Generalized hearing ranges were chosen based on the approximately 65 decibel (dB) threshold from the normalized composite audiograms, with the exception for lower limits for low-frequency cetaceans where the lower bound was deemed to be biologically implausible and the lower bound from Southall *et al.* (2007) retained. Marine mammal hearing groups and their associated hearing ranges are provided in Table 19.

TABLE 19—MARINE MAMMAL HEARING GROUPS

[NMFS, 2018]

Hearing group	Generalized hearing range *
Low-frequency (LF) cetaceans (baleen whales)	7 Hz to 35 kHz.
Mid-frequency (MF) cetaceans (dolphins, toothed whales, beaked whales, bottlenose whales)	150 Hz to 160 kHz.
High-frequency (HF) cetaceans (true porpoises, *Kogia,* river dolphins, Cephalorhynchid, *Lagenorhynchus cruciger* & *L. australis*)	275 Hz to 160 kHz.
Phocid pinnipeds (PW) (underwater) (true seals)	50 Hz to 86 kHz.
Otariid pinnipeds (OW) (underwater) (sea lions and fur seals)	60 Hz to 39 kHz.

* Represents the generalized hearing range for the entire group as a composite (*i.e.,* all species within the group), where individual species' hearing ranges are typically not as broad. Generalized hearing range chosen based on ~65 dB threshold from normalized composite audiogram, with the exception for lower limits for LF cetaceans (Southall *et al.* 2007) and PW pinniped (approximation).

The pinniped functional hearing group was modified from Southall *et al.* (2007) on the basis of data indicating that phocid species have consistently demonstrated an extended frequency range of hearing compared to otariids, especially in the higher frequency range (Hemilä *et al.* 2006; Kastelein *et al.,* 2009; Reichmuth and Holt, 2013).

For more detail concerning these groups and associated frequency ranges, please see NMFS (2018) for a review of available information.

Potential Effects of Specified Activities on Marine Mammals and Their Habitat

This section includes a summary of the ways that components of the specified activity may impact marine mammals and their habitat. The Estimated Take of Marine Mammals section later in this rule includes a quantitative analysis of the number of instances of take that could occur from these activities. The Preliminary Analysis and Negligible Impact Determination section considers the content of this section, the Estimated Take of Marine Mammals section, and the Proposed Mitigation Measures section to draw conclusions regarding the likely impacts of these activities on the reproductive success or survivorship of individuals and whether those impacts on individuals are likely to adversely affect the species through effects on annual rates of recruitment or survival.

The USAF has requested authorization for the take of marine mammals that may occur incidental to training and testing activities in the EGTTR. The USAF analyzed potential impacts to marine mammals from air-to-surface operations that involve firing live or inert munitions, including missiles, bombs, and gun ammunition, from aircraft at targets on the water surface in the LOA application as well as the 2022 REA, for which NMFS served as a cooperating agency. The proposed training and testing exercises have the potential to cause take of marine mammals by exposing them to impulsive noise and pressure waves generated by explosive detonation at or near the surface of the water. Exposure to noise or pressure resulting from these detonations could result in non-lethal injury (Level A harassment) or disturbance (Level B harassment). As explained in the Estimated Take of Marine Mammals section, neither mortality nor non-auditory injury are anticipated or authorized.

A summary of the potential impacts of the pressure waves generated by explosive detonations is included below. Following, a brief technical background is provided here on sound, on the characteristics of certain sound types, and on metrics used in this proposal. Last, a brief overview of the potential effects (*e.g.,* tolerance, masking, hearing threshold shift, behavioral disturbance, and stress responses) to marine mammals associated with the USAF's proposed activities is included.

Impacts from Pressure Waves Caused by Explosive Detonations

Exposure to the pressure waves generated by explosive detonations has the potential to cause injury, serious injury, or mortality, although those impacts are not anticipated here. (This conclusion is based on the size, type, depth, and duration of the explosives in combination with the density of marine mammals, which together predict a low probability of exposures, as well as the required mitigation measures, as described in detail the Estimated Take of Marine Mammals section.) The potential acoustic impacts of explosive detonations *(e.g.,* permanent threshold shift (PTS), temporary threshold shift (TTS), and behavioral disturbance) are described in subsequent sections.

Generally speaking, the pressure from munition detonations have the potential to cause mortality, injury, hearing impairment, or behavioral disturbances in marine mammals, depending on the explosive energy released by the munition and the distance of the animal from the detonation. The impulsive noise from these detonations may also cause hearing impairment or behavioral disturbances. The most potentially severe effects would occur close to the detonation point, including tissue damage, barotrauma, or even death. Serious injury or mortality to marine mammals from explosive detonations, if they occurred, which is not expected here, would consist of primary blast injury, which refers to those injuries that result from the compression of a body exposed to a blast wave and which is usually observed as barotrauma of gas-containing structures (*e.g.,* lung and gut) and structural damage to the auditory system (Richmond *et al.* 1973). The near instantaneous high magnitude pressure change near an explosion can injure an animal where tissue material properties significantly differ from the surrounding environment, such as around air-filled cavities in the lungs or gastrointestinal (GI) tract. The gas-containing organs (lungs and GI tract) are most vulnerable to primary blast injury. Severe injuries to these organs are presumed to result in mortality (*e.g.,* severe lung damage may introduce air into the cardiopulmonary vascular system, resulting in lethal air emboli). Large pressure changes at tissue-air interfaces in the lungs and GI tract may cause tissue rupture, resulting in a range of injuries depending on degree of exposure. Recoverable injuries would include slight lung injury, such as capillary interstitial bleeding, and contusions to the GI tract. More severe injuries, such as tissue lacerations, major hemorrhage, organ rupture, or air in the chest cavity (pneumothorax), would significantly reduce fitness and likely cause death in the wild. Rupture of the lung may also introduce air into the vascular system, producing air emboli that can cause a stroke or heart attack and restrict oxygen delivery to critical organs. Susceptibility would increase with depth, until normal lung collapse (due to increasing hydrostatic pressure) and increasing ambient pressures again reduce susceptibility.

Exposures to higher levels of impulse and pressure levels would generally result in greater impacts to an individual animal. However, the effects of noise on marine mammals are highly variable, often depending on species and contextual factors (Richardson *et al.* 1995). As described in the Estimated Take of Marine Mammals section, the more serious impacts (*i.e.,* mortality, serious injury, and non-auditory injury) are not anticipated to result from this action.

The USAF performed a quantitative analysis to estimate the probability that marine mammals could be exposed to the sound and energy from explosions during USAF activities and the effects of those exposures (Appendix A in LOA Application). The effects of underwater explosions on marine mammals depend on a variety of factors including animal size and depth; charge size and depth; depth of the water column; and distance between the animal and the charge. In general, an animal would be less susceptible to injury near the water surface because the pressure wave reflected from the water surface would interfere with the direct path pressure wave, reducing positive pressure exposure. There are a limited number of explosives that would detonate just below the water surface as outlined previously in the section, Description of Stressors. Most explosives would detonate at or near the surface of the water and are unlikely to transfer energy underwater sufficient to result in non-auditory injury (GI injury or lung injury) or mortality. For reasons described in the Estimated Take of Marine Mammals section, NMFS agrees with USAF's analysis that no mortality or serious injury from tissue damage in the form of GI injury or lung injury is anticipated to result from the proposed activities. The USAF did not request, and NMFS does not propose, mortality or serious injury for authorization, and therefore this proposed rule will not discuss it further. For additional details on the criteria for estimating non-auditory physiological impacts on marine mammals due to naval underwater explosions, we refer the reader to the report, Criteria and Thresholds for U.S. Navy Acoustic and Explosive Effects Analysis (Phase III) (U.S. Department of the Navy, 2017e).

Sections 6, 7, and 9 of the USAF's application include summaries of the ways that components of the specified activity may impact marine mammals and their habitat, including specific discussion of potential effects to marine mammals from noise and pressure waves produced through the use explosives detonating at or near the surface. We have reviewed the USAF's discussion of potential effects for accuracy and completeness in its application and refer to that information rather than repeating it in full here. Below we include a summary of the potential effects to marine mammals.

Description of Sound Sources

This section contains a brief technical background on sound, on the characteristics of certain sound types, and on metrics used in this proposal inasmuch as the information is relevant to the specified activity and to a discussion of the potential effects of the specified activity on marine mammals found later in this document. For general information on sound and its interaction with the marine environment, please see Au and Hastings (2008); Richardson *et al.* (1995); and Urick (1983).

Sound travels in waves, the basic components of which are frequency, wavelength, velocity, and amplitude. Frequency is the number of pressure waves that pass by a reference point per unit of time and is measured in hertz or cycles per second. Wavelength is the distance between two peaks or corresponding points of a sound wave (length of one cycle). Higher frequency sounds have shorter wavelengths than lower frequency sounds, and typically attenuate (decrease) more rapidly, except in certain cases in shallower water. Amplitude is the height of the sound pressure wave or the ''loudness'' of a sound and is typically described using the relative unit of the decibel (dB). A sound pressure level (SPL) in dB is described as the ratio between a measured pressure and a reference pressure (for underwater sound, this is 1 microPascal (μPa)), and is a logarithmic unit that accounts for large variations in amplitude. Therefore, a relatively small change in dB corresponds to large changes in sound pressure. The source level (SL) represents the SPL referenced at a distance of 1 m from the source (referenced to 1 μPa), while the received level is the SPL at the listener's position (referenced to 1 μPa).

Root mean square (rms) is the quadratic mean sound pressure over the duration of an impulse. Root mean square is calculated by squaring all of the sound amplitudes, averaging the squares, and then taking the square root of the average (Urick 1983). Root mean square accounts for both positive and negative values; squaring the pressures makes all values positive so that they may be accounted for in the summation of pressure levels (Hastings and Popper 2005). This measurement is often used in the context of discussing behavioral effects, in part because behavioral effects, which often result from auditory cues, may be better expressed through averaged units than by peak pressures.

Sound exposure level (SEL; represented as dB re 1 μPa^2-s) represents the total energy in a stated frequency band over a stated time interval or event and considers both intensity and duration of exposure. The per-pulse SEL is calculated over the time window containing the entire pulse (*i.e.,* 100 percent of the acoustic energy). SEL is a cumulative metric; it can be accumulated over a single pulse, or calculated over periods containing multiple pulses. Cumulative SEL represents the total energy accumulated by a receiver over a defined time window or during an event. Peak sound pressure (also referred to as zero-to-peak sound pressure or 0-pk) is the maximum instantaneous sound pressure measurable in the water at a specified distance from the source and is represented in the same units as the rms sound pressure.

When underwater objects vibrate or activity occurs, sound-pressure waves are created. These waves alternately compress and decompress the water as the sound wave travels. Underwater sound waves radiate in a manner similar to ripples on the surface of a pond and may be either directed in a beam or beams or may radiate in all directions (omnidirectional sources). The compressions and decompressions associated with sound waves are detected as changes in pressure by aquatic life and man-made sound receptors such as hydrophones.

Even in the absence of sound from the specified activity, the underwater environment is typically loud due to ambient sound, which is defined as environmental background sound levels lacking a single source or point (Richardson *et al.* 1995). The sound level of a region is defined by the total acoustical energy being generated by known and unknown sources. These sources may include physical (*e.g.,* wind and waves, earthquakes, ice, atmospheric sound), biological (*e.g.,* sounds produced by marine mammals, fish, and invertebrates), and anthropogenic (*e.g.,* vessels, dredging, construction) sound. A number of sources contribute to ambient sound, including wind and waves, which are a main source of naturally occurring ambient sound for frequencies between 200 Hz and 50 kHz (Mitson 1995). In general, ambient sound levels tend to increase with increasing wind speed and wave height. Precipitation can become an important component of total sound at frequencies above 500 Hz, and possibly down to 100 Hz during quiet times. Marine mammals can contribute significantly to ambient sound levels, as can some fish and snapping shrimp. The frequency band for biological contributions is from approximately 12 Hz to over 100 kHz. Sources of ambient sound related to human activity include transportation (surface vessels), dredging and construction, oil and gas drilling and production, geophysical surveys, sonar, and explosions. Vessel noise typically dominates the total ambient sound for frequencies between 20 and 300 Hz. In general, the frequencies of anthropogenic sounds are below 1 kHz and, if higher frequency sound levels are created, they attenuate rapidly.

The sum of the various natural and anthropogenic sound sources that comprise ambient sound at any given location and time depends not only on the source levels (as determined by current weather conditions and levels of biological and human activity) but also on the ability of sound to propagate through the environment. In turn, sound propagation is dependent on the spatially and temporally varying properties of the water column and sea floor, and is frequency-dependent. As a result of the dependence on a large number of varying factors, ambient sound levels can be expected to vary widely over both coarse and fine spatial and temporal scales. Sound levels at a given frequency and location can vary by 10–20 decibels (dB) from day to day (Richardson *et al.* 1995). The result is that, depending on the source type and its intensity, sound from the specified activity may be a negligible addition to the local environment or could form a distinctive signal that may affect marine mammals. Details of source types are described in the following text.

Sounds are often considered to fall into one of two general types: Pulsed and non-pulsed (defined in the following). The distinction between these two sound types is important because they have differing potential to cause physical effects, particularly with regard to hearing (*e.g.,* Ward 1997 in Southall *et al.* 2007). Please see Southall *et al.* (2007) and NMFS' Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0) Underwater Thresholds for Onset of Permanent and Temporary Threshold Shift (Acoustic Technical Guidance) (NMFS 2018) for an in-depth discussion of these concepts. The distinction between these two sound types is not always obvious, as certain signals share properties of both pulsed and non-pulsed sounds. A signal near a source could be categorized as a pulse, but due to propagation effects as it moves farther from the source, the signal duration becomes longer (*e.g.,* Greene and Richardson 1988).

Pulsed sound sources (*e.g.,* airguns, explosions, gunshots, sonic booms, impact pile driving) produce signals that are brief (typically considered to be less than one second), broadband, atonal transients (ANSI 1986, 2005; Harris 1998; NIOSH 1998; ISO 2003) and occur either as isolated events or repeated in some succession. Pulsed sounds are all characterized by a relatively rapid rise from ambient pressure to a maximal pressure value followed by a rapid decay period that may include a period of diminishing, oscillating maximal and minimal pressures, and generally have an increased capacity to induce physical injury as compared with sounds that lack these features.

Non-pulsed sounds can be tonal, narrowband or broadband, brief or prolonged, and may be either continuous or intermittent (ANSI, 1995; NIOSH, 1998). Some of these non-pulsed sounds can be transient signals of short duration but without the essential properties of pulses (*e.g.,* rapid rise time). Examples of non-pulsed sounds include those produced by vessels, aircraft, machinery operations such as drilling or dredging, vibratory pile driving, and active sonar systems. The duration of such sounds, as received at a distance, can be greatly extended in a highly reverberant environment.

Hearing Loss—Threshold Shift

Marine mammals exposed to high-intensity sound, or to lower-intensity sound for prolonged periods, can experience hearing threshold shift, which is the loss of hearing sensitivity at certain frequency ranges after cessation of sound (Finneran 2015). Threshold shift can be permanent (PTS), in which case the loss of hearing sensitivity is not fully recoverable, or temporary (TTS), in which case the animal's hearing threshold would recover over time (Southall *et al.* 2007).

Irreparable damage to the inner or outer cochlear hair cells may cause PTS; however, other mechanisms are also involved, such as exceeding the elastic limits of certain tissues and membranes in the middle and inner ears and resultant changes in the chemical composition of the inner ear fluids (Southall *et al.* 2007). PTS is considered an injury and Level A harassment while TTS is considered to be Level B harassment and not considered an injury.

Hearing loss, or threshold shift (TS), is typically quantified in terms of the amount (in decibels) that hearing thresholds at one or more specified frequencies are elevated, compared to their pre-exposure values, at some specific time after the noise exposure. The amount of TS measured usually decreases with increasing recovery time—the amount of time that has elapsed since a noise exposure. If the TS eventually returns to zero (*i.e.,* the hearing threshold returns to the pre-exposure value), the threshold shift is called a TTS. If the TS does not completely recover (the threshold remains elevated compared to the pre-exposure value), the remaining TS is a PTS.

Hearing loss has only been studied in a few species of marine mammals, although hearing studies with terrestrial mammals are also informative. There are no direct measurements of hearing loss in marine mammals due to exposure to explosive sources. The sound resulting from an explosive detonation is considered an impulsive sound and shares important qualities (*i.e.,* short duration and fast rise time) with other impulsive sounds such as those produced by air guns. General research findings regarding TTS and PTS in marine mammals, as well as findings specific to exposure to other impulsive sound sources, are discussed below.

Many studies have examined noise-induced hearing loss in marine mammals (see Finneran (2015) and Southall *et al.* (2019) for summaries), however for cetaceans, published data on the onset of TTS are limited to the captive bottlenose dolphin, beluga, harbor porpoise, and Yangtze finless porpoise, and, for pinnipeds in water, measurements of TTS are limited to harbor seals, elephant seals, and California sea lions. These studies examine hearing thresholds measured in marine mammals before and after exposure to intense sounds. The difference between the pre-exposure and post-exposure thresholds can then be used to determine the amount of threshold shift at various post-exposure times. NMFS has reviewed the available studies, which are summarized below:

- The method used to test hearing may affect the resulting amount of measured TTS, with neurophysiological measures producing larger amounts of TTS compared to psychophysical measures (Finneran *et al.* 2007; Finneran 2015).
- The amount of TTS varies with the hearing test frequency. As the exposure SPL increases, the frequency at which the maximum TTS occurs also increases (Kastelein *et al.* 2014). For high-level exposures, the maximum TTS typically occurs one-half to one octave above the exposure frequency (Finneran *et al.* 2007; Mooney *et al.* 2009a; Nachtigall *et al.* 2004; Popov *et al.* 2011; Popov *et al.* 2013; Schlundt *et al.* 2000; Kastelein *et al.* 2021b; Kastelein *et al.* 2022). The overall spread of TTS from tonal exposures can therefore extend over a large frequency range (*i.e.,* narrowband exposures can produce broadband (greater than one octave) TTS).
- The amount of TTS increases with exposure SPL and duration and is correlated with SEL, especially if the range of exposure durations is relatively small (Kastak *et al.* 2007; Kastelein *et al.* 2014b; Popov *et al.* 2014). As the exposure duration increases, however, the relationship between TTS and SEL begins to break down. Specifically, duration has a more significant effect on TTS than would be predicted on the basis of SEL alone (Finneran *et al.* 2010a; Kastak *et al.* 2005; Mooney *et al.* 2009a). This means if two exposures have the same SEL but different durations, the exposure with the longer duration (thus lower SPL) will tend to produce more TTS than the exposure with the higher SPL and shorter duration. In most acoustic impact assessments, the scenarios of interest involve shorter duration exposures than the marine mammal experimental data from which impact thresholds are derived; therefore, use of SEL tends to over-estimate the amount of TTS. Despite this, SEL continues to be used in many situations because it is relatively simple, more accurate than SPL alone, and lends itself easily to scenarios involving multiple exposures with different SPL.
- Gradual increases of TTS may not be directly observable with increasing exposure levels before the onset of PTS (Reichmuth *et al.* 2019). Similarly, PTS can occur without measurable behavioral modifications (Reichmuth *et al.* 2019).
- The amount of TTS depends on the exposure frequency. Sounds at low frequencies, well below the region of best sensitivity, are less hazardous than those at higher frequencies, near the region of best sensitivity (Finneran and Schlundt, 2013). The onset of TTS—defined as the exposure level necessary to produce 6 dB of TTS (*i.e.,* clearly above the typical variation in threshold measurements)—also varies with exposure frequency. At low frequencies, onset-TTS exposure levels are higher compared to those in the region of best sensitivity. For example, for harbor porpoises exposed to one-sixth octave noise bands at 16 kHz (Kastelein *et al.* 2019a), 32 kHz (Kastelein *et al.* 2019b), 63 kHz (Kastelein *et al.* 2020a), and 88.4 kHz (Kastelein *et al.* 2020b), less susceptibility to TTS was found as frequency increased, whereas exposure frequencies below ~6.5 kHz showed an increase in TTS susceptibility as frequency increased and approached the region of best sensitivity. Kastelein *et al.* (2020b) showed a much higher onset of TTS for a 88.5 kHz exposure as compared to lower exposure frequencies (*i.e.,* 16 kHz (Kastelein *et al.,* 2019) 1.5 kHz and 6.5 kHz (Kastelein *et al.* 2020a)). For the 88.4 kHz test frequency, a 185 dB re 1 micropascal squared per second (μPa^2 -s) exposure resulted in 3.6 dB of TTS, and a 191 dB re 1 μPa^2 -s exposure produced 5.2 dB of TTS at 100 kHz and 5.4 dB of TTS at 125 kHz. Together, these new studies demonstrate that the criteria for high-frequency (HF) cetacean auditory impacts is likely to be conservative.
- TTS can accumulate across multiple exposures, but the resulting TTS will be less than the TTS from a single, continuous exposure with the same SEL (Finneran *et al.* 2010a; Kastelein *et al.* 2014b; Kastelein *et al.* 2015b; Mooney *et al.* 2009b). This means that TTS predictions based on the total, cumulative SEL will overestimate the amount of TTS from intermittent exposures such as sonars and impulsive sources. The importance of duty cycle in predicting the likelihood of TTS is demonstrated further in Kastelein *et al.* (2021b). The authors found that reducing the duty cycle of a sound generally reduced the potential for TTS in California sea lions, and that, further, California sea lions are more susceptible to TTS than previously believed at the 2 and 4 kHz frequencies tested.
- The amount of observed TTS tends to decrease with increasing time following the exposure; however, the relationship is not monotonic (*i.e.,* increasing exposure does not always increase TTS). The time required for complete recovery of hearing depends on the magnitude of the initial shift; for relatively small shifts recovery may be complete in a few minutes, while large

shifts (*e.g.,* approximately 40 dB) may require several days for recovery. Recovery times are consistent for similar-magnitude TTS, regardless of the type of fatiguing sound exposure (impulsive, continuous noise band, or sinusoidal wave; (Kastelein *et al.* 2019c)). Under many circumstances TTS recovers linearly with the logarithm of time (Finneran *et al.,* 2010a, 2010b; Finneran and Schlundt 2013; Kastelein *et al.* 2012a; Kastelein *et al.* 2012b; Kastelein *et al.* 2014b; Kastelein *et al.* 2014c; Popov *et al.* 2011; Popov *et al.* 2013; Popov *et al.* 2014). This means that for each doubling of recovery time, the amount of TTS will decrease by the same amount (e.g*.,* 6 dB recovery per doubling of time).

Nachtigall *et al.* (2018) and Finneran (2018) describe the measurements of hearing sensitivity of multiple odontocete species (bottlenose dolphin, harbor porpoise, beluga, and false killer whale) when a relatively loud sound was preceded by a warning sound. These captive animals were shown to reduce hearing sensitivity when warned of an impending intense sound. Based on these experimental observations of captive animals, the authors suggest that wild animals may dampen their hearing during prolonged exposures or if conditioned to anticipate intense sounds. Another study showed that echolocating animals (including odontocetes) might have anatomical specializations that might allow for conditioned hearing reduction and filtering of low-frequency ambient noise, including increased stiffness and control of middle ear structures and placement of inner ear structures (Ketten *et al.* 2021). Finneran recommends further investigation of the mechanisms of hearing sensitivity reduction in order to understand the implications for interpretation of existing TTS data obtained from captive animals, notably for considering TTS due to short duration, unpredictable exposures.

Marine mammal TTS data from impulsive sources are limited. Two studies with measured TTS of 6 dB or more, with Finneran *et al.* (2002) reporting behaviorally measured TTSs of 6 and 7 dB in a beluga exposed to single impulses from a seismic water gun, and with Lucke *et al.* (2009) reporting Audio-evoked Potential measured TTS of 7–20 dB in a harbor porpoise exposed to single impulses from a seismic air gun. Kastelein *et al.* (2017) quantified TTS caused by exposure to 10–20 consecutive shots from 2 airguns simultaneously in harbor porpoises. Statistically significant initial TTS (1–4 min after sound exposure stopped) of ~4.4 dB occurred. However, recovery occurred within 12 min post-exposure.

Several impulsive noise exposure studies have also been conducted without behaviorally measurable TTS. Specifically, Finneran *et al.* (2000) exposed dolphins and belugas to single impulses from an explosion simulator, and Finneran *et al.* (2015) exposed three dolphins to sequences of 10 impulses from a seismic air gun (maximum cumulative SEL = 193–195 dB re 1 $\mu Pa^2 s$, peak SPL =196–210 dB re 1 μPa) without measurable TTS. The proposed activities include both TTS and a limited amount of PTS in some marine mammals.

Behavioral Disturbance

Behavioral responses to sound are highly variable and context-specific. Many different variables can influence an animal's perception of and response to an acoustic event. An animal's prior experience with a sound or sound source affects whether it is less likely (habituation) or more likely (sensitization) to respond to certain sounds in the future (animals can also be innately predisposed to respond to certain sounds in certain ways) (Southall *et al.* 2007). Related to the sound itself, the perceived nearness of the sound, bearing of the sound (approaching vs. retreating), the similarity of a sound to biologically relevant sounds in the animal's environment (*i.e.,* calls of predators, prey, or conspecifics), and familiarity of the sound may affect the way an animal responds to the sound (Southall *et al.*2007, DeRuiter *et al.* 2013). Individuals (of different age, gender, reproductive status, *etc.*) among most populations will have variable hearing capabilities, and differing behavioral sensitivities to sounds that will be affected by prior conditioning, experience, and current activities of those individuals. Often, specific acoustic features of the sound and contextual variables (*i.e.,* proximity, duration, or recurrence of the sound or the current behavior that the marine mammal is engaged in or its prior experience), as well as entirely separate factors such as the physical presence of a nearby vessel, may be more relevant to the animal's response than the received level alone.

Controlled experiments with captive marine mammals have shown pronounced behavioral reactions, including avoidance of loud underwater sound sources (Ridgway *et al.* 1997; Finneran *et al.* 2003). Observed responses of wild marine mammals to loud pulsed sound sources (typically seismic guns or acoustic harassment devices) have been varied but often consist of avoidance behavior or other behavioral changes suggesting discomfort (Morton and Symonds 2002; Thorson and Reyff 2006; see also Gordon *et al.,* 2004; Nowacek *et al.* 2007).

The onset of noise can result in temporary, short-term changes in an animal's typical behavior and/or avoidance of the affected area. These behavioral changes may include: reduced/increased vocal activities; changing/cessation of certain behavioral activities (such as socializing or feeding); visible startle response or aggressive behavior; avoidance of areas where sound sources are located; and/or flight responses (Richardson *et al.* 1995).

The biological significance of many of these behavioral disturbances is difficult to predict, especially if the detected disturbances appear minor. However, the consequences of behavioral modification could potentially be biologically significant if the change affects growth, survival, or reproduction. The onset of behavioral disturbance from anthropogenic sound depends on both external factors (characteristics of sound sources and their paths) and the specific characteristics of the receiving animals (hearing, motivation, experience, demography) and is difficult to predict (Southall *et al.* 2007).

Ellison *et al.* (2011) outlined an approach to assessing the effects of sound on marine mammals that incorporates contextual-based factors. The authors recommend considering not just the received level of sound, but also the activity the animal is engaged in at the time the sound is received, the nature and novelty of the sound (*i.e.,* is this a new sound from the animal's perspective), and the distance between the sound source and the animal. They submit that this ''exposure context,'' as described, greatly influences the type of behavioral response exhibited by the animal. Forney *et al.* (2017) also point out that an apparent lack of response (*e.g.,* no displacement or avoidance of a sound source) may not necessarily mean there is no cost to the individual or population, as some resources or habitats may be of such high value that animals may choose to stay, even when experiencing stress or hearing loss. Forney *et al.* (2017) recommend considering both the costs of remaining in an area of noise exposure such as TTS, PTS, or masking, which could lead to an increased risk of predation or other threats or a decreased capability to forage, and the costs of displacement, including potential increased risk of vessel strike, increased risks of predation or competition for resources, or decreased habitat suitable for foraging, resting, or socializing. This sort of contextual information is challenging to predict with accuracy for ongoing activities that occur over large spatial and temporal expanses. However, distance is one contextual factor for which data exist to quantitatively inform a take estimate, and the method for predicting Level B harassment in this proposed rule does consider distance to the source. Other factors are often considered qualitatively in the analysis of the likely consequences of sound exposure, where supporting information is available.

Exposure of marine mammals to sound sources can result in, but is not limited to, no response or any of the following observable responses: increased alertness; orientation or attraction to a sound source; vocal modifications; cessation of feeding; cessation of social interaction; alteration of movement or diving behavior; habitat abandonment (temporary or permanent); and, in severe cases, panic, flight, stampede, or stranding, potentially resulting in death (Southall *et al.* 2007). A review of marine mammal responses to anthropogenic sound was first conducted by Richardson (1995). More recent reviews (Nowacek *et al.* 2007; DeRuiter *et al.* 2012 and 2013; Ellison *et al.* 2012; Gomez *et al.* 2016) address studies conducted since 1995 and focused on observations where the received sound level of the exposed marine mammal(s) was known or could be estimated. Gomez *et al.* (2016) conducted a review of the literature considering the contextual information of exposure in addition to received level and found that higher received levels were not always associated with more severe behavioral responses and vice versa. Southall *et al.* (2016) states that results demonstrate that some individuals of different species display clear yet varied responses, some of which have negative implications, while others appear to tolerate high levels, and that responses may not be fully predictable with simple acoustic exposure metrics (*e.g.,* received sound level). Rather, the authors state that differences among species and individuals along with contextual aspects of exposure (*e.g.,* behavioral state) appear to affect response probability.

During an activity with a series of explosions (not concurrent multiple explosions shown in a burst), an animal is expected to exhibit a startle reaction to the sound of the first detonation followed by another behavioral response after multiple detonations. At close ranges and high sound levels, avoidance of the area around the explosions is the assumed behavioral response in most cases. In certain circumstances, exposure to loud sounds can interrupt feeding behaviors and potentially decrease foraging success, interfere with communication or migration, or disrupt important reproductive or young-rearing behaviors, among other effects.

Many animals perform vital functions, such as feeding, resting, traveling, and socializing, on a diel cycle (24-hour cycle). Behavioral reactions to noise exposure (such as disruption of critical life functions, displacement, or avoidance of important habitat) are more likely to be significant for fitness if they last more than one diel cycle or recur on subsequent days (Southall *et al.* 2007). Consequently, a behavioral response lasting less than one day and not recurring on subsequent days is not considered particularly severe unless it could directly affect reproduction or survival (Southall *et al.* 2007). It is important to note the difference between behavioral reactions lasting or recurring over multiple days and anthropogenic activities lasting or recurring over multiple days. For example, just because a given anthropogenic activity lasts for multiple days (*e.g.,* a training event) does not necessarily mean that individual animals will be either exposed to those activity-related stressors (*i.e.,* explosions) for multiple days or further exposed at a level would result in sustained multi-day substantive behavioral responses.

Auditory Masking

Sound can disrupt behavior through masking, or interfering with, an animal's ability to detect, recognize, or discriminate between acoustic signals of interest (*e.g.,* those used for intraspecific communication and social interactions, prey detection, predator avoidance, or navigation) (Richardson *et al.* 1995; Erbe and Farmer 2000; Tyack 2000; Erbe *et al.* 2016). Masking occurs when the receipt of a sound is interfered with by another coincident sound at similar frequencies and at similar or higher intensity, and may occur whether the sound is natural (*e.g.,* snapping shrimp, wind, waves, precipitation) or anthropogenic (*e.g.,* shipping, sonar, seismic exploration) in origin. The ability of a noise source to mask biologically important sounds depends on the characteristics of both the noise source and the signal of interest (*e.g.,* signal-to-noise ratio, temporal variability, direction), in relation to each other and to an animal's hearing abilities (*e.g.,* sensitivity, frequency range, critical ratios, frequency discrimination, directional discrimination, age, or TTS hearing loss), and existing ambient noise and propagation conditions. Masking these acoustic signals can disturb the behavior of individual animals, groups of animals, or entire populations. Masking can lead to behavioral changes including vocal changes (*e.g.,* Lombard effect, increasing amplitude, or changing frequency), cessation of foraging, and leaving an area, to both signalers and receivers, in an attempt to compensate for noise levels (Erbe *et al.* 2016). Masking only occurs in the presence of the masking noise and does not persist after the cessation of the noise. Masking may lead to a change in vocalizations or a change in behavior (*e.g.,* cessation of foraging, leaving an area). Masking by explosive detonation sounds would not be expected, given the short duration, and there are no direct observations of masking in marine mammals due to exposure to sound from explosive detonations.

Physiological Stress

There is growing interest in monitoring and assessing the impacts of stress responses to sound in marine animals. Classic stress responses begin when an animal's central nervous system perceives a potential threat to its homeostasis. That perception triggers stress responses regardless of whether a stimulus actually threatens the animal; the mere perception of a threat is sufficient to trigger a stress response (Moberg 2000; Sapolsky *et al.* 2005; Seyle 1950). Once an animal's central nervous system perceives a threat, it mounts a biological response or defense that consists of a combination of the four general biological defense responses: behavioral responses, autonomic nervous system responses, neuroendocrine responses, or immune responses.

According to Moberg (2000), in the case of many stressors, an animal's first and sometimes most economical (in terms of biotic costs) response is behavioral avoidance of the potential stressor or avoidance of continued exposure to a stressor. An animal's second line of defense to stressors involves the sympathetic part of the autonomic nervous system and the classical ''fight or flight'' response which includes the cardiovascular system, the gastrointestinal system, the exocrine glands, and the adrenal medulla to produce changes in heart rate, blood pressure, and gastrointestinal activity that humans commonly associate with ''stress.'' These responses have a relatively short duration and may or may not have a significant long-term effect on an animal's welfare.

An animal's third line of defense to stressors involves its neuroendocrine systems or sympathetic nervous systems; the system that has received the most study has been the hypothalamus-pituitary-adrenal system (also known as the HPA axis in mammals or the hypothalamus-pituitary-interrenal axis in fish and some reptiles). Unlike stress responses associated with the autonomic nervous system, virtually all neuro-endocrine functions that are affected by stress—including immune competence, reproduction, metabolism, and behavior—are regulated by pituitary hormones. Stress-induced changes in the secretion of pituitary hormones have been implicated in failed reproduction (Moberg, 1987; Rivier and Rivest 1991), altered metabolism (Elasser *et al.* 2000), reduced immune competence (Blecha 2000), and behavioral disturbance (Moberg 1987; Blecha 2000). Increases in the circulation of glucocorticosteroids (cortisol, corticosterone, and aldosterone in marine mammals; see Romano *et al.* 2004) have been equated with stress for many years.

Because there are many unknowns regarding the occurrence of acoustically induced stress responses in marine mammals, it is assumed that any physiological response (*e.g.,* hearing loss or injury) or significant behavioral response is also associated with a stress response.

Munition Strike

Another potential risk to marine mammals is direct strike by ordnance, in which the ordnance physically hits an animal. Based on the dispersed distribution of marine mammals in the open ocean, the relatively short amount of time they spend at the water surface compared with the time they spend underwater, and the annual quantities of munitions proposed to be expended, it is highly improbable that a marine mammal would be directly struck by a munition during EGTTR operations. This conclusion, which NMFS concurs with, was reached in the previous 2015 REA (USAF 2015). The Air Force did not request take of marine mammals by direct munition strikes, as it is not anticipated, and it is not analyzed further.

Marine Mammal Habitat

Impacts on marine mammal habitat are part of the consideration in making a finding of negligible impact on the species and stocks of marine mammals. Habitat includes, but is not necessarily limited to, rookeries, mating grounds, feeding areas, and areas of similar significance. We have preliminarily determined USAF's proposed activities would not result in permanent effects on the habitats used by the marine mammals in the EGTTR, including the availability of prey (*i.e.* fish and invertebrates). While it is anticipated that the proposed activity may result in marine mammals avoiding certain areas due to temporary ensonification, any impact to habitat is temporary and reversible and was considered in further detail earlier in this document, as behavioral modification. The main impact associated with the proposed activity will be temporarily elevated noise levels and the associated direct effects on marine mammals, previously discussed in this proposed rule.

Sound may affect marine mammals through impacts on the abundance, behavior, or distribution of prey species (*e.g.,* crustaceans, cephalopods, fish, zooplankton). Marine mammal prey varies by species, season, and location and, for some species, is not well documented. Here, we describe studies regarding the effects of noise on known marine mammal prey.

Effects on Fish—Fish utilize the soundscape and components of sound in their environment to perform important functions such as foraging, predator avoidance, mating, and spawning (*e.g.,* Zelick *et al.* 1999; Fay 2009). The most likely effects on fishes exposed to loud, intermittent, low-frequency sounds are behavioral responses (*i.e.,* flight or avoidance). Short duration, sharp sounds (such as pile driving or air guns) can cause overt or subtle changes in fish behavior and local distribution. The reaction of fish to acoustic sources depends on the physiological state of the fish, past exposures, motivation (*e.g.,* feeding, spawning, migration), and other environmental factors. Key impacts to fishes may include behavioral responses, hearing damage, barotrauma (pressure-related injuries), and mortality.

Fishes, like other vertebrates, have a variety of different sensory systems to glean information from ocean around them (Astrup and Mohl 1993; Astrup 1999; Braun and Grande 2008; Carroll *et al.* 2017; Hawkins and Johnstone 1978; Ladich and Popper 2004; Ladich and Schulz-Mirbach 2016; Nedwell *et al.* 2004; Popper *et al.* 2003; Popper *et al.* 2005). Depending on their hearing anatomy and peripheral sensory structures, which vary among species, fishes hear sounds using pressure and particle motion sensitivity capabilities and detect the motion of surrounding water (Fay *et al.* 2008) (terrestrial vertebrates generally only detect pressure). Most marine fishes primarily detect particle motion using the inner ear and lateral line system, while some fishes possess additional morphological adaptations or specializations that can enhance their sensitivity to sound pressure, such as a gas-filled swim bladder (Braun and Grande 2008; Popper and Fay 2011).

Hearing capabilities vary considerably between different fish species with data only available for just over 100 species out of the 34,000 marine and freshwater fish species (Eschmeyer and Fong 2016). In order to better understand acoustic impacts on fishes, fish hearing groups are defined by species that possess a similar continuum of anatomical features which result in varying degrees of hearing sensitivity (Popper and Hastings 2009a). There are four hearing groups defined for all fish species (modified from Popper *et al.* 2014) within this analysis and they include: fishes without a swim bladder (*e.g.,* flatfish, sharks, rays, *etc.*); fishes with a swim bladder not involved in hearing (*e.g.,* salmon, cod, pollock, *etc.*); fishes with a swim bladder involved in hearing (*e.g.,* sardines, anchovy, herring, *etc.*); and fishes with a swim bladder involved in hearing and high-frequency hearing (*e.g.,* shad and menhaden). Currently, less data are available to estimate the range of best sensitivity for fishes without a swim bladder.

In terms of behavioral responses of fish, Juanes *et al.* (2017) discuss the potential for negative impacts from anthropogenic soundscapes on fish, but the authors' focus was on broader based sounds, such as ship and boat noise sources. Occasional behavioral reactions to intermittent explosions occurring at or near the surface are unlikely to cause long-term consequences for individual fish or populations; there are no detonations of explosives occurring underwater from the proposed activities. Fish that experience hearing loss as a result of exposure to explosions may have a reduced ability to detect relevant sounds, such as predators, prey, or social vocalizations. However, PTS has not been known to occur in fishes and any hearing loss in fish may be as temporary as the timeframe required to repair or replace the sensory cells that were damaged or destroyed (Popper *et al.* 2005; Popper *et al.* 2014; Smith *et al.* 2006). It is not known if damage to auditory nerve fibers could occur, and if so, whether fibers would recover during this process. It is also possible for fish to be injured or killed by an explosion in the immediate vicinity of the surface from dropped or fired ordnance. Physical effects from pressure waves generated by detonations at or near the surface could potentially affect fish within proximity of training or testing activities. The shock wave from an explosion occurring at or near the surface may be lethal to fish at close range, causing massive organ and tissue damage and internal bleeding (Keevin and Hempen, 1997). At greater distance from the detonation point, the extent of mortality or injury depends on a number of factors including fish size, body shape, orientation, and species (Keevin and Hempen, 1997; Wright, 1982). At the same distance from the source, larger fish are generally less susceptible to death or injury, elongated forms that are round in cross-section are less at risk than deep-bodied forms, and fish oriented sideways to the blast suffer the greatest impact (Edds-Walton and Finneran 2006; Wiley *et al.* 1981; Yelverton *et al.* 1975). Species with gas-filled organs are more susceptible to injury and mortality than those without them (Gaspin, 1975; Gaspin *et al.* 1976; Goertner *et al.* 1994).

Training and testing exercises involving explosions at or near the surface are dispersed in space and time; therefore, repeated exposure of individual fishes are unlikely. Mortality and injury effects to fishes from explosives would be localized around the area of a given explosion at or above the water surface, but only if individual fish and the explosive at the surface were co-located at the same time. Fishes deeper in the water column or on the bottom would not be affected by surface explosions. Most acoustic effects, if any, are expected to be short term and localized. Long-term consequences for fish populations, including key prey species within the EGTTR Area, would not be expected.

Effects on Invertebrates—In addition to fish, prey sources such as marine invertebrates could potentially be impacted by sound stressors as a result of the proposed activities. However, most marine invertebrates' ability to sense sounds is very limited. In most cases, marine invertebrates would not respond to impulsive sounds. Data on response of invertebrates such as squid, another marine mammal prey species, to anthropogenic sound has been documented (de Soto 2016; Sole *et al.* 2017). Explosions could kill or injure nearby marine invertebrates. Vessels also have the potential to impact marine invertebrates by disturbing the water column or sediments, or directly striking organisms (Bishop 2008). The propeller wash (water displaced by propellers used for propulsion) from vessel movement and water displaced from vessel hulls can potentially disturb marine invertebrates in the water column and are a likely cause of zooplankton mortality (Bickel *et al.* 2011). The localized and short-term exposure to explosions or vessels at or near the surface could displace, injure, or kill zooplankton, invertebrate eggs or larvae, and macro-invertebrates. However, mortality or long-term consequences for a few animals is unlikely to have measurable effects on overall populations. As with fish, cumulatively individual and population-level impacts from exposure to explosives at or above the water surface are not anticipated, and impacts would be short term and localized, and would likely be inconsequential to invertebrate populations, and to the marine mammals that use them as prey.

Expended Materials—Military expended materials resulting from training and testing activities could potentially result in minor long-term changes to benthic habitat, however the impacts of small amounts of expended materials are unlikely to have measurable effects on overall populations. Military expended materials may be colonized over time by benthic organisms that prefer hard substrate and would provide structure that could attract some species of fish or invertebrates.

Overall, the combined impacts of explosions and military expended materials resulting from the proposed activities would not be expected to have measurable effects on populations of marine mammal prey species. Prey species exposed to sound might move away from the sound source or show no obvious direct effects at all, but a rapid return to normal recruitment, distribution, and behavior is anticipated. Long-term consequences to fish or marine invertebrate populations would not be expected as a result of exposure to sounds or vessels in the EGTTR.

Acoustic Habitat—Acoustic habitat is the soundscape which encompasses all of the sound present in a particular location and time, as a whole, when considered from the perspective of the animals experiencing it. Animals produce sound for, or listen for sounds produced by, conspecifics (communication during feeding, mating, and other social activities), other animals (finding prey or avoiding predators), and the physical environment (finding suitable habitats, navigating). Together, sounds made by animals and the geophysical environment (*e.g.,* produced by earthquakes, lightning, wind, rain, waves) make up the natural contributions to the total acoustics of a place. These acoustic conditions, termed acoustic habitat, are one attribute of an animal's total habitat.

Soundscapes are also defined by, and acoustic habitat influenced by, the total contribution of anthropogenic sound. This may include incidental emissions from sources, such as vessel traffic or may be intentionally introduced to the marine environment for data acquisition purposes (*e.g.,* as in the use of air gun arrays) or USAF training and testing purposes (as in the use of explosives). Anthropogenic noise varies widely in its frequency, content, duration, and loudness, and these characteristics greatly influence the potential habitat-mediated effects to marine mammals, which may range from local effects for brief periods of time to chronic effects over large areas and for long durations. Depending on the extent of effects to habitat, animals may alter their communications signals (thereby potentially expending additional energy) or miss acoustic cues (either conspecific or adventitious). Problems arising from a failure to detect cues are more likely to occur when noise stimuli are chronic and overlap with biologically relevant cues used for communication, orientation, and predator/prey detection (Francis and Barber, 2013). For more detail on these concepts see Pijanowski *et al.* 2011; Francis and Barber 2013; Lillis *et al.* 2014. We do not anticipate these problems arising from at or near surface explosions during training and testing activities as they would be either widely dispersed or concentrated in small areas for shorter periods of time. Sound produced from training and testing activities in the EGTTR would be temporary and transitory; the affected area would be expected to immediately return to the original state when these activities cease.

Marine Water Quality—Training and testing activities may introduce water quality constituents into the water column. Metals are the dominant constituent by weight of bombs, missiles, gun ammunition, and other munitions, including inert munitions, used during EGTTR training and testing operations. Some targets used during EGTTR missions also contain metals, including CONEX and hopper barge targets used for PSW tests and certain components of remotely controlled target boats. Metals contained in casing fragments of detonated munitions, intact inert munitions, unexploded ordnance, and other mission-related debris will corrode from exposure to seawater. The rate of corrosion depends on the metal type and the extent to which the item is directly exposed to seawater, which can be influenced by existing corrosion on the item, and how much the item may be encrusted by marine organisms and/or buried in sediments. Aluminum and steel, which is composed mostly of iron, comprise the bulk of the metal that enters the marine environment from EGTTR operations. Iron and aluminum are relatively benign metals in terms of toxicity. Chromium, lead, and copper, which make up a relatively small percentage of the overall metal input into the marine environment from EGTTR operations, have higher toxicity effects. Through its lifetime in the marine environment, a portion of the overall metal content would dissolve, depending on the solubility of the material. Dissolved metals would readily undergo mixing and dilution and would have no appreciable effect on water quality or marine life within the water column. Metals in particulate form would be released into sediments through the corrosion process. Elevated levels of undissolved metals in sediments would be restricted to a relatively small area around the metal-containing item and any associated impacts to water quality would be negligible.

Munitions used for EGTTR training and testing operations contain a wide variety of explosives, including TNT, RDX, HMX, Composition B, Tritonal, AFX–757, PBXN, and others. During live missions in the EGTTR, explosives can enter the marine environment via high-order detonations, which occur when the munition functions as intended and the vast majority of explosives are consumed; low-order detonations, which occur when the munition partially functions and only a portion of the explosives are consumed; and unexploded munitions, which fail to detonate with no explosives consumed. During high-order detonations, a residual amount of the explosive material, typically less than 1 percent, would be unconsumed and released into the environment (Walsh *et al.* 2011). The majority of live munitions used during EGTTR operations are successfully detonated as intended. During low-order detonations, a residual amount of explosives associated with the detonation and the remaining unconsumed portion of the explosive fill would enter the marine environment. If the munition does not explode, it becomes unexploded ordnance (UXO). In this case, all the explosive material would remain within the munition casing and enter the marine environment with explosives potentially being released due to corrosion or rupture. Explosives and explosives by-products released into the marine environment can be removed via biodegradation, and expended or disposed military munitions on the seafloor do not result in excessive accumulation of explosives in sediments or significant degradation of sediment quality by explosives. Given that high-order detonations consume the vast majority of explosive material in the munition, successful detonations are considered a negligible source of explosives released into the marine environment.

Estimated Take of Marine Mammals

This section indicates the number of takes that NMFS is proposing to authorize, which is based on the maximum amount that is reasonably likely to occur, depending on the type of take and the methods used to estimate it, as described in detail below. NMFS preliminarily agrees that the methods the USAF has put forth described herein to estimate take (including the model, thresholds, and density estimates), and the resulting numbers estimated for authorization, are appropriate and based on the best available science.

All takes are by harassment. For a military readiness activity, the MMPA defines ''harassment'' as (i) Any act that injures or has the significant potential to injure a marine mammal or marine mammal stock in the wild (Level A Harassment); or (ii) Any act that disturbs or is likely to disturb a marine mammal or marine mammal stock in the wild by causing disruption of natural behavioral patterns, including, but not limited to, migration, surfacing, nursing, breeding, feeding, or sheltering, to a point where such behavioral patterns are abandoned or significantly altered (Level B Harassment). No serious injury or mortality of marine mammals is expected to occur.

Proposed authorized takes would primarily be in the form of Level B harassment, as use of the explosive sources may result, either directly or as result of TTS, in the disruption of natural behavioral patterns to a point where they are abandoned or significantly altered (as defined specifically at the beginning of this section, but referred to generally as behavioral disruption). There is also the potential for Level A harassment, in the form of auditory injury to result from exposure to the sound sources utilized in training and testing activities. As described in this Estimated Take of Marine Mammals section, no non-auditory injury is anticipated or proposed for authorization, nor is any serious injury or mortality.

Generally speaking, for acoustic impacts NMFS estimates the amount and type of harassment by considering: (1) acoustic thresholds above which NMFS believes the best available science indicates marine mammals will be taken by Level B harassment or incur some degree of temporary or permanent hearing impairment; (2) the area or volume of water that will be ensonified above these levels in a day or event; (3) the density or occurrence of marine mammals within these ensonified areas; and (4) the number of days of activities or events. This analysis of the potential impacts of the proposed activities on marine mammals was conducted by using the spatial density models developed by NOAA's Southeast Fisheries Science Center for the species in the Gulf of Mexico (NOAA 2022). The density model integrated visual observations from aerial and shipboard surveys conducted in the Gulf of Mexico from 2003 to 2019.

The munitions proposed to be used by each military unit were grouped into mission-day categories so the acoustic impact analysis could be based on the total number of detonations conducted during a given mission to account for the accumulated energy from multiple detonations over a 24-hour period. A total of 19 mission-day categories were developed for the munitions proposed to be used. Using the dBSea underwater acoustic model and associated analyses, the threshold distances associated with Level A harassment (PTS) and Level B (TTS and behavioral) harassment zones were estimated for each mission-day category for each marine mammal species. Takes were estimated based on the area of the harassment zones, predicted animal density, and annual number of events for each mission-day category. To assess the potential impacts of inert munitions on marine mammals, the proposed inert munitions were categorized into four classes based on their impact energies, and the threshold distances for each class were modeled and calculated as described for the mission-day categories.

Acoustic Thresholds

Using the best available science, NMFS has established acoustic thresholds that identify the most appropriate received level of underwater sound above which marine mammals exposed to these sound sources could be reasonably expected to directly experience a disruption in behavior patterns to a point where they are abandoned or significantly altered, to incur TTS (equated to Level B harassment), or to incur PTS of some degree (equated to Level A harassment). Thresholds have also been developed to identify the pressure levels above which animals may incur non-auditory injury from exposure to pressure waves from explosive detonation. Refer to the Criteria and Thresholds for U.S. Navy Acoustic and Explosive Effects Analysis (Phase III) report (U.S. Department of the Navy 2017c) for detailed information on how the criteria and thresholds were derived.

Hearing Impairment (TTS/PTS), Tissues Damage, and Mortality

NMFS' Acoustic Technical Guidance (NMFS 2018) identifies dual criteria to assess auditory injury (Level A harassment) to five different marine mammal groups (based on hearing sensitivity) as a result of exposure to noise from two different types of sources (impulsive or non-impulsive). The Acoustic Technical Guidance also identifies criteria to predict TTS, which is not considered injury and falls into the Level B harassment category. The USAF's proposed activity only includes the use of impulsive (explosives) sources. These thresholds (Table 20) were developed by compiling and synthesizing the best available science and soliciting input multiple times from both the public and peer reviewers. The references, analysis, and methodology used in the development of the thresholds are described in Acoustic Technical Guidance, which may be accessed at: *https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-acoustic-technical-guidance.*

Additionally, based on the best available science, NMFS uses the acoustic and pressure thresholds indicated in Table 20 to predict the onset of TTS, PTS, tissue damage, and mortality for explosives (impulsive) and other impulsive sound sources.

TABLE 20—ONSET OF TTS, PTS, TISSUE DAMAGE, AND MORTALITY THRESHOLDS FOR MARINE MAMMALS FOR EXPLOSIVES AND OTHER IMPULSIVE SOURCES

Functional hearing group	Species	Onset TTS	Onset PTS	Mean onset slight GI tract injury	Mean onset slight lung injury	Mean onset mortality
Low-frequency cetaceans	Rice's whale	168 dB SEL (weighted) or 213 dB Peak SPL.	183 dB SEL (weighted) or 219 dB Peak SPL.	237 dB Peak SPL	Equation 1	Equation 2
Mid-frequency cetaceans	Dolphins	170 dB SEL (weighted) or 224 dB Peak SPL.	185 dB SEL (weighted) or 230 dB Peak SPL.	237 dB Peak SPL..		

Notes: Equation 1: $47.5M^{1/3}$ $(1+[D_{Rm}/10.1])^{1/6}$ Pa-sec. Equation 2: $103M^{1/3}$ $(1+[D_{Rm}/10.1])^{1/6}$ Pa-sec. M = mass of the animals in kg; D_{Rm} = depth of the receiver (animal) in meters; SPL = sound pressure level.

Refer to the Criteria and Thresholds for U.S. Navy Acoustic and Explosive Effects Analysis (Phase III) report (U.S. Department of the Navy, 2017c) for detailed information on how the criteria and thresholds were derived. Non-auditory injury (*i.e.,* other than PTS) and mortality are so unlikely as to be discountable under normal conditions and are therefore not considered further in this analysis.

Behavioral Disturbance

Though significantly driven by received level, the onset of Level B harassment by direct behavioral disturbance from anthropogenic noise exposure is also informed to varying degrees by other factors related to the source (*e.g.,* frequency, predictability, duty cycle, distance), the environment (*e.g.,* bathymetry), and the receiving animals (hearing, motivation, experience, demography, behavioral context) and can be difficult to predict (Ellison *et al.* 2011; Southall *et al.* 2007). Based on what the available science indicates and the practical need to use thresholds based on a factor or factors that are both predictable and measurable for most activities, NMFS uses generalized acoustic thresholds based primarily on received level (and distance in some cases) to estimate the onset of Level B harassment by behavioral disturbance.

Explosives—Explosive thresholds for Level B harassment by behavioral disturbance for marine mammals are the hearing groups' TTS thresholds minus 5 dB (see Table 21 below for the TTS thresholds for explosives) for events that contain multiple impulses from explosives underwater. See the Criteria and Thresholds for U.S. Navy Acoustic and Explosive Effects Analysis (Phase III) report (U.S. Department of the Navy 2017c) for detailed information on how the criteria and thresholds were derived. NMFS continues to concur that this approach represents the best available science for determining behavioral disturbance of marine mammals from multiple explosives. While marine mammals may also respond to single explosive detonations, these responses are expected to more typically be in the form of startle reaction, rather than a disruption in natural behavioral patterns to the point where they are abandoned or significantly altered. On the rare occasion that a single detonation might result in a more severe behavioral response that qualifies as Level B harassment, it would be expected to be in response to a comparatively higher received level. Accordingly, NMFS considers the potential for these responses to be quantitatively accounted for through the application of the TTS threshold, which, as noted above, is 5 dB higher than the behavioral harassment threshold for multiple explosives.

TABLE 21—THRESHOLDS FOR LEVEL B HARASSMENT BY BEHAVIORAL DISTURBANCE FOR EXPLOSIVES FOR MARINE MAMMALS

Medium	Functional hearing group	SEL (weighted)
Underwater	LF	163
Underwater	MF	165

Note: Weighted SEL thresholds in dB re 1 μPa²s underwater. LF = low-frequency, MF = mid-frequency, HF = high-frequency.

USAF's Acoustic Effects Model

The USAF's Acoustic Effects Model calculates sound energy propagation from explosives during UASF activities in the EGTTR. The net explosive weight (NEW) of a munition at impact can be directly correlated with the energy in the impulsive pressure wave generated by the warhead detonation. The NEWs of munitions addressed as part of this proposed rule range from 0.1 lb (0.04 kg) for small projectiles to 945 lb (428.5kg) for the largest bombs. The explosive materials used in these munitions also vary considerably with different formulations used to produce different intended effects. The primary detonation metrics directly considered and used for modeling analysis are the peak impulse pressure and duration of the impulse. An integration of the pressure of an impulse over the duration (time) of an impulse provides a measure of the energy in an impulse. Some of the NEWs of certain types of munitions, such as missiles, are associated with the propellant used for the flight of the munition. This propellant NEW is unrelated to the NEW of the warhead, which is the primary source of explosive energy in most munitions. The propellant of a missile fuels the flight phase and is mostly consumed prior to impact. Missile propellant typically has a lower flame speed than warhead explosives and is relatively insensitive to detonation from impacts but burns readily. A warhead detonation provides a high-pressure, high-velocity flame front that may cause burning propellant to detonate; therefore, this analysis assumes that the unconsumed residual propellant that remains at impact contributes to the detonation-induced pressure impulse in the water. The impact analysis assumes that 20 percent of the propellant remains unconsumed in missiles at impact; this assumption is based on input from user groups and is considered a reasonable estimate for the purpose of analysis. The NEW associated with this unconsumed propellant is added to the NEW of the warhead to derive the total energy released by the detonation. Absent a warhead detonation, it is assumed that continued burning or deflagration of unconsumed residual propellant does not contribute to the pressure impulse in the water; this applies to inert missiles that lack a warhead but contain propellant for flight.

In addition to the energy associated with the detonation, energy is also released by the physical impact of the munition with the water. This kinetic energy has been calculated and incorporated into the estimations of munitions energy for both live and inert munitions in this proposed rule. The kinetic energy of the munition at impact is calculated as one half of the munition mass times the square of the munition velocity. The initial impact event contributing to the pressure impulse in water is assumed to be 1 millisecond in duration. To calculate the velocity (and kinetic energy) immediately after impact, the deceleration contributing to the pressure impulse in the water is assumed for all munitions to be 1,500 g-forces, or 48,300 feet per square second over 1 millisecond. A substantial portion of the change in kinetic energy at impact is dissipated as a pressure impulse in the water, with the remainder being dissipated through structural deformation of the munition, heat, displacement of water, and other smaller energy categories. Even with 1,500 g-forces of deceleration, the change in velocity over this short time period is small and is proportional to the impact velocity and munition mass. The impact energy is the portion of the kinetic energy at impact that is transmitted as an underwater pressure impulse, expressed in units of trinitrotoluene-equivalent (TNTeq). The impact energies of the proposed live munitions were calculated and included in their total energy estimations. The impact energies of the inert munitions proposed to be used were also calculated. To assess the potential impacts of inert munitions on marine animals, the inert munitions were categorized based on their impact energies into the following four classes of 2 lb (0.9 kg), 1 lb (0.45 kg), 0.5 lb (0.22 kg), and 0.15 lb (0.07 kg) TNTeq; these values correspond closely to the actual or average impact energy values of the munitions and are rounded for the purpose of analysis. The 2 lb class represents the largest inert bomb, which includes the Mark (Mk)–84 General Purpose (GP), Guided Bomb Unit (GBU)–10, and GBU–31 bombs, whereas the 1 lb class represents the largest inert missile, which is the Air-to-Ground Missile (AGM)–158 Joint Air-to-Surface Standoff Missile (JASSM). The JASSM has greater mass but lower impact energy than the GBU–31; this is because of the JASSM's lower velocity at impact and associated change in velocity over the deceleration period, which contributes to the pressure impulse. The 0.5 lb and 0.15 lb impact energy classes each represent the approximate average impact energy of multiple munitions, with the 0.5 lb class representing munitions with mid-level energies, and the 0.15 lb class representing munitions with the lowest energies (Table 22).

TABLE 22—IMPACT ENERGY CLASSES FOR PROPOSED INERT MUNITIONS

Impact energy class (lb TNT_{eq})/(kg)	Representative munitions	Approximate weight (lb)/(kg)	Approximate velocity (mach)
2 (0.9)	Mk–84, GBU–10, and GBU–31	2,000 (907)	1.1.
1 (0.45)	AGM–158 JASSM	2,250 (1020.3)	0.9.
0.5 (0.22)	GBU–54 and AIM–120	250 to 650 (113.4 to 294.8)	Variable.
0.15 (0.07)	AIM–9, GBU–39, and PGU–15	1 to 285 (0.5 to 129.2)	Variable.

The NEW associated with the physical impact of each munition and the unconsumed propellant in certain munitions is added to the NEW of the warhead to derive the NEW at impact (NEWi) for each live munition. The NEWi of each munition was then used to calculate the peak pressure and pressure decay for each munition. This results in a more accurate estimate of the actual energy released by each detonation. Extensive research since the 1940s has shown that each explosive formulation produces unique correlations to explosive performance metrics. The peak pressure and pressure decay constant depend on the NEW, explosive formulation, and distance from the detonation. The peak pressure and duration of the impulse for each munition can be calculated empirically using similitude equations, with constants used in these equations determined from experimental data (NSWC 2017). The explosive-specific similitude constants and munition-specific NEWi were used for calculating the peak pressure and pressure decay for each munition analyzed. It should be noted that this analysis assumes that all detonations occur in the water and none of the detonations occur above the water surface when a munition impacts a target. This exceptionally conservative assumption implies that all munition energy is imparted to the water rather than the intended targets. See Appendix A in the LOA application for detailed explanations of similitude equations.

The following standard metrics are used to assess underwater pressure and impulsive noise impacts on marine animals:

- *SPL:* The SPL for a given munition can be explicitly calculated at a radial distance using the similitude equations.
- *SEL:* A commercially available software package, dBSea (version 2.3), was used to calculate the SEL for each mission day.
- *Positive Impulse:* This is the time integral of the initial positive phase of

the pressure impulse. This metric provides a measure of energy in the form of time-integrated pressure. Units are typically pascal-seconds (Pa·s) or pounds per square inch (psi) per millisecond (msec) (psi·msec). The positive impulse for a given munition can be explicitly calculated at a given distance using the similitude equations and integrating the pressure over the initial positive phase of the pressure impulse.

The munition-specific peak pressure and pressure decay at various radii were used to determine the species-specific distance to effect threshold for mortality, non-auditory injury, peak pressure–induced permanent threshold shift (PTS) in hearing and peak pressure–induced temporary threshold shift (TTS) in hearing for each species. The munition-specific peak pressures and decays for all munitions in each mission-day category were used as a time-series input in the dBSea underwater acoustic model to determine the distance to effect for cumulative SEL-based (24-hour) PTS, TTS, and behavioral effects for each species for each mission day.

The dBSea model was conducted using a constant sound speed profile (SSP) of 1500 m/s to be both representative of local conditions and to prevent thermocline induced refractions from distorting the analysis results. Salinity was assumed to be 35 parts per thousand (ppt) and pH was 8. The water surface was treated as smooth (no waves) to conservatively eliminate diffraction induced attenuation of sound. Currents and tidal flow were treated as zero. Energy expended on the target and/or on ejecting water or transfer into air was ignored and all weapon energy was treated as going into underwater acoustic energy to be conservative. Finally, the bottom was treated as sand with a sound speed of 1650 m/s and an attenuation of 0.8 dB/wavelength.

The harassment zone is the area or volume of ocean in which marine animals could be exposed to various pressure and impulsive noise levels generated by a surface or subsurface detonation that would result in mortality; non-auditory injury and PTS (Level A harassment impacts); and TTS and behavioral impacts (Level B harassment impacts). The harassment zones for the proposed detonations were estimated using Version 2.3 of the dBSea model for cumulative SEL and using explicit similitude equations for SPL and positive impulse. The characteristics of the impulse noise at the source were calculated based on munition-specific data including munition mass at impact, munition velocity at impact, NEW of warheads, explosive-specific similitude data, and propellant data for missiles. Table 23 presents the source-level SPLs (at r = 1 meter) calculated for the proposed munitions.

TABLE 23—CALCULATED SOURCE SPLS FOR MUNITIONS

Type	Warhead NEW (lb)/(kg)	Modeled explosive	Model NEWi (lm)/(kg)	Peak pressure and decay values		
				Pmax @1 m (psi)	SPL @1 m dB re 1 mPa	Θ msec
AGM–158 JASSM All Variants	240.26 (108.9)	Tritonal	241.36 (109.5)	45961.4858	290.0	0.320
GBU–54 KMU–572C/B, B/B	192 (87.1)	Tritonal	192.3 (87.2)	42101.8577	289.3	0.302
AGM–65 (all variants)	85 (38.5)	Comp B	98.3 (44.6)	37835.4932	288.3	0.200
AIM–120C3	15 (6.8)	PBXN–110	36.18 (13.4)	24704.864	284.6	0.167
AIM–9X Blk I	7.7 (3.5)	PBXN–110	20 (9.1)	19617.2833	282.6	0.143
AGM–114 (All ex R2 with TM(R10))	9 (4.1)	PBXN–110	13.08 (5.9)	16630.2435	281.2	0.128
AGM–179 JAGM	9 (4.1)	PBXN–110	13.08 (5.9)	16630.2435	281.2	0.128
AGM–114 R2 with TM (R10)	8 (3.6)	PBXN–9	13.08 (5.9)	17240.2131	281.5	0.124
AGR–20 (APKWS)	2.3 (1.0)	Comp B	3.8 (1.7)	10187.8419	276.9	0.090
PGU–43 (105 mm)	4.7 (2.1)	Comp B	4.72 (2.1)	11118.8384	277.7	0.095
GBU–69	36 (16.3)	Tritonal	36.1 (16.4)	22074.1015	283.7	0.198
GBU–70	36 (16.3)	Tritonal	36.1 (19.4)	22074.1015	283.7	0.198
GBU–39 SDB (GTV)	0.39 (0.2)	PBXN–9	0.49 (0.2)	4757.6146	270.3	0.054
GBU–53/B (GTV)	0.34 (0.2)	PBXN–9	0.44 (0.2)	4561.06062	270.0	0.053
GBU–12	192 (87.1)	Tritonal	192.3 (87.2)	42101.8577	289.3	0.302
Mk–81 (GP 250 lb)	100 (45.4)	H–6	100 (45.4)	38017.3815	288.4	0.237

θ = shock wave time constant; AGM = Air-to-Ground Missile; AIM = Air Intercept Missile; APKWS = Advanced Precision Kill Weapon System; dB re 1 µPa = decibel(s) referenced to 1 micropascal; FU = Full Up; GBU = Guided Bomb Unit; GP = General Purpose; GTV = Guided Test Vehicle; HACM = Hypersonic Attack Cruise Missile; HE = High Explosive; JASSM = Joint Air-to-Surface Standoff Missile; lb = pound(s); lbm = pound-mass; LSDB = Laser Small-Diameter Bomb; m = meter(s); Mk = Mark; mm = millimeter(s); msec = millisecond(s); NEW = net explosive weight; NEWi = net explosive weight at impact; NLOS = Non-Line-of-Sight; PGU = Projectile Gun Unit; Pmax = shock wave peak pressure; psi = pound(s) per square inch; SDB = Small-Diameter Bomb; SPL = sound pressure level; TM = telemetry.

For SEL analysis, the dBSea model was used with the ray-tracing option for calculating the underwater transmission of impulsive noise sources represented in a time series (1,000,000 samples per second) as calculated using similitude equations (r = 1 meter) for each munition for each mission day. All surface detonations are assumed to occur at a depth of 1 m, and all subsurface detonations, which would include the GBU–10, GBU–24, GBU–31, and subsurface mines, are assumed to occur at a depth of 3 m. The model used bathymetry for LIA with detonations occurring at the center of the LIA with a water depth of 70 m. The seafloor of the LIA is generally sandy, so sandy bottom characteristics for reflectivity and attenuation were used in the dBSea model, as previously described. The model was used to calculate impulsive acoustic noise transmission on one-third octaves from 31.5 hertz to 32 kilohertz. Maximum SELs from all depths projected to the surface were used for the analyses.

The cumulative SEL is based on multiple parameters including the acoustic characteristics of the detonation and sound propagation loss in the marine environment, which is influenced by a number of environmental factors including water depth and seafloor properties. Based on integration of these parameters, the dBSea model predicts the distances at which each marine animal species is estimated to experience SELs associated with the onset of PTS, TTS, and behavioral disturbance. As noted previously, thresholds for the onset of TTS and PTS used in the model and pressure calculations are based on those presented in Criteria and Thresholds for U.S. Navy Acoustic and Explosive Effects Analysis (Phase III) (DoN 2017) for cetaceans with mid- to high-frequency hearing (dolphins) and low-frequency hearing (Rice's whale). Behavioral thresholds are set 5 dB below the SEL-based TTS threshold. Table 24 shows calculated SPLs and SELs for the designated mission-day categories.

TABLE 24—CALCULATED SOURCE SPLS AND SELS FOR MISSION-DAY CATEGORIES

Mission day	Total warhead NEW, lbm [a] (kg)	Modeled NEWi, lbm/(kg)	Source cumulative SEL, dB	Source peak SPL, dB
A	2402.6 (108.6)	2413.6 (1094.6)	262.1	290
B	1961 (889.3)	2029.9 (920.6)	261.4	289.3
C	1145 (519.2)	1376.2 (624.1)	259.8	288.3
D	562 (254.8)	836.22 (379.2)	257.6	288.3
E	817.88 (370.9)	997.62 (452.0)	257.1	281.5
F	584 (264.8)	584.6 (265.1)	256.2	289.3
G	191(86.6)	191.6 (86.9)	250.4	277.7
H	60.5 (24.7)	61.1 (27.7)	245.2	268.8
I	18.4 (8.3)	30.4 (13.8)	242.5	276.9
J	945 (428.6)	946.8 (429.4)	258.1	294.6
K	Not available	350 (158.7)	253.4	291.5
L	624.52 (283.2)	627.12 (284.4)	256.2	290
M	324 (146.9)	324.9 (147.3)	253.2	283.6
N	219.92 (99.7)	238.08 (107.9)	252	285.3
O	72 (36.6)	104.64 (47.5)	248.3	281.2
P	90 (40.8)	130.8 (59.3)	249.3	281.2
Q	94 (42.6)	94.4 (42.8)	247.5	277.7
R	35.12 (15.9)	35.82 (16.2)	241.7	270.3
S	130 (58.9)	130 (58.9)	249.4	283

[a] lbm = pound-mass.

Mission-Day Categories

The munitions proposed to be used by each military unit were grouped into mission-day categories so the acoustic impact analysis could be based on the total number of detonations conducted during a given mission instead of each individual detonation. This analysis was done to account for the accumulated energy from multiple detonations over a 24-hour period.

The estimated number of mission days assigned to each category was based on historical numbers and projections provided by certain user groups. Although the mission-day categories may not represent the exact manner in which munitions would be used, they provide a conservative range of mission scenarios to account for accumulated energy from multiple detonations. It is important to note that only acoustic energy metrics (SEL) are affected by the accumulation of energy over a 24-hour period. Pressure metrics (*e.g.,* peak SPL and positive impulse) do not accumulate and are based on the highest impulse pressure value within the 24-hour period. Based on the categories developed, the total NEWi per mission day would range from 2,413.6 to 30.4 lb (1,094.6 to 13.8 kg). The highest detonation energy of any single munition used under the USAF's proposed activities would be 945 lb (428.5 kg) NEW, which was also the highest NEW for a single munition in the previous LOA Request. The munitions having this NEW include the GBU–10, GBU–24, and GBU–31.

Note that the types of munitions that would be used for SINKEX testing are controlled information and, therefore, not identified in this LOA Request. For the purpose of analysis, SINKEX exercises are assigned to mission-day category J, which represents a single subsurface detonation of 945 lb NEW. SINKEX exercises would not exceed this NEW. The 2 annual SINKEX exercises are added to the other 8 annual missions involving subsurface detonations of these bombs, resulting in 10 total annual missions under mission-day category J.

As indicated in Table 25, a total of 19 mission-day categories (A through S) were developed a part of this LOA application. The table also contains information on the number of munitions per day, number of mission days per year, annual quantity of munitions and the NEWi per mission day.

TABLE 25—MISSION-DAY CATEGORIES FOR ACOUSTIC IMPACT ANALYSIS

User group	Mission-day category	Munition type	Category	Warhead NEW (lb)/(kg)	NEWi (lb)/kg	Detonation scenario	Munitions per day	Mission days per year	Annual quantity	NEWi per mission day (lb)/(kg)
53 WEG ...	A	AGM–158D JASSM XR.	Missile ...	240.26 (108.9)	241.36 (109.4)	Surface ...	4	1	4	2,413.6 (1,095.9)
		AGM–158B JASSM ER.	Missile ...	240.26 (108.9)	241.36 (109.4)	Surface ...	3	1	3	...
		AGM–158A JASSM	Missile ...	240.26 (108.9)	241.36 (109.4)	Surface ...	3	1	3	...
	B	GBU–54 KMU–572C/B.	Bomb (Mk–82) ...	192 (87.1)	192.3 (87.2)	Surface ...	4	1	4	2,029.9 (920.5)
		GBU–54 KMU–572B/B.	Bomb (Mk–82) ...	192 (87.1)	192.3 (87.2)	Surface ...	4	1	4	...
		AGM–65D ...	Missile ...	85 (38.5)	98.3 (44.6)	Surface ...	5	1	5	...
	C	AGM–65H2 ...	Missile ...	85 (37.5)	98.3 (44.6)	Surface ...	5	1	5	1,376.2 (624.1)
		AGM–65G2 ...	Missile ...	85 (38.5)	98.3 (44.6)	Surface ...	5	1	5	...
		AGM–65K2 ...	Missile ...	85 (38.5)	98.3 (44.6)	Surface ...	4	1	4	...
	D	AGM–65L ...	Missile ...	85 (38.5)	98.3 (44.6)	Surface ...	5	1	5	836.22 (379.2)
		AIM–120C3 ...	Missile ...	15 (6.8)	36.18 (16.4)	Surface ...	4	1	4	...
		AIM–9X Blk I ...	Missile ...	7.7 (4.5)	20 (9.1)	Surface ...	10	1	10	...
	E	AGM–114 N–4D with TM.	Missile ...	9 (4.1)	13.08 (5.9)	Surface ...	4	1	4	997.62 (452.4)
		AGM–114 N–6D with TM.	Missile ...	9 (4.1)	13.08 (5.9)	Surface ...	4	1	4	...

TABLE 25—MISSION-DAY CATEGORIES FOR ACOUSTIC IMPACT ANALYSIS—Continued

User group	Mission-day category	Munition type	Category	Warhead NEW (lb)/(kg)	NEWi (lb)/kg	Detonation scenario	Munitions per day	Mission days per year	Annual quantity	NEWi per mission day (lb)/(kg)
		AGM–179 JAGM	Missile	9 (4.1)	13.08 (5.9)	Surface	4	1	4	
		AGM–114 R2 with TM (R10).	Missile	9 (4.1)	13.08 (5.9)	Surface	4	1	4	
		AGM–114 R–9E with TM (R11).	Missile	9 (4.1)	13.08 (5.9)	Surface	4	1	4	
		AGM–114Q with TM	Missile	9 (4.1)	13.08 (5.9)	Surface	4	1	4	
		AGR–20 (APKWS)	Rocket	2.3 (1.0)	3.8 (1.7)	Surface	12	1	12	
		AGM–176	Missile	9 (4.1)	13.08 (5.9)	Surface	4	1	4	
		PGU–43 (105 mm)	Gun Ammunition	4.7 (2.1)	4.72 (2.1)	Surface	100	1	100	
		GBU–69	Bomb	36 (16.3)	36.1 (13.3)	Surface	2	1	2	
		GBU–70	Bomb	36 (16.3)	36.1 (16.3)	Surface	1	1	4	
		AGM–88C w/FTS	Missile	[a] 0.70 (0.3)	0	Surface	2	1	2	
		AGM–88B w/FTS	Missile	[a] 0.70 (0.3)	0	Surface	2	1	2	
		AGM–88F w/FTS	Missile	[a] 0.70 (0.3)	0	Surface	2	1	2	
		AGM–88G w/FTS	Missile	[a] 0.70 (0.3)	0	Surface	2	1	2	
		GBU–39 SDB (GTV)	Bomb	[a] 0.39 (0.2)	0.49 (0.2)	Surface	4	1	4	
		GBU–53/B (GTV)	Bomb	[a] 0.34 (0.2)	0.44 (0.2)	Surface	8	1	8	
AFSOC	F	GBU–12	Bomb (Mk–82)	192 (87.1)	192.3 (87.2)	Surface	2	15	30	584.6 (263.1)
		Mk–81 (GP 250 lb)	Bomb	100 (45.3)	100 (45.3)	Surface	2	15	30	
AFSOC	G	105 mm HE (FU)	Gun Ammunition	4.7 (2.1)	4.72 (2.1)	Surface	30	25 (daytime)	750	191.6 (86.8)
		30 mm HE	Gun Ammunition	0.1 (0.1)	0.1 (0.01)	Surface	500		12,500	
	H	105 mm HE (TR)	Gun Ammunition	0.35 (0.2)	0.37 (0.2)	Surface	30	45 (nighttime)	1,350	61.1 (27.7)
		30 mm HE	Gun Ammunition	0.1 (0.1)	0.1 (0.01)	Surface	500		22,500	
	I	2.75-inch Rocket (including APKWS).	Rocket	2.3 (1.0)	3.8 (1.7)	Surface	8	50	400	30.4 (13.8)
96 OG	J	GBU–10, 24, or 31 (QUICKSINK).	Bomb (Mk–84)	945 (428.6)	946.8 (429.4)	Subsurface.	1	[b] 10	[b] 10	946.8 (429.4)
	K	HACM	Hypersonic Weapon	Not available	350 (158.7)	Surface	1	1	2	350 (158.7)
	L	AGM–158 (JASSM)	Missile	240.26 (108.9)	241.36 (109.4)	Surface	2	1	2	627.12 (284.3)
		GBU–39 (SDB I) Simultaneous Launch [c].	Bomb	72 (32.6)	72.2 (32.7)	Surface	2	1	2	
	M	GBU–39 (SDB I)	Bomb	36 (16.3)	36.1 13.3)	Surface	4	2	8	324.9 (147.3)
		GBU–39 (LSDB)	Bomb	36 (16.3)	36.1 (16.3)	Surface	5	2	10	
	N	GBU–39B/B LSDB	Bomb	36 (16.3)	36.1 (16.3)	Surface	2	1	2	238.08 (107.9)
		Spike NLOS	Missile	34.08 (15.4)	40 (18.1)	Surface	3	1	3	
		GBU–53 (SDB II)	Bomb	22.84 (13.4)	22.94 (10.4)	Surface	2	1	2	
	O	AGM–114R Hellfire	Missile	9 (4.1)	13.08 (5.9)	Surface	8	4	36	104.64 (47.5)
	P	AGM–114 Hellfire	Missile	9 (4.1)	13.08 (5.9)	Surface	5	2	10	130.8 (59.3)
		AGM–176 Griffin	Missile	9 (4.1)	13.08 (5.9)	Surface	5	2	10	
	Q	105 mm HE (FU)	Gun Ammunition	4.7 (2.1)	4.72 (2.1)	Surface	20	3	60	94.4 (42.8)
	R	Inert GBU–39 (LSDB) with live fuze.	Bomb	0.39 (0.2)	0.49 (0.2)	Surface	4	1	4	35.82 (16.2)
		Inert GBU–53 (SDB II) with live fuze.	Bomb	0.34 (0.2)	0.44 (0.2)	Surface	4	1	4	
		105 mm HE (TR)	Gun Ammunition	0.35 (0.2)	0.37 (0.2)	Surface	60	1	60	
		30 mm HE	Gun Ammunition	0.1 (0.1)	0.1 (0.01)	Surface	99	1	99	
NAVSCOL EOD.	S	Underwater Mine Charge.	Charge	[d] 20 (9.07)	20 (9.07)	Subsurface.	4	8	32	130 (58.9)
		Floating Mine Charge.	Charge	[d] 5 (2.3)	5 (2.3)	Surface	10	8	80	

[a] Warhead replaced by FTS/TM. Identified NEW is for the FTS.
[b] Includes 2 SINKEX exercises.
[c] NEW is doubled for simultaneous launch.
[d] Estimated.

Marine Mammal Density

Densities of the common bottlenose dolphin, Atlantic spotted dolphin, and Rice's whale in the study area are based on habitat-based density models and spatial density models developed by the NOAA Southeast Fisheries Science Center for the species in the Gulf of Mexico (NOAA 2022). The density models, herein referred to as the NOAA model, integrated visual observations from aerial and shipboard surveys conducted in the Gulf of Mexico from 2003 to 2019.

The NOAA model was used to predict the average density of the common bottlenose dolphin and Atlantic spotted dolphin in the existing LIA and proposed East LIA. The model generates densities for hexagon-shaped raster grids that are 40 square kilometers (km^2). The average annual density of each dolphin species in the existing LIA and proposed East LIA was computed in a geographic information system (GIS) based on the densities of the raster grids within the boundaries of each LIA. To account for portions of the grids outside of the LIA, the species density value of each grid was area-weighted based on the respective area of the grid within the LIA. For example, the density of a grid that is 70 percent within the LIA would be weighted to reflect only the 70 percent grid area, which contributes to the average density of the entire LIA. The density of the 30 percent grid area outside the LIA does not contribute to the average LIA density, so it is not included in the estimation. The resulting area-weighted densities of all the grids were summed to determine the average annual density of each dolphin species within each LIA. The densities of dolphins estimated are presented in Table 26.

TABLE 26—PREDICTED DOLPHIN DENSITIES IN THE EXISTING AND PROPOSED LIAS

Species	Density estimate (animals per km²) [a]	
	Existing LIA	Proposed east LIA
Atlantic spotted dolphin	0.032	0.038
Common bottlenose dolphin	0.261	0.317

[a] Estimated average density within LIA based on spatial density model developed by NOAA (2022).

The NOAA model was used to determine Rice's whale density in the exposure analysis conducted for the Rice's whale in this LOA Request. Areas of Rice's whale exposure to pressure and impulsive noise from munitions use, predicted by underwater acoustic modeling and quantified by GIS analysis, were coupled with the associated modeled grid densities from the NOAA model to estimate abundance of affected animals.

Take Estimation

The distances from the live ammunition detonation point that correspond to the various effect thresholds described previously are referred to as threshold distances. The threshold distances were calculated using dBSea for each mission-day category for each marine mammal species. The model was run assuming that the detonation point is at the center of the existing LIA, the SEL threshold distances are the same for the proposed East LIA, and all missions are conducted in either the existing LIA or proposed East LIA. Model outputs for the two LIAs are statistically the same as a result of similarities in water depths, sea bottom profiles, water temperatures, and other environmental characteristics. Table 27, Table 28 and Table 29 present the threshold distances estimated for the dolphins and Rice's whale, respectively, for live missions in the existing LIA.

The threshold distances were used to calculate the harassment zones for each effect threshold for each species. The thresholds resemble concentric circles, with the most severe (mortality) being closest to the center (detonation point) and the least severe (behavioral disturbance) being farthest from the center. The areas encompassed by the concentric thresholds are the impact areas associated with the applicable criteria. To prevent double counting of animals, areas associated with higher-impact criteria were subtracted from areas associated with lower-impact criteria. To estimate the number of animals potentially exposed to the various thresholds within the harassment zone, the adjusted impact area was multiplied by the predicted animal density and the annual number of events for each mission-day category. The results were rounded at the annual mission-day level and then summed for each criterion to estimate the total annual take numbers for each species. For impulse and SPL metrics, a take is considered to occur if the received level is equal to or above the associated threshold. For SEL metrics, a take is considered to occur if the received level is equal to or above the associated threshold within the appropriate frequency band of the sound received, adjusted for the appropriate weighting function value of that frequency band. For impact categories with multiple criteria (*e.g.,* non-auditory injury and PTS for Level A harassment) and criteria with two thresholds (*e.g.,* SEL and SPL for PTS), the criterion and/or threshold that yielded the higher exposure estimate was used. Threshold distances for dolphins are shown in Table 27 and 28, while Table 29 contains threshold distances for Rice's whale.

TABLE 27—BOTTLENOSE DOLPHIN THRESHOLD DISTANCES (IN km) FOR LIVE MISSIONS IN THE EXISTING LIVE IMPACT AREA

Mission-day category	Mortality	Level A harassment				Level B harassment		
	Positive impulse B: 248.4 Pa·s AS: 197.1 Pa·s	Slight lung injury	GI tract injury	PTS		TTS		Behavioral [a]
		Positive impulse B: 114.5 Pa·s AS: 90.9 Pa·s	Peak SPL 237 dB	Weighted SEL 185 dB	Peak SPL 230 dB	Weighted SEL 170 dB	Peak SPL 224 dB	Weighted SEL 165 dB
Bottlenose Dolphin								
A	0.139	0.276	0.194	0.562	0.389	5.59	0.706	9.538
B	0.128	0.254	0.180	0.581	0.361	5.215	0.655	8.937
C	0.100	0.199	0.144	0.543	0.289	4.459	0.524	7.568
D	0.100	0.199	0.144	0.471	0.289	3.251	0.524	5.664
E	0.068	0.136	0.103	0.479	0.207	3.272	0.377	5.88
F	0.128	0.254	0.180	0.352	0.362	2.338	0.655	4.596
G	0.027	0.054	0.048	0.274	0.093	1.095	0.165	2.488
H	0.010	0.019	0.021	0.225	0.040	0.809	0.071	1.409
I	0.025	0.049	0.045	0.136	0.087	0.536	0.154	0.918
J	0.228	0.449	0.306	0.678	0.615	3.458	1.115	6.193
K	0.158	0.313	0.222	0.258	0.445	1.263	0.808	2.663
L	0.139	0.276	0.194	0.347	0.389	2.35	0.706	4.656
M	0.068	0.136	0.103	0.286	0.207	1.446	0.377	3.508
N	0.073	0.145	0.113	0.25	0.225	1.432	0.404	2.935
O	0.046	0.092	0.078	0.185	0.155	0.795	0.278	1.878
P	0.046	0.092	0.078	0.204	0.155	0.907	0.278	2.172
Q	0.027	0.054	0.048	0.247	0.093	0.931	0.165	1.563
R	0.012	0.024	0.026	0.139	0.052	0.537	0.093	0.91

TABLE 27—BOTTLENOSE DOLPHIN THRESHOLD DISTANCES (IN km) FOR LIVE MISSIONS IN THE EXISTING LIVE IMPACT AREA—Continued

Mission-day category	Mortality	Level A harassment				Level B harassment		
	Positive impulse B: 248.4 Pa·s AS: 197.1 Pa·s	Slight lung injury	GI tract injury	PTS		TTS		Behavioral [a]
		Positive impulse B: 114.5 Pa·s AS: 90.9 Pa·s	Peak SPL 237 dB	Weighted SEL 185 dB	Peak SPL 230 dB	Weighted SEL 170 dB	Peak SPL 224 dB	Weighted SEL 165 dB
S	0.053	0.104	0.084	0.429	0.164	1.699	0.294	2.872

[a] Behavioral threshold for multiple detonations assumes TTS threshold minus 5 dB.

TABLE 28—ATLANTIC SPOTTED DOLPHIN THRESHOLD DISTANCES (IN km) FOR LIVE MISSIONS IN THE EXISTING LIVE IMPACT AREA

Mission-day category	Mortality	Level A harassment				Level B harassment		
	Positive impulse B: 248.4 Pa·s AS: 197.1 Pa·s	Slight lung injury	GI tract injury	PTS		TTS		Behavioral [a]
		Positive impulse B: 114.5 Pa·s AS: 90.9 Pa·s	Peak SPL 237 dB	Weighted SEL 185 dB	Peak SPL 230 dB	Weighted SEL 170 dB	Peak SPL 224 dB	Weighted SEL 165 dB
Atlantic Spotted Dolphin								
A	0.171	0.338	0.194	0.562	0.389	5.59	0.706	9.538
B	0.157	0.311	0.180	0.581	0.361	5.215	0.655	8.937
C	0.123	0.244	0.144	0.543	0.289	4.459	0.524	7.568
D	0.123	0.244	0.144	0.471	0.289	3.251	0.524	5.664
E	0.084	0.168	0.103	0.479	0.207	3.272	0.377	5.88
F	0.157	0.312	0.180	0.352	0.362	2.338	0.655	4.596
G	0.033	0.066	0.048	0.274	0.093	1.095	0.165	2.488
H	0.012	0.023	0.021	0.225	0.040	0.809	0.071	1.409
I	0.030	0.060	0.045	0.136	0.087	0.536	0.154	0.918
J	0.279	0.550	0.306	0.678	0.615	3.458	1.115	6.193
K	0.194	0.384	0.222	0.258	0.445	1.263	0.808	2.663
L	0.171	0.338	0.194	0.347	0.389	2.35	0.706	4.656
M	0.084	0.168	0.103	0.286	0.207	1.446	0.377	3.508
N	0.090	0.179	0.113	0.25	0.225	1.432	0.404	2.935
O	0.057	0.113	0.078	0.185	0.155	0.795	0.278	1.878
P	0.057	0.113	0.078	0.204	0.155	0.907	0.278	2.172
Q	0.033	0.066	0.048	0.247	0.093	0.931	0.165	1.563
R	0.015	0.030	0.026	0.139	0.052	0.537	0.093	0.91
S	0.065	0.128	0.084	0.429	0.164	1.699	0.294	2.872

[a] Behavioral threshold for multiple detonations assumes TTS threshold minus 5 dB.

TABLE 29—RICE'S WHALE THRESHOLD DISTANCES (IN km) FOR LIVE MISSIONS IN THE EXISTING LIVE IMPACT AREA

Mission-day category	Mortality	Level A harassment				Level B harassment		
	Positive impulse 906.2 Pa·s	Slight lung injury	GI tract injury	PTS		TTS		Behavioral [a]
		Positive impulse 417.9 Pa·s	Peak SPL 237 dB	Weighted SEL 183 dB	Peak SPL 219 dB	Weighted SEL 168 dB	Peak SPL 213 dB	Weighted SEL 163 dB
A	0.044	0.088	0.194	5.695	1.170	21.435	2.120	27.923
B	0.041	0.81	0.180	5.253	1.076	20.641	1.955	26.845
C	0.031	0.063	0.144	4.332	0.861	18.772	1.562	24.526
D	0.031	0.063	0.144	2.979	0.861	16.419	1.562	21.579
E	0.021	0.043	0.103	2.323	0.617	15.814	1.121	21.22
F	0.041	0.081	0.180	2.208	1.076	14.403	1.955	19.439
G	0.009	0.017	0.048	0.494	0.266	7.532	0.470	12.92
H	0.003	0.006	0.021	0.401	0.114	3.624	0.201	7.065
I	0.008	0.016	0.045	0.305	0.247	2.95	0.437	6.059
J	0.073	0.145	0.306	4.487	1.830	13.216	3.323	16.88
K	0.050	0.100	0.222	0.831	1.320	7.723	2.393	11.809
L	0.044	0.088	0.194	2.325	1.170	15.216	2.120	20.319
M	0.021	0.043	0.103	1.304	0.617	11.582	1.121	16.688
N	0.023	0.046	0.113	1.026	0.658	9.904	1.183	14.859
O	0.015	0.029	0.078	0.611	0.460	6.926	0.832	11.159
P	0.014	0.029	0.078	0.671	0.460	7.841	0.832	12.307
Q	0.009	0.017	0.048	0.549	0.266	6.299	0.470	10.393
R	0.004	0.008	0.026	0.283	0.152	2.383	0.273	5.06
S	0.017	0.034	0.084	0.938	0.473	8.676	0.843	12.874

[a] Behavioral threshold for multiple detonations assumes TTS threshold minus 5 dB.

As discussed previously and shown in Table 22, a portion of the kinetic energy released by an inert munition at impact is transmitted as underwater acoustic energy in a pressure impulse. The proposed inert munitions were categorized into four classes based on their impact energies to assess the potential impacts of inert munitions on marine mammals. The threshold distances for each class were modeled and calculated as described for the mission-day categories. Table 30 presents the impact energy classes developed for the proposed inert munitions. The four impact energy classes represent the entire suite of inert munitions proposed to be used in the EGTTR during the next mission period. The impact energy is the portion of the kinetic energy at impact that is transmitted as an underwater pressure impulse, expressed in units of TNT-equivalent (TNTeq). Tables 30 and 31 present the threshold distances estimated for the dolphins and Rice's whale, respectively, for inert munitions in the existing LIA.

TABLE 30—DOLPHIN THRESHOLD DISTANCES (IN KM) FOR INERT MUNITIONS IN THE EXISTING LIVE IMPACT AREA

Inert impact class (lb TNT_{eq})	Mortality	Level A harassment				Level B harassment		
	Positive impulse B: 248.4 Pa·s AS: 197.1 Pa·s	Slight lung injury	GI tract injury	PTS		TTS	Behavioral [a]	
		Positive impulse B: 114.5 Pa·s AS: 90.9 Pa·s	Peak SPL 237 dB	Weighted SEL 185 dB	Peak SPL 230 dB	Weighted SEL 170 dB	Peak SPL 224 dB	Weighted SEL 165 dB
Bottlenose Dolphin								
2	0.020	0.041	0.040	0.030	0.080	0.205	0.145	0.327
1	0.015	0.031	0.032	0.025	0.063	0.134	0.114	0.250
0.5	0.012	0.023	0.025	0.015	0.050	0.119	0.091	0.198
0.15	0.008	0.015	0.017	0.009	0.034	0.061	0.061	0.119
Atlantic Spotted Dolphin								
2	0.025	0.051	0.040	0.030	0.080	0.205	0.145	0.327
1	0.019	0.038	0.032	0.025	0.063	0.134	0.114	0.250
0.5	0.014	0.029	0.025	0.015	0.050	0.119	0.091	0.198
0.15	0.009	0.018	0.017	0.009	0.034	0.061	0.061	0.119

[a] Behavioral threshold for multiple detonations assumes TTS threshold minus 5 dB.

TABLE 31—RICE'S WHALE THRESHOLD DISTANCES (IN KM) FOR INERT MUNITIONS IN THE EXISTING LIVE IMPACT AREA

Inert impact class (lb TNT_{eq})	Mortality	Level A harassment				Level B harassment		
	Positive impulse 906.2 Pa·s	Slight lung injury	GI tract injury	PTS		TTS	Behavioral [a]	
		Positive impulse 417.9 Pa·s	Peak SPL 237 dB	Weighted SEL 183 dB	Peak SPL 219 dB	Weighted SEL 168 dB	Peak SPL 213 dB	Weighted SEL 163 dB
2	0.006	0.013	0.040	0.151	0.238	0.474	0.430	0.884
1	0.005	0.010	0.032	0.110	0.188	0.327	0.340	0.542
0.5	0.004	0.007	0.025	0.055	0.149	0.261	0.270	0.521
0.15	0.002	0.005	0.017	0.026	0.100	0.154	0.181	0.284

[a] Behavioral threshold for multiple detonations assumes TTS threshold minus 5 dB.

Dolphin Species

Estimated takes for dolphins are based on the area of the Level A and Level B harassment zones, predicted dolphin density, and annual number of events for each mission-day category. As previously discussed, take estimates for dolphins are based on the average yearly density of each dolphin species in each LIA. To estimate the takes of each dolphin species in both LIAs collectively, the take estimates for each LIA were weighted based on the expected usage of each LIA over the 7-year mission period. This information was provided by the user groups. Ninety percent of the total missions are expected to be conducted in the existing LIA and 10 percent are expected to be conducted in the proposed East LIA. Therefore, total estimated takes are the sum of 90 percent of the takes in the existing LIA and 10 percent of the takes in the proposed East LIA. Should the usage ratio changes substantially in the future, USAF would re-evaluate the exposure estimates and reinitiate consultation with NMFS to determine whether the take estimations need to be adjusted.

TABLE 32—CALCULATED ANNUAL EXPOSURES OF DOLPHINS UNDER THE USAF'S PROPOSED ACTIVITIES

	Mortality	Level A harassment		Level B harassment	
		Injury [a]	PTS	TTS	Behavioral
Bottlenose Dolphin					
Missions at Existing LIA	0.74	2.14	9.25	312.7	799.7
Missions at East LIA	0.89	2.6	11.24	379.79	971.29
90 Percent of Existing LIA Missions	0.66	1.92	8.33	281.4	719.73

TABLE 32—CALCULATED ANNUAL EXPOSURES OF DOLPHINS UNDER THE USAF'S PROPOSED ACTIVITIES—Continued

	Mortality	Level A harassment		Level B harassment	
		Injury [a]	PTS	TTS	Behavioral
10 Percent of East LIA Missions	0.09	0.26	1.12	37.98	97.13
Total	0.75	2.18	9.45	319.14	816.86
Total Takes Requested	0	0	9	319	817
Atlantic Spotted Dolphin					
Missions at Existing LIA	0.14	0.39	0.96	38.34	98.05
Missions at East LIA	0.16	0.47	1.14	45.53	116.43
90 Percent of Existing LIA Missions	0.12	0.36	0.86	34.50	88.24
10 Percent of East LIA Missions	0.02	0.05	0.11	4.55	11.64
Total	0.14	0.4	0.98	39.06	99.89
Total Takes Proposed	0	0	1	39	100

[a] Slight lung and/or gastrointestinal tract injury.

The annual exposures of dolphins requested by the USAF and proposed for authorization by NMFS are presented in Table 32. As indicated, a total of 9 Level A harassment takes and 1,136 Level B harassment takes of the common bottlenose dolphin, and 1 Level A harassment takes and 139 Level B harassment takes of the Atlantic spotted dolphin are requested annually for EGTTR operations during the next 7-year mission period. The presented takes are overestimates of actual exposure based on the conservative assumption that all proposed detonations would occur at or just below the water surface instead of a portion occurring upon impact with targets.

Based on the best available science, the USAF (in coordination with NMFS) used the acoustic and pressure thresholds indicated in Tables 26–30 to predict the onset of tissue damage and mortality for explosives (impulsive) and other impulsive sound sources for inert and live munitions in both the existing LIA and proposed East LIA. The mortality takes calculated for the bottlenose dolphin (0.75) and Atlantic spotted dolphin (0.14) are both less than one animal. Mortality for Rice's whale is zero. Therefore, and in consideration of the required mitigation measures, no mortality takes are requested for either dolphin species or Rice's whale. The non-auditory injury takes are calculated to be 2.18 and 0.40 for the bottlenose dolphin and Atlantic spotted dolphin, respectively. However, these (and the take estimates for the other effect thresholds) are the sum of the respective takes for all 19 mission-day categories. Each individual mission-day category results in a fraction of a non-auditory injury take. Given the required mitigation, adding up all the fractional takes in this manner would likely result in an over-estimate of take. Calculated non-auditory injury for the Rice's whale is zero.

The mitigation measures associated with explosives are expected to be effective in preventing mortality and non-auditory tissue damage to any potentially affected species. All of the calculated distances to mortality or non-auditory injury thresholds are less than 400 m. The USAF would be required to employ trained protected species observers (PSOs) to monitor the mitigation zones based on the mission-day activities. The mitigation zone is defined as double the threshold distance at which Level A harassment exposures in the form of PTS could occur (also referred to below as ''double the Level A PTS threshold distance''). During pre-monitoring PSOs would be required to postpone or cancel operations if animals are found in these zones. Protected species monitoring would be vessel-based, aerial-based or remote video-based depending on the mission-day activities. The USAF would also be required to conduct testing and training exercise beyond setback distances shown in Table 33. These setback distances would start from the 100-m isobath, which is approximately the shallowest depth where the Rice's whale has been observed. The setback distances are based on the PTS threshold calculated for the Rice's whale depending on the mission-day activity. Also, all gunnery missions must take place 500 m landward of the 100-m isopleth to avoid impacts to the Rice's whale. When these mitigation measures are considered in combination with the modeled exposure results, no species are anticipated to incur mortality or non-auditory tissue damage during the period of this rule.

Based on the conservative assumptions applied to the impact analysis and the pre-mission surveys conducted for dolphins, which extend out to, at a minimum, twice the PTS threshold distance that applies to both dolphin species (185 dB SEL), NMFS has determined that no mortality or non-auditory injury takes are expected and none are authorized for EGTTR operations.

Rice's Whale

Figure 6–2 in the LOA application shows the estimated Rice's whale threshold distances and associated harassment zones for mission-day category A, J, and P and use of a 2 lb class inert munition at the location where the GRATV is typically anchored in the existing LIA. As indicated on Figure 6–2, portions of the behavioral harassment zone of mission-day categories A and J extend into Rice's whale habitat, whereas the monitoring zones for mission-day category P and the largest inert munition are entirely outside Rice's whale habitat. The monitoring zone is defined as the area between double the Level A harassment mitigation zone and the human safety zone perimeter. As previously discussed, the spatial density model developed by NOAA (2022) for the Rice's whale was used to predict Rice's whale density for the purpose of estimating takes. The NOAA model generates densities for hexagon-shaped raster grids that are 40 km². The specific areas of the raster grids within each of the Level A and Level B harassment zones were computed in GIS and coupled with their respective modeled densities to estimate the number of animals that would be exposed.

Figure 6–3 in the LOA application shows the harassment zones of mission-day category A at the current GRATV anchoring site. As shown, portions of the mitigation zones (TTS and behavioral disturbance) are within grids of modeled density greater than zero individuals per 40 km². However, the modeled densities in these areas are small and reflect higher occurrence probability for the Rice's whale farther to the southwest, outside the LIA. To estimate annual takes, the number of animals in all model grids within each mitigation, monitoring zone, and Level B harassment (behavioral) zone for all mission-day categories, except gunnery missions (G and H), were computed using the densities from the NOAA model (2022) model and the impact areas calculated in GIS. The modeled densities and the associated areas were multiplied together to estimate abundance within each mitigation, monitoring, and Level B harassment zone. The resulting abundance estimates were summed together and then multiplied by the number of annual missions proposed to estimate annual takes. These calculations resulted in a total of 0.04 annual TTS take and 0.10 annual behavioral disturbance take, which indicates that all missions conducted at the current GRATV site combined would not result in a single Level B harassment take of the Rice's whale. For comparison, Figure 6–4 shows the harassment zones of mission-day category A at the center of the proposed East LIA. As shown, a small portion of the behavioral disturbance zone (27.9 km) encompasses a grid of low modeled density, with grids of higher density being farther to the southwest.

Certain missions could have a PTS impact if they were to be conducted farther to the southwest within the LIAs closer to Rice's whale habitat, as defined by the 100-m isobath. The modeled threshold distances were used to determine the locations in the existing LIA and proposed East LIA where each mission-day category would cause the onset of PTS, measured as a setback from the 100-m isobath. At this setback location, the mission would avoid PTS and result only in non-injury Level B harassment, if one or more Rice's whales were in the affected habitat. The setback distances are based on the longest distance predicted by the dBSea model for a cumulative SEL of 168 dB within the mitigation zone; the predicted average cumulative SEL is used as the basis of effect for estimating takes. The setback distances determined for the mission-day categories are presented in Table 33 and are shown for the existing LIA and proposed East LIA on Figures 6–5 and 6–6, respectively.

TABLE 33—SETBACKS TO PREVENT PERMANENT THRESHOLD SHIFT IMPACTS TO THE RICE'S WHALE

User group	Mission-day category	NEWi (lb)/(kg)	Setback from 100-meter isobath (km)/(nmi)
53 WEG	A	2,413.6 (1094.6)	7.323 (3.95)
	B	2,029.9 (920.6)	6.659 (5.59)
	C	1,376.2 (624.1)	5.277 (2.84)
	D	836.22 (379.2)	3.557 (1.92)
	E	934.9 (423.9)	3.192 (1.72)
AFSOC	F	584.6 (265.1)	3.169 (1.71)
	I	29.6 (13.4)	0.394 (0.21)
96 OG	J	946.8 (429.4	5.188 (2.80
	K	350 (158.7)	1.338 (0.72)
	L	627.1 (284.3)	3.315 (1.78)
	M	324.9 (147.3)	2.017 (1.08)
	N	238.1 (107.9)	1.815 (0.98)
	O	104.6 (47.5)	0.734 (0.39)
	P	130.8 (59.3)	0.787 (0.42)
	Q	94.4 (42.8)	0.667 (0.36)
	R	37.1 (16.8)	0.368 (0.19)
NAVSCOLEOD	S	130 (58.9)	1.042 (0.56)

Locating a given mission in the LIA at its respective setback distance would represent the maximum Level B harassment scenario for the mission. If all the missions were conducted at their respective setbacks, the resulting takes would represent the maximum Level B harassment takes that would result for all mission-day categories except for gunnery missions. This is not a realistic scenario; however, it is analyzed to provide a worst-case estimate of takes. The takes under this scenario were calculated using the NOAA model (2022) model as described for the GRATV Location scenario. Figure 6–7 shows mission-day category A conducted at its maximum Level B setback location (7.23 km). Under this scenario, the TTS and behavioral disturbance mitigation zones extend farther into Rice's whale habitat. However, the modeled densities within affected areas are still relatively small. PTS impacts are avoided entirely. The PTS mitigation zone is slightly offset from the 100-m isobath because the setback is based on the longest distance predicted by the dBSea model, whereas the mitigation zones shown are based on the average distance predicted by the model. The take calculations for the maximum Level B harassment scenario resulted in a total of 0.49 annual TTS takes and 1.19 annual behavioral disturbance takes as shown in Table 34. These are the maximum number of takes estimated to potentially result from detonations in the existing LIA. These takes are overestimates because a considerable portion of all missions in the LIA are expected to continue to be conducted at or near the currently used GRATV anchoring site. These takes would not be exceeded because all missions will be conducted behind their identified setbacks as a new mitigation measure to prevent injury to the Rice's whale. Take calculations for the maximum Level B harassment scenario in the East LIA resulted in 0.63 annual TTS takes and 2.33 annual behavioral disturbance takes (Table 34). However, if we assume that 90 percent of the mission would occur in existing LIA and 10 percent would occur in the proposed East LIA as was done for dolphins, the estimated result is 0.55 annual TTS (0.49 + 0.06) and 1.42 annual behavioral (1.19 + 0.23) takes.

The take calculations were performed using the NOAA (2022) density model for both day and night gunnery missions. As indicated on Figures 6–8 and 6–9 in the application, the modeled Rice's whale densities in the TTS and behavioral disturbance zones are small, and reflect a higher occurrence probability for the Rice's whale farther to the southwest. The take calculations estimated 0.003 TTS takes and 0.012 behavioral disturbance takes per daytime gunnery mission and 0.0006 TTS takes and 0.002 behavioral disturbance takes per nighttime gunnery mission. The resulting annual takes for all proposed 25 daytime gunnery missions are 0.08 TTS take and 0.30 behavioral disturbance take, and the resulting annual takes for all 45 proposed nighttime gunnery missions are 0.03 TTS take and 0.09 behavioral disturbance take (Table 34). This is a conservative estimation of Level B harassment takes because all gunnery missions would not be conducted precisely 500 m landward of the 100-m isobath as assumed under this worst-case take scenario. This represents a mitigation measure described later in the Proposed Mitigation section. Based on a review of gunnery mission locations, most gunnery missions during the last 5 years have occurred in waters shallower than 100 m.

The annual maximum Level B harassment takes estimated for daytime gunnery missions (mission-day G) and nighttime gunnery missions (mission-day category H) are combined with the annual maximum Level B harassment takes estimated for the other mission-day categories to determine the total takes of the Rice's whale from all EGTTR operations during the next mission period. The annual takes of the Rice's whale requested under the USAF's proposed activities are 0.61 TTS takes conservatively and 1.69 behavioral takes as presented in Table 34. However, the average group size for Bryde's whales found in the northeast Gulf of Mexico is two animals (Maze-Foley and Mullin 2006). NMFS will assume that each exposure would result in take of two animals. Therefore, NMFS is proposing to authorize Level B harassment in the form of two takes by TTS and four takes by behavioral disturbance annually for EGTTR operations during the next 7-year mission period.

Note that the requested takes are likely overestimates because they represent the maximum Level B harassment scenario for all missions. These takes are also likely overestimates of actual exposure based on the conservative assumption that all proposed detonations would occur at or just below the water surface instead of a portion occurring upon impact with targets.

TABLE 34—CALCULATED ANNUAL EXPOSURES OF THE RICE'S WHALE UNDER THE USAF'S PROPOSED ACTIVITIES

		Level A harassment		Level B harassment	
		Injury[a]	PTS	TTS	Behavioral
Missions at Existing LIA	0	0	0	0.49	1.19
Missions at East LIA	0	0	0	0.63	2.33
90 Percent of Existing LIA Missions	0	0	0	0.441	1.071
10 Percent of East LIA Missions	0	0	0	0.063	0.233
Daytime Gunnery Missions	0	0	0	0.08	0.30
Nighttime Gunnery Missions	0	0	0	0.03	0.09
Total	0	0	0	0.61	1.69
Total Takes Requested	0	0	0	*2*[b]	*4*[b]

[a] Slight lung and/or gastrointestinal tract injury.
[b] Based on average group size (Maze-Foley and Mullin (2006).

For the USAF's proposed activities in the EGTTR, Table 35 summarizes the take NMFS proposes, to authorize, including the maximum annual, 7-year total amount, and type of Level A harassment and Level B harassment that NMFS anticipates is reasonably likely to occur by species and stock. Note that take by Level B harassment includes both behavioral disturbance and TTS. No mortality or non-auditory injury is anticipated or proposed, as described previously.

TABLE 35—PROPOSED ANNUAL AND SEVEN-YEAR TOTAL SPECIES-SPECIFIC TAKE AUTHORIZATION FROM EXPLOSIVES FOR ALL TRAINING AND TESTING ACTIVITIES IN THE EGTTR

Common name	Stock/DPS	Proposed annual take			Proposed 7-year total take		
		Level A	Level B		Level A	Level B	
		PTS	TTS	Behavioral disturbance	PTS	TTS	Behavioral disturbance
Common bottlenose dolphin.	Northern Gulf of Mexico Continental Shelf.	9	319	817	63	2,233	5,719
Atlantic spotted dolphin.	Northern Gulf of Mexico.	1	39	100	7	273	700
Rice's whale *	NSD	0	2	4	0	14	28

* ESA-listed species.
Note: NSD = No stock designation.

Proposed Mitigation

Under section 101(a)(5)(A) of the MMPA, NMFS must set forth the permissible methods of taking pursuant to the activity, and other means of effecting the least practicable adverse impact on the species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of the species or stocks for subsistence uses (latter not applicable for this action). NMFS regulations require applicants for incidental take authorizations to include information about the availability and feasibility (economic and technological) of equipment, methods, and manner of conducting the activity or other means of effecting the least practicable adverse impact upon the affected species or stocks, and their habitat (50 CFR 216.104(a)(11)). The NDAA for FY 2004 amended the MMPA as it relates to military readiness activities and the incidental take authorization process such that ''least practicable impact'' shall include consideration of personnel safety, practicality of implementation, and impact on the effectiveness of the military readiness activity.

In evaluating how mitigation may or may not be appropriate to ensure the least practicable adverse impact on species or stocks and their habitat, as well as subsistence uses where applicable, NMFS considers two primary factors:

(1) The manner in which, and the degree to which, the successful implementation of the measure(s) is expected to reduce impacts to marine mammals, marine mammal species or stocks, and their habitat. This considers the nature of the potential adverse impact being mitigated (likelihood, scope, range). It further considers the likelihood that the measure will be effective if implemented (probability of accomplishing the mitigating result if implemented as planned), the likelihood of effective implementation (probability implemented as planned), and

(2) The practicability of the measures for applicant implementation, which may consider such things as cost, impact on operations, and, in the case of a military readiness activity, personnel safety, practicality of implementation, and impact on the effectiveness of the military readiness activity.

Assessment of Mitigation Measures for the EGTTR

Section 216.104(a)(11) of NMFS' implementing regulations requires an applicant for incidental take authorization to include in its request, among other things, ''the availability and feasibility (economic and technological) of equipment, methods, and manner of conducting such activity or other means of effecting the least practicable adverse impact upon the affected species or stocks, their habitat, and [where applicable] on their availability for subsistence uses, paying particular attention to rookeries, mating grounds, and areas of similar significance.'' Thus, NMFS' analysis of the sufficiency and appropriateness of an applicant's measures under the least practicable adverse impact standard will always begin with evaluation of the mitigation measures presented in the application.

NMFS has fully reviewed the specified activities and the mitigation measures included in the USAF's rulemaking/LOA application and the EGTTR 2022 REA to determine if the mitigation measures would result in the least practicable adverse impact on marine mammals and their habitat. The USAF would be required to implement the mitigation measures identified in this rule for the full 7 years to avoid or reduce potential impacts from proposed training and testing activities.

Monitoring and mitigation measures for protected species are implemented for all EGTTR missions that involve the use of live or inert munitions (*i.e.,* missiles, bombs, and gun ammunition). Mitigation includes operational measures such as pre-mission monitoring, postponement, relocation, or cancellation of operations, to minimize the exposures of all marine mammals to pressure waves and acoustic impacts as well as vessel strike avoidance measures to minimize the potential for ship strikes; geographic mitigation measures, such as setbacks and areas where mission activity is prohibited, to minimize impacts in areas used by Rice's whales; gunnery-specific mitigation measures which dictate how and where gunnery operations occur; and environmental mitigation which describes when missions may occur and under what weather conditions. These measures are supported by the use of PSOs from various platforms, and sea state restrictions. Identification and observation of appropriate mitigation zones (*i.e.* double the threshold distance at which Level A harassment exposures in the form of PTS could occur) and monitoring zones (*i.e.,* area between the mitigation zone and the human safety zone perimeter) are important components of an effective mitigation plan.

Operational Measures

Pre-Mission Surveys

Pre-mission surveys for protected species are conducted prior to every mission (*i.e.,* missiles, bombs, and gunnery) in order to verify that the mitigation zone is free of visually detectable marine mammals and to evaluate the mission site for environmental suitability. USAF range-clearing vessels and protected species survey vessels holding PSOs will be onsite approximately 90 minutes prior to the mission. The duration of pre-mission surveys depends on the area required to be surveyed, the type of survey platforms used (*i.e.,* vessels, aircraft, video), and any potential lapse in time between the end of the surveys and the beginning of the mission. Depending on the mission category, vessel-based PSOs will survey the mitigation and/or monitoring zones for marine mammals. Surveys of the mitigation zone will continue for approximately 30 minutes or until the entire mitigation zone has been adequately surveyed, whichever comes first. The mitigation zone survey area is defined by the area covered by double the dolphin Level A harassment (PTS) threshold distances predicted for the mission-day categories as presented previously in Table 27 and Table 28. Each user group will identify the mission-day category that best corresponds to its actual mission based on the energy that would be released. The user group will estimate the NEWi of the actual mission to identify which mission-day category to use. The energy of the actual mission will be less than the energy of the mission-day category in terms of total NEWi and largest single munition NEWi to ensure that the energy and effects of the actual mission will not exceed the energy and effects estimated for the corresponding mission-day category. For any live mission other than gunnery missions, the pre-mission survey mitigation zone will extend out to, at a minimum, double the Level A harassment PTS threshold distance that applies to both dolphin species. Depending on the mission-day category that best corresponds to the actual mission, the distance from the detonation point to the mitigation zone (*i.e.,* double the Level A harassment (PTS) threshold distance) could vary between approximately 1,356 m for mission-day category J and 272 m for mission-day category I (Table 36). Surveying twice the dolphin Level A harassment (PTS) threshold distance provides a buffer area for when there is a lapse between the time when the survey ends and the time when the species observers reach the perimeter of the human safety zone before the start of the mission. Surveying this additional buffer area ensures that dolphins are not within the PTS zone at the start of the mission. Missions involving air-to-surface gunnery operations must conduct surveys of even larger areas based on previously established safety profiles and the ability to conduct aerial surveys of large areas from the types of aircraft used for these missions.

The monitoring zone for non-gunnery missions is the area between the mitigation zone and the human safety zone and is not standardized, since the size of the human safety zone is not standardized. The safety zone will be determined per each mission by the Eglin AFB Test Wing Safety Office based on the munition and parameters of its release (to include altitude, pitch, heading, and airspeed). Additionally, based on the operational altitudes of gunnery firing, and the fact that the only monitoring during the mission will be coming from onboard the aircraft conducting the live firing, the monitoring zone for gunnery missions will be a smaller area than the mitigation zone and will be based on the field of view from the aircraft. These observable areas will at least be double the Level A harassment (PTS) threshold distance for the mission-day categories G, H, and Q (gunnery-only mission-day categories) as shown in Table 36.

TABLE 36—MITIGATION AND MONITORING ZONE SIZES FOR LIVE MISSIONS IN THE EXISTING LIVE IMPACT AREA (m)

Mission-day category	Mitigation zone (m)/(ft)	Monitoring zone
A	1,130 (3,706.4)	TBD
B	1,170 (3,837.6)	TBD
C	1,090 (3,575.2)	TBD
D	950 (3,116)	TBD
E	950 (3,116)	TBD
F	710 (2,328)	TBD
G	[1] 9,260 (30.372.8)	550 (1,804)
H	[2] 9,260 (30,372.8)	450 (1,476)
I	280 (918.4)	TBD
J	1,360 (4,460.8)	TBD
K	520 (1,705.6)	TBD
L	700 (2,296)	TBD
M	580 (1,640)	TBD
N	500 (1,640)	TBD
O	370 (1,213.6)	TBD
P	410 (1,344.8)	TBD
Q	[3] 9,260 (30,372.6)	490 (1,607)
R	[4] 280 (918.4) and 9,260 (30372.8)	TBD
S	860 (2,820.8)	TBD

[1] For G, double the Level A harassment threshold distance (PTS) is 0.548 km, but G is AC–130 gunnery mission with an inherent mitigation zone of 9.260 km/5 NMI.

[2] For H, double the Level A harassment (PTS) threshold distance is 0.450 km, but H is AC–130 gunnery mission with an inherent mitigation zone of 9.260 km/5 nmi.

[3] For Q, double the Level A harassment (PTS) threshold distance is 0.494 km, but Q is AC–130 gunnery mission with an inherent mitigation zone of 9.260 km/5 nmi.

[4] R has components of both gunnery and inert small diameter bomb. Double the Level A harassment (PTS) threshold distance is 0.278 km, however, for gunnery component the inherent mitigation zone would be 9.260 km.

[5] The Monitoring Zone for non-gunnery missions is the area between the Mitigation Zone and the Human Safety Zone and is not standardized, as the Human Safety Zone is not standardized. HSZ is determined per each mission by the Test Wing Safety Office based on the munition and parameters of its release (to include altitude, pitch, heading, and airspeed).

[6] Based on the operational altitudes of gunnery firing, and the only monitoring during mission coming from onboard the aircraft conducting the firing, the Monitoring Zone for gunnery missions will be a smaller area than the Mitigation Zone and be based on the field of view from the aircraft. These observable areas will at least be double the Level A harassment (PTS) threshold distance for the mission-day categories G, H, and Q (gunnery-only mission-day categories).

For non-gunnery inert missions, the mitigation zone is based on double the Level A harassment (PTS) threshold distance as shown in Table 37. The monitoring zone is the area between the mitigation zone and the human safety zone which is not standardized. The safety zone is determined per each mission by the Test Wing Safety Office based on the munition and parameters of its release including altitude, pitch, heading, and airspeed.

TABLE 37—PRE-MISSION MITIGATION AND MONITORING ZONES (IN m) FOR INERT MISSIONS IMPACT AREA

Inert impact class (lb TNTeq)	Mitigation zone m/(ft)	Monitoring zone [1]
2	160 (524)	TBD
1	126 (413)	TBD
0.5	100 (328)	TBD
0.15	68 (223)	TBD

[1] The Monitoring Zone for non-gunnery missions is the area between the Mitigation Zone and the Human Safety Zone and is not standardized, as the Human Safety Zone is not standardized. HSZ is determined per each mission by the Test Wing Safety Office based on the munition and parameters of its release (to include altitude, pitch, heading, and airspeed).

Mission postponement, relocation, or cancellation—Mission postponement, relocation, or cancellation would be required when marine mammals are observed within the mitigation or monitoring zone depending on the mission type to minimize the potential for marine mammals to be exposed to injurious levels of pressure and noise energy from live detonations. If one or more marine mammal species other than the two dolphin species for which take is proposed to be authorized are detected in either the mitigation zone or the monitoring zone, then mission activities will be cancelled for the remainder of the day. The mission must be postponed, relocated or cancelled if either of the two dolphin species are visually detected in the mitigation zone during the pre-mission survey. If members of the two dolphin species for which authorized take has been proposed are observed in the monitoring zone while vessels are exiting the human safety zone and the PSO has determined the animals are heading towards the mitigation zone, then missions will be postponed, relocated, or cancelled, based on mission-specific test and environmental parameters. Postponement would continue until the animals are confirmed to be outside of the mitigation zone on a heading away from the targets or are not seen again for 30 minutes and are presumed to be outside the mitigation zone. If large schools of fish or large flocks of birds are observed feeding at the surface are observed within the mitigation zone, postponement would continue until these potential indicators of marine mammal presence are confirmed to be outside the mitigation zone.

Vessel strike avoidance measures—Vessel strike avoidance measures as previously advised by NMFS Southeast Regional Office must be employed by the USAF to minimize the potential for ship strikes. These measures include staying at least 150 ft (46 m) away from protected species and 300 ft (92 m) away from whales. Additional action area measures will require vessels to stay 500 m away from the Rice's whale. If a baleen whale cannot be positively identified to species level then it must be assumed to be a Rice's whale and 500 m separation distance must be maintained. Vessels must avoid transit in the Core Distribution Area (CDA) and within the 100–400 m isobath zone outside the CDA. If transit in these areas is unavoidable, vessels must not exceed 10 knots and transit at night is prohibited. An exception to the speed restriction is for instances required for human safety, such as when members of the public need to be intercepted to secure the human safety zone, or when the safety of a vessel operations crew could be compromised.

Geographic Mitigation Measures

Setbacks From Rice's Whale Habitat

New mitigation measures that were not required as part of the existing LOA have been proposed to reduce impacts to the Rice's whale. These measures would require that given mission-day activities could only occur in areas that are exterior to and set back some specified distance from Rice's whale habitat boundaries as well as areas where mission activities are prohibited. These are described below.

As a mitigation measure to prevent impacts to cetacean species known to occur in deeper portions of the Gulf of Mexico, such as the federally endangered sperm whale, all gunnery missions have been located landward of the 200-m isobath, which is generally considered to be the shelf break in the Gulf of Mexico. Most missions conducted over the last 5 years under the existing LOA have occurred in waters less than 100 m in depth. While implementing this measure would prevent impacts to most marine mammal species in the Gulf, it may not provide full protection to the Rice's whale, which has been documented to occur in waters as shallow as 117 m, although the majority of sightings have occurred in waters deeper than 200 m.

To prevent any PTS impacts to the Rice's whale from gunnery operations, NMFS has proposed that all gunnery missions would be conducted at least 500 m landward of the 100-m isobath instead of landward of the 200-m isobath as was originally proposed by the USAF. This setback distance from the 100-m isobath is based on the modeled PTS threshold distance for daytime gunnery missions (mission-day G) of 494 m (Table 29). At this setback distance, potential PTS effects from daytime gunnery missions would not extend into Rice's whale habitat, as defined by the 100-m isobath. The PTS Level A harassment isopleth of a nighttime gunnery mission, which is 401 m in radius, is contained farther landward of the habitat boundary.

Another mitigation measure to prevent any PTS (or more severe) impacts to the Rice's whale will restrict the use of all live munitions in the western part of the existing LIA and proposed East LIA based on the setbacks from the 100-m isobaths. The setback distances determined for the mission-day categories are presented in Table 33 and are shown for the existing LIA and proposed East LIA on Figures 6–5 and 6–6, respectively. For example, the subsurface detonation of a GBU–10, GBU–24, or GBU–31, each of which have a NEW of 945 lb (428.5 kg), would represent the most powerful single detonation that would be conducted under the USAF's proposed activities. Such a detonation would correspond to mission-day category J. To prevent any PTS impacts to the Rice's whale, a mission that would involve such a single subsurface detonation would be conducted in a portion of the LIA that is behind the setback identified for mission-day category J.

Likewise, a mission that would involve multiple detonations that have a total cumulative NEWi comparable to that of mission-day category A would be conducted behind the setback identified for mission-day category A. Each user group will use the mission-day categories and corresponding setback distances to determine the setback distance that is appropriate for their actual mission. The user group will estimate the NEWi of the actual mission to identify which mission-day category and associated setback to use. The energy of the actual mission must be less than the energy of the mission-day category in terms of total NEWi and largest single-munition NEWi to ensure that the energy and effects of the actual mission will not exceed the energy and effects estimated for the corresponding mission-day category.

Rice's Whale Habitat Area Prohibitions

This section identifies areas where firing of live or inert munitions is prohibited to limit impacts to Rice's whales. The USAF will prohibit the use of live or inert munitions in Rice's whale habitat during the effective period for the proposed LOA. Under this new mitigation measure, all munitions use will be prohibited between the 100-m and 400-m isobaths which represents the area where most Rice's whale detections have occurred. Live HACMs would be permitted to be fired into the existing LIA or East LIA but must have a setback of 1.338 km from the 100-m isobath while inert HACMs could be fired into portions of the EGTTR outside the LIAs. However, they would need to be outside the area between the 100-m and 400-m isobaths.

Overall, the USAF has agreed to procedural mitigation measures that would reduce the probability and/or severity of impacts expected to result from acute exposure to live explosives and inert munitions and impacts to marine mammal habitat.

Gunnery-Specific Mitigation

Additional mitigation measures are applicable only to gunnery missions. The USAF must use 105 mm Training Rounds (TR; NEW of 0.35 lb (0.16 kg)) for nighttime missions. These rounds contain less explosive material content than the 105 mm Full Up (FU; NEW of 4.7 lb (2.16 kg)) rounds that are used during the day. Therefore, the harassment zones associates with the 105 mm TR are smaller and can be more effectively monitored compared to the daytime zones. Ramp-up procedures will also be required for day and night gunnery missions which must begin firing with the smallest round and proceed to increasingly larger rounds. The purpose of this measure is to expose the marine environment to steadily increasing noise levels with the intent that marine animals will move away from the area before noise levels increase. During each gunnery training mission, gun firing can last up to 90 minutes but typically lasts approximately 30 minutes. Live firing is continuous, with pauses usually lasting well under 1 minute and rarely up to 5 minutes. Aircrews must reinitiate protected species surveys if gunnery firing pauses last longer than 10 minutes.

Protected species monitoring procedures for CV–22 gunnery training are similar to those described for AC–130 gunnery training, except that CV–22 aircraft typically operate at much lower altitudes than AC–130 gunships. If protected marine species are detected during pre-mission surveys or during the mission, operations will be immediately halted until the monitoring zone is clear of all animals, or the mission will be relocated to another target area. If the mission is relocated, the pre-mission survey procedures will be repeated in the new area. If multiple gunnery missions are conducted during the same flight, marine species monitoring will be conducted separately for each mission. Following each mission, aircrews will conduct a post-mission survey beginning at the operational altitude and continuing through an orbiting descent to the designated monitoring altitude.

All gunnery missions must monitor a set distance depending on the aircraft type as show in Table 38. Pre-mission aerial surveys conducted by gunnery aircrews in AC–130s extend out 5 nmi (9,260 m) while CV–22 aircraft would have a monitoring range of 3 nmi (5,556 m). The modeled distances for behavioral disturbance for gunnery daytime and nighttime missions are 12.9 km and 7.1 km, respectively. The behavioral disturbance zone is smaller at night due to the required use of less impactful training rounds (105-mm TR). Therefore, the aircrews are able to survey all of the behavioral disturbance for a nighttime gunnery mission but not for a daytime gunnery mission. The size of the monitoring areas are based on the monitoring and operational altitudes of each aircraft as well as previously established aircraft safety profiles.

TABLE 38—MONITORING AREAS AND ALTITUDES FOR GUNNERY MISSIONS

Aircraft	Gunnery round	Monitoring area	Monitoring altitude	Operational altitude
AC–30 Gunship	30 mm; 105 mm (FU and TR).	5 nmi (9,260 m)	6,000 feet (1,828 m)	15,000 to 20,000 feet (4572–6096 m).
CV–22 Osprey	.50 caliber	3 nmi (5,556 m)	1,000 feet (305 m)	1,000 feet (305 m).

Other than gunnery training, HACM tests are the only other EGTTR missions currently proposed to be conducted at nighttime during the 2023–2030 period. HACM tests and any other missions that are actually conducted at nighttime during the mission period will be required to be supported by AC–130 aircraft with night-vision instrumentation or other platforms with comparable nighttime monitoring capabilities. For live HACM missions, the pre-mission survey area will extend out to, at a minimum, double the Level A harassment (PTS) threshold distance that applies to both dolphin species for a HACM test. A HACM test would correspond to mission-day category K, which is estimated to have a PTS threshold distance of 0.258 km. Therefore, the pre-mission survey for a HACM test would extend out to 0.52 km, at a minimum.

Environmental Conditions

Sea State Conditions—Appropriate sea state conditions must exist for protected species monitoring to be effective. Wind speed and the associated roughness of the sea surface are key factors that influence the efficacy of PSO monitoring. Strong winds increase wave height and create whitecaps, both of which limit a PSO's ability to visually detect marine species at or near the surface. The sea state scale used for EGTTR pre-mission protected species surveys is presented in Table 39. All missions will be postponed or rescheduled if conditions exceed sea state 4, which is defined as moderate breeze, breaking crests, numerous white caps, wind speed of 11 to 16 knots, and wave height of 3.3 to 6 ft (1.0 to 1.8 m). PSOs will determine whether sea conditions are suitable for protective species monitoring.

TABLE 39—SEA STATE SCALE USED FOR EGTTR PRE-MISSION PROTECTED SPECIES SURVEYS

Sea state number	Sea conditions
0	Flat, calm, no waves or ripples.
1	Light air, winds 1 to 2 knots; wave height to 1 foot; ripples without crests.
2	Light breeze, winds 3 to 6 knots; wave height 1 to 2 feet; small wavelets, crests not breaking.
3	Gentle breeze, winds 7 to 10 knots; wave height 2 to 3.5 feet; large wavelets, scattered whitecaps.
4	Moderate breeze, winds 11 to 16 knots; wave height 3.5 to 6 feet; breaking crests, numerous whitecaps.
5	Strong breeze, winds 17 to 21 knots; wave height 6 to 10 feet; large waves, spray possible.

Daylight Restrictions—Daylight and visibility restrictions are also implemented to ensure the effectiveness of protected species monitoring. All live missions except for nighttime gunnery and hypersonic weapon missions will occur no earlier than 2 hours after sunrise and no later than 2 hours before sunset to ensure adequate daylight for pre- and post-mission monitoring.

Mitigation Conclusions

NMFS has carefully evaluated the USAF's proposed mitigation measures. Our evaluation of potential measures included consideration of the following factors in relation to one another: the manner in which, and the degree to which, the successful implementation of the mitigation measures is expected to reduce the likelihood and/or magnitude of adverse impacts to marine mammal species and their habitat; the proven or likely efficacy of the measures; and the practicability of the measures for applicant implementation, including consideration of personnel safety, practicality of implementation, and impact on the effectiveness of the military readiness activity.

Based on our evaluation of the USAF's proposed measures including pre-mission surveys; mission postponements or cancellations if animals are observed in the mitigation or monitoring zones; Rice's whale setbacks; Rice's whale habitat prohibitions; gunnery-specific measures; and environmental measures, NMFS has preliminarily determined that these proposed mitigation measures are the appropriate means of effecting the least practicable adverse impact on the marine mammal species and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and considering specifically personnel safety, practicality of implementation, and impact on the effectiveness of the military readiness activity. Additionally, an adaptive management provision ensures that mitigation is regularly assessed and provides a mechanism to improve the mitigation, based on the factors above, through modification as appropriate.

The proposed rule comment period provides the public an opportunity to submit recommendations, views, and/or concerns regarding the USAF's activities and the proposed mitigation measures. While NMFS has preliminarily determined that the USAF's proposed mitigation measures would effect the least practicable adverse impact on the affected species and their habitat, NMFS will consider all public comments to help inform our final determination. Consequently, the proposed mitigation measures may be refined, modified, removed, or added to prior to the issuance of the final rule, based on public comments received, and, as appropriate, analysis of additional potential mitigation measures.

Proposed Monitoring and Reporting

In order to issue an IHA for an activity, section 101(a)(5)(A) of the MMPA states that NMFS must set forth requirements pertaining to the monitoring and reporting of such taking. The MMPA implementing regulations at 50 CFR 216.104(a)(13) indicate that requests for authorizations must include the suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species and of the level of taking or impacts on populations of marine mammals that are expected to be present while conducting the activities. Effective reporting is critical both to compliance as well as to ensuring that the most value is obtained from the required monitoring.

Monitoring and reporting requirements prescribed by NMFS should contribute to improved understanding of one or more of the following:

- Occurrence of marine mammal species or stocks in the area in which take is anticipated (*e.g.,* presence, abundance, distribution, density);
- Nature, scope, or context of likely marine mammal exposure to potential stressors/impacts (individual or cumulative, acute or chronic), through better understanding of: (1) action or environment (*e.g.,* source characterization, propagation, ambient noise); (2) affected species (*e.g.,* life history, dive patterns); (3) co-occurrence of marine mammal species with the activity; or (4) biological or behavioral context of exposure (*e.g.,* age, calving or feeding areas);
- Individual marine mammal responses (behavioral or physiological) to acoustic stressors (acute, chronic, or cumulative), other stressors, or cumulative impacts from multiple stressors;
- How anticipated responses to stressors impact either: (1) long-term fitness and survival of individual marine mammals; or (2) populations, species, or stocks;
- Effects on marine mammal habitat (*e.g.,* marine mammal prey species, acoustic habitat, or other important physical components of marine mammal habitat); and,
- Mitigation and monitoring effectiveness.

The USAF will require training for all PSOs who will utilize vessel-based, aerial-based, video-based platforms or some combination of these approaches depending on the requirements of the mission type as shown in Table 40. Specific PSO training requirements are described below.

PSO Training

All personnel who conduct protected species monitoring are required to complete Eglin AFB's Marine Species Observer Training Course, which was developed in consultation with NMFS. The required PSO training covers applicable environmental laws and regulations, consequences of non-compliance, PSO roles and responsibilities, photographs and descriptions of protected species and indicators, survey methods, monitoring requirements, and reporting procedures. Any person who will serve as a PSO for a particular mission must have completed the training within a year prior to the mission. For missions that require multiple survey platforms to cover a large area, a Lead Biologist is designated to lead the monitoring and coordinate sighting information with the Eglin AFB Test Director (Test Director) or the Eglin AFB Safety Officer (Safety Officer).

Note that all three monitoring platforms described in Table 40 are not needed for all missions. The use of the platforms for a given mission are evaluated based on mission logistics, public safety, and the effectiveness of the platform to monitor for protected species. Vessel and video monitoring are almost always used but aerial monitoring may not be used for some missions because it is not needed in addition to the vessel-based surveys that are conducted. Aerial monitoring is considered to be supplemental to vessel-based monitoring and is used only when needed, for example if not enough vessels are available or to provide coverage in areas farther offshore where using vessels may be more logistically difficult. Note that at least one of the monitoring platforms described in Table 40 must be used for every mission. In most instances, two or three of the monitoring platforms will be employed.

TABLE 40—MONITORING OPTIONS REQUIRED TO THE EXTENT PRACTICABLE AND LOCATIONS FOR LIVE AIR-TO-SURFACE MISSION PROPONENTS OPERATING IN THE EGTTR

User group	Mission-day category	Munition type	Monitoring platform			Location		
			Aerial-based	Vessel-based	Video-based	LIA	East LIA	Outside LIAs
53 WEG	A	Missile	x	x	x	x	x	
	B	Missile, Bomb	x	x	x	x	x	
	C	Missile	x	x	x	x	x	
	D	Missile	x	x	x	x	x	
	E	Missile, Bomb, Rocket, Gun Ammunition.	x	x	x	x	x	
AFSOC	F	Bomb	x	x	x	x	x	

TABLE 40—MONITORING OPTIONS REQUIRED TO THE EXTENT PRACTICABLE AND LOCATIONS FOR LIVE AIR-TO-SURFACE MISSION PROPONENTS OPERATING IN THE EGTTR—Continued

User group	Mission-day category	Munition type	Monitoring platform			Location		
			Aerial-based	Vessel-based	Video-based	LIA	East LIA	Outside LIAs
	G	Gun Ammunition	x			x	x	x
	H	Gun Ammunition	x			x	x	x
	I	Rockets	x	x	x	x	x	
96 OG	J	Bomb	x	x	x	x	x	
	K	Hypersonic	x	x	x	x	x	
	L	Missile, Bomb	x	x	x	x	x	
	M	Bomb	x	x	x	x	x	
	N	Missile, Bomb	x	x	x	x	x	
	O	Missile	x	x	x	x	x	
	P	Missile	x	x	x	x	x	
	Q	Gun Ammunition	x			x	x	
	R	Bomb, Gun Ammunition	x			x	x	
NAVSCOLOED	S	Charge		x		x	x	x

Monitoring Platforms

Vessel-Based Monitoring

Pre-mission surveys conducted from vessels will typically begin at sunrise. Vessel-based monitoring is required for all mission-day categories except for gunnery missions. Trained marine species PSOs will use dedicated vessels to monitor for protected marine species and potential indicators during the pre-mission surveys. For missions that require multiple vessels to cover a large survey area, a Lead Biologist will be designated to coordinate all survey efforts, compile sighting information from the other vessels, serve as the point of contact between the survey vessels and Tower Control, and provide final recommendations to the Safety Officer/Test Director on the suitability of the mission site based on environmental conditions and survey results.

Survey vessels will run predetermined line transects, or survey routes, that will provide sufficient coverage of the survey area. Monitoring will be conducted from the highest point feasible on the vessels. There will be at least two PSOs on each vessel, and they will each use professional-grade binoculars.

All sighting information from pre-mission surveys will be communicated to the Lead Biologist on a predetermined radio channel to reduce overall radio chatter and potential confusion. After compiling all the sighting information from the other survey vessels, the Lead Biologist will inform Tower Control if the survey area is clear or not clear of protected species. If the area is not clear, the Lead Biologist will provide recommendations on whether the mission should be postponed or cancelled. For example, a mission postponement would be recommended if a protected species is in the mitigation zone but appears to be heading away from the mission area. The postponement would continue until the Lead Biologist has confirmed that the animals are no longer in the mitigation zone and are swimming away from the range. A mission cancellation could be recommended if one or more protected species are sighted in the mitigation zones and there is no indication that they would leave the area within a reasonable time frame. Tower Control will relay the Lead Biologist's recommendation to the Safety Officer. The Safety Officer and Test Director will collaborate regarding range conditions based on the information provided. Ultimately, the Safety Officer will have final authority on decisions regarding postponements and cancellations of missions.

Human Safety Zone Monitoring

Established range clearance procedures are followed during all EGTTR missions for public safety. Prior to each mission, a human safety zone appropriate for the mission is established around the target area. The size of the human safety zone varies depending on the munition type and delivery method. A composite safety zone is often developed for missions that involve multiple munition types and delivery methods. A typical composite safety zone is octagon-shaped to make it easier to monitor by range clearing boats and easier to interpret by the public when it is overlaid on maps with latitude and longitude coordinates. The perimeter of a composite safety zone may extend out to approximately 15 miles (13 nmi) from the center of the zone and may be monitored by up to 25 range-clearing boats to ensure it is free of any non-participating vessels before and during the mission.

Air Force Support Vessels

USAF support vessels will be operated by a combination of USAF and civil service/civilian personnel responsible for mission site/target setup and range-clearing activities. For each mission, USAF personnel will be within the mission area (on boats and the GRATV) well in advance of initial munitions use, typically around sunrise. While in the mission area, they will perform a variety of tasks, such as target preparation and equipment checks, and will also observe for marine mammals and indicators when possible. Any sightings would be relayed to the Lead Biologist.

The Safety Officer, in cooperation with the CCF (Central Control Facility) and Tower Control, will coordinate and manage all range-clearing efforts and will be in direct communication with the survey vessel team, typically through the Lead Biologist. All support vessels will be in radio contact with each other and with Tower Control. The Safety Officer will monitor all radio communications, and Tower Control will relay messages between the vessels and the Safety Officer. The Safety Officer and Tower Control will also be in constant contact with the Test Director throughout the mission to convey information on range clearance and marine species surveys. Final decisions regarding mission execution, including possible mission postponement or cancellation based on marine species sightings or civilian boat traffic, will be the responsibility of the Safety Officer, with concurrence from the Test Director.

Aerial-Based Monitoring

Aircraft provide an excellent viewing platform for detecting marine mammals at or near the sea surface. Depending on the mission, the aerial survey team will consist of Eglin AFB Natural Resources

Office personnel or their designees aboard a non-mission aircraft or the mission aircrew who have completed the PSO training. The Eglin AFB Natural Resources Office has overall responsibility for implementing the natural resources management program and is the lead organization for monitoring compliance with applicable Federal, State, and local regulations. It reports to the installation command, the 96th Test Wing, via the Environmental Management Branch of the 96th Civil Engineer Group. All mission-day categories require aerial-based monitoring, assuming assets are available and when such monitoring does not interfere with testing and training parameters required by mission proponents. Note that gunnery mission aircraft must also serve as aerial-based monitoring platforms.

For non-mission aircraft, the pilot will be instructed on marine species survey techniques and will be familiar with the protected species expected to occur in the area. One PSO in the aircraft will record data and relay information on species sightings, including the species (if possible), location, direction of movement, and number of animals, to the Lead Biologist. The aerial team will also look for potential indicators of protected species presence, such as large schools of fish and large, active groups of birds. Pilots will fly the aircraft so that the entire mitigation and monitoring zones (and a buffer, if required) are monitored. Marine species sightings from the aerial survey team will be compiled by the Lead Biologist and communicated to the Test Director or Safety Officer. Monitoring by non-mission aircraft would be conducted only for certain missions, when the use of such aircraft is practicable based on other mission-related factors.

Some mission aircraft have the capability to conduct aerial surveys for marine species immediately prior to releasing munitions. Mission aircraft used to conduct aerial surveys will be operated at reasonable and safe altitudes appropriate for visually scanning the sea surface and/or using onboard instrumentation to detect protected species. The primary mission aircraft that conduct aerial surveys for marine species are the AC–130 gunship and CV–22 Osprey used for gunnery operations.

AC–130 gunnery training involves the use of 30 mm and 105 mm FU rounds during daytime and 30 mm and 105 mm TRs during nighttime. The TR variant (0.35 lb (0.15 kg) NEW) of the 105 mm HE round has less explosive material than the FU round (4.7 lb (2.13 kg) NEW). AC–130s are equipped with and required to use low-light electro-optical and infrared sensor systems that provide excellent night vision. Gunnery missions use the 105 mm TRs during nighttime missions as an additional mitigation measure for protected marine species. If a towed target is used, mission personnel will maintain the target in the center portion of the survey area to ensure gunnery impacts do not extend past the predetermined mitigation and monitoring zones. During the low-altitude orbits and climb, the aircrew will visually scan the sea surface for the presence of protected marine species. The visual survey will be conducted by the flight crew in the cockpit and personnel stationed in the tail observer bubble and starboard viewing window.

After arriving at the mission site and before initiating gun firing, the aircraft would be required to fly at least two complete orbits around the target area out to the applicable monitoring zone at a minimum safe airspeed and appropriate monitoring altitude. If no protected species or indicators are detected, the aircraft will then ascend to an operational altitude while continuing to orbit the target area as it climbs. The initial orbits typically last approximately 10 to 15 minutes. Monitoring for marine species and non-participating vessels continues throughout the mission. When aerial monitoring is conducted by aircraft, a minimum ceiling of 305 m (1,000 feet) and visibility of 5.6 km (3 nmi) are required for effective monitoring efforts and flight safety.

Infrared systems are equally effective during day or night. Nighttime missions would be conducted by AC–130s that have been upgraded recently with MX–25D sensor systems, which provide superior night-vision capabilities relative to earlier sensor systems. CV–22 training involves the use of only .50 caliber rounds, which do not contain explosive material and, therefore, do not detonate. Aircrews will conduct visual and instrumentation-based scans during the post-mission survey as described for the pre-mission survey.

Video-Based Monitoring

Video-based monitoring is conducted via transmission of live, high-definition video feeds from the GRATV at the mission site to the CCF and is required on all mission-day categories except for gunnery missions. These video feeds can be used to remotely view the mission site to evaluate environmental conditions and monitor for marine species up to the time munitions are used. There are multiple sources of video that can be streamed to multiple monitors within the CCF. A PSO from Eglin Natural Resources will monitor the live video feeds transmitted to the CCF when practicable and will report any protected marine species sightings to the Safety Officer, who will also be at the CCF. Video monitoring can mitigate the lapse in time between the end of the pre-mission survey and the beginning of the mission.

Four video cameras are typically operated on the GRATV for real-time monitoring and data collection during the mission. All cameras have a zoom capability of up to at least a 300 mm equivalent. The cameras allow video PSOs to detect an item as small as 1 square foot (0.09 square m) up to 4,000 m away.

Supplemental video monitoring must be used when practicable via additional aerial assets. Aerial assets with video monitoring capabilities include Eglin AFB's aerostat balloon and unmanned aerial vehicles (UAVs). These aerial assets support certain missions, for example by providing video of munition detonations and impacts; these assets are not used during all missions. The video feeds from these aerial assets can be used to monitor protected species; however, they would always be a supplemental form of monitoring that would be used only when available and practicable. Eglin AFB's aerostat balloon provides aerial imagery of weapon impacts and instrumentation relay. When used, it is tethered to a boat anchored near the GRATV. The balloon can be deployed to an altitude of up to 2,000 ft (607 m). It is equipped with a high-definition camera system that is remotely controlled to pivot and focus on a specific target or location within the mission site. The video feed from the camera system is transmitted to the CCF. Eglin AFB may also employ other assets such as intelligence, surveillance, and reconnaissance aircraft to provide real-time imagery or relay targeting pod videos from mission aircraft. UAVs may also be employed to provide aerial video surveillance. While each of these platforms may not be available for all missions, they typically can be used in combination with each other and with the GRATV cameras to supplement overall monitoring efforts. Even with a variety of platforms potentially available to supply video feeds to the CCF, the entirety of the mitigation and monitoring zones may not be visible for the entire duration of the mission. The targets and immediate surrounding areas will typically be in the field of view of the GRATV cameras, which will allow the PSO to detect any protected species that may enter the target area before weapon releases. The cameras also allow the PSO to readily inspect the target area for any signs that animals were injured. If a protected marine species is detected on the live video, the weapon release can be stopped almost immediately because the video camera PSO is in direct contact with Test Director and Safety Officer at the CCF.

The video camera PSO will have open lines of communication with the PSOs on vessels to facilitate real-time reporting of marine species sightings and other relevant information, such as the presence of non-participating vessels near the human safety zone. Direct radio communication will be maintained between vessels, GRATV personnel, and Tower Control throughout the mission. The Safety Officer will monitor all radio communications from the CCF, and information between the Safety Officer and support vessels will be relayed via Tower Control.

Post-Mission Monitoring

During post-mission monitoring, PSOs would survey the mission site for any dead or injured marine mammals. Vessels will move into the survey area from outside the safety zone and monitor for at least 30 minutes, concentrating on the area down current of the test site. The duration of post-mission surveys is based on the survey platforms used and any potential time lapse between the last detonation and the beginning of the post-mission survey. This lapse typically occurs when survey vessels stationed on the perimeter of the human safety zone are required to wait until the range has been declared clear before they can begin the survey. Up to 10 USAF support vessels will spend several hours in this area collecting debris from damaged targets.

All vessels will report any dead or injured marine mammals to the Lead Biologist. All marine mammal sightings during post-mission surveys are documented on report forms that are submitted to Eglin Natural Resources Office after the mission. The post-mission survey area will be the area covered in 30 minutes of observation in a direction down-current from impact site or the actual pre-mission survey area, whichever is reached first.

For gunnery missions, aircrews must conduct a post-mission surveys beginning at the operational altitude and continuing through an orbiting descent to the designated monitoring altitude. The descent will typically last approximately 3 to 5 minutes. The post-mission survey area will be the area covered in 30 minutes of observation in a direction down-current from impact site or the actual pre-mission survey area, whichever is reached first. Aircrews will conduct visual and instrumentation-based scans during the post-mission survey as described for the pre-mission survey.

As agreed upon between the USAF and NMFS, the proposed mitigation monitoring measures presented in the Proposed Mitigation section focus on the protection and management of potentially affected marine mammals. A well-designed monitoring program can provide important feedback for validating assumptions made in analyses and allow for adaptive management of marine resources.

Adaptive Management

NMFS may modify (including augment) the existing mitigation, monitoring, or reporting measures (after consulting with Eglin AFB regarding the practicability of the modifications) if doing so creates a reasonable likelihood of more effectively accomplishing the goals of the mitigation and monitoring measures for these regulations.

Possible sources of data that could contribute to the decision to modify the mitigation, monitoring, or reporting measures in an LOA include: (1) Results from Eglin AFB's acoustic monitoring study; (2) results from monitoring during previous year(s); (3) results from other marine mammal and/or sound research or studies; and (4) any information that reveals marine mammals may have been taken in a manner, extent or number not authorized by these regulations or subsequent LOAs.

If, through adaptive management, the modifications to the mitigation, monitoring, or reporting measures are substantial, NMFS will publish a notice of proposed LOA in the **Federal Register** and solicit public comment. If, however, NMFS determines that an emergency exists that poses a significant risk to the well-being of the species or stocks of marine mammals in the Gulf of Mexico, an LOA may be modified without prior notice or opportunity for public comment. Notice would be published in the **Federal Register** within 30 days of the action.

Proposed Reporting

Section 101(a)(5)(A) of the MMPA states that, in order to issue incidental take authorization for an activity, NMFS must set forth requirements pertaining to the monitoring and reporting of such taking. Effective reporting is critical both to compliance as well as to ensuring that the most value is obtained from the required monitoring.

A summary annual report of marine mammal observations and mission activities must be submitted to the NMFS Southeast Regional Office and the NMFS Office of Protected Resources 90 days after completion of mission activities each year. A final report shall be prepared and submitted within 30 days following resolution of comments on the draft report from NMFS. This annual report must include the following information:

- Date, time and location of each mission including mission-day category, general munition type, and specific munitions used;
- Complete description of the pre-mission and post-mission monitoring activities including type and location of monitoring platforms utilized (*i.e.,* vessel-, aerial or video-based);
- Summary of mitigation measures employed including postponements, relocations, or cancellations of mission activity;
- Number, species, and any other relevant information regarding marine mammals observed and estimated exposed/taken during activities;
- Description of the observed behaviors (in both presence and absence of test activities);
- Environmental conditions when observations were made, including visibility, air temperature, clouds, wind speed, and swell height and direction;
- Assessment of the implementation and effectiveness of mitigation and monitoring measures; and
- PSO observation results as provided through the use of protected species observer report forms.

A Final Comprehensive Report summarizing monitoring and mitigation activities over the 7-year LOA effective period must be submitted 90 days after the completion of mission activities at the end of Year 7.

If a dead or seriously injured marine mammal is found during post-mission monitoring, the incident must be reported to the NMFS Office of Protected Resources, NMFS Southeast Region Marine Mammal Stranding Network, and the Florida Marine Mammal Stranding Network. In the unanticipated event that any cases of marine mammal mortality are judged to result from missions in the EGTTR at any time during the period covered by the LOA, this will be reported to NMFS Office of Protected Resources and the National Marine Fisheries Service's Southeast Regional Administrator. The report must include the following information:

1. Time and date of the incident;
2. Description of the incident;
3. Environmental conditions (*e.g.,* wind speed and direction, cloud cover, and visibility);

4. Species identification or description of the animal(s) involved;
5. Fate of the animal(s); and
6. Photographs or video footage of the animal(s).

Mission activities must not resume in the EGTTR until NMFS is able to review the circumstances of the prohibited take. If it is determined that the unauthorized take was caused by mission activities, NMFS will work with the USAF to determine what measures are necessary to minimize the likelihood of further prohibited take and ensure MMPA compliance. The USAF may not resume their activities until notified by NMFS.

Past Monitoring Results in the EGTTR

Eglin AFB has submitted to NMFS annual reports that summarize the results of protected species surveys conducted for EGTTR missions. From 2010 to 2021, Eglin AFB conducted 67 gunnery missions in the EGTTR. To date, there has been no evidence that marine mammals have been impacted from gunnery operations conducted in the EGTTR. The use of instrumentation on the AC–130 and CV–22 in pre-mission surveys has proven effective to ensure the mission site is clear of protected species prior to gun firing. Monitoring altitudes during pre-mission surveys for both the AC–130 and CV–22 are much lower than 15,000 ft (4,572 m); therefore, the instrumentation on these aircraft would be even more effective at detecting marine species than indicated by photographs. From 2013 to 2020, Eglin AFB conducted 25 live missions collectively under the Maritime Strike Operations and Maritime Weapons System Evaluation Program (WSEP) Operational Testing programs in the EGTTR. From 2016–2021, Eglin AFB conducted 16 live PSW (Precision Strike Weapon) missions in the EGTTR. Protected species monitoring for these past missions was conducted using a combination of vessel-based surveys and live video monitoring from the CCF, as described. Pre-mission survey areas for Maritime WSEP and PSW missions were based on mission-day categories developed per NMFS's request to account for the accumulated energy from multiple detonations. Note that surveys conducted for the earlier Maritime Strike missions were based on thresholds determined for single detonations; however, these Maritime WSEP and PSW missions involved detonations of larger munitions. There has been no evidence of mortality, injury, or any other detectable adverse impact to any marine mammal from the Maritime Strike, Maritime WSEP, or WSEP missions conducted to date. Dolphins were sighted within the mitigation zone prior to ordnance delivery during some of these past missions. In these cases, the mission was postponed until the animals were confirmed to be outside the mitigation zone. Although monitoring during and following munitions use is limited to observable impacts within and in the vicinity of the mission area, the lack of any past evidence of any associated impacts on marine mammals is an indication that the monitoring and mitigation measures implemented for EGTTR operations are effective.

Eglin AFB submitted annual reports required under the existing LOA from 2018–2021. Although marine mammals were sighted on a number of mission days, usually during pre-and post-mission surveys, Eglin AFB concluded that no marine mammal takes occurred as a result of any mission activities from 2018–2021. The annual monitoring reports are available at: *https://www.fisheries.noaa.gov/action/incidental-take-authorization-us-air-force-testing-and-training-activities-eglin-gulf-test.*

Preliminary Analysis and Negligible Impact Determination

NMFS has defined negligible impact as an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival (*i.e.,* population-level effects) (50 CFR 216.103). An estimate of the number of takes alone is not enough information on which to base an impact determination. In considering how Level A harassment or Level B harassment factor into the negligible impact analysis, in addition to considering the number of estimated takes, NMFS considers other factors, such as the likely nature of any responses (*e.g.,* intensity, duration), the context of any responses (*e.g.,* critical reproductive time or location, migration), as well as effects on habitat, and the likely effectiveness of the mitigation. Consistent with the 1989 preamble for NMFS' implementing regulations (54 FR 40338, September 29, 1989), the impacts from other past and ongoing anthropogenic activities are incorporated into this analysis via their impacts on the baseline (*e.g.,* as reflected in the regulatory status of the species, population size and growth rate where known).

In the Estimated Take of Marine Mammals section of this proposed rule, we identified the subset of potential effects that are reasonably expected to occur and rise to the level of takes based on the methods described. The impact that any given take will have on an individual, and ultimately the species or stock, is dependent on many case-specific factors that need to be considered in the negligible impact analysis (*e.g.,* the context of behavioral exposures such as duration or intensity of a disturbance, the health of impacted animals, the status of a species that incurs fitness-level impacts to individuals, *etc.*). For this proposed rule, we evaluated the likely impacts of the number of harassment takes reasonably expected to occur, and proposed for authorization, in the context of the specific circumstances surrounding these predicted takes. Last, we collectively evaluated this information, as well as other more taxa-specific information and mitigation measure effectiveness, to support our negligible impact conclusions for each species and stock.

As explained in the Estimated Take of Marine Mammals section, no take by serious injury or mortality is proposed for authorization or anticipated to occur. Further, any Level A harassment would be expected to be in the form of PTS; no non-auditory injury is anticipated or authorized.

The Specified Activities reflect maximum levels of training and testing activities. The Description of the Proposed Activity section describes annual activities. There may be some flexibility in the exact number of missions that may vary from year to year, but take totals will not exceed the maximum annual numbers or the 7-year totals indicated in Table 35. We base our analysis and negligible impact determination on the maximum number of takes that are reasonably expected to occur and that are proposed for authorization, although, as stated before, the number of takes are only a part of the analysis, which includes qualitative consideration of other contextual factors that influence the degree of impact of the takes on the affected individuals. To avoid repetition, in this Preliminary Analysis and Negligible Impact Determination section we provide some general analysis that applies to all the species and stocks listed in Table 35, given that some of the anticipated effects of the USAF's training and testing activities on marine mammals are expected to be relatively similar in nature. Next, we break up our analysis by species and stock, to provide more specific information related to the anticipated effects on individuals of that species and to discuss where there is information about the status or structure of any species that would lead to a differing assessment of the effects on the species.

The USAF's take request, which, as described above, is for harassment only, is based on its acoustic effects model. The model calculates sound energy propagation from explosive and inert munitions during training and testing activities in the EGTTR. The munitions proposed to be used by each military unit were grouped into mission-day categories so the acoustic impact analysis could be based on the total number of detonations conducted during a given mission to account for the accumulated energy from multiple detonations over a 24-hour period. A total of 19 mission-day categories were developed for the munitions proposed to be used. Using the dBSea underwater acoustic model and associated analyses, the threshold distances and harassment zones were estimated for each mission-day category for each marine mammal species. Takes were estimated based on the area of the harassment zones, predicted animal density, and annual number of events for each mission-day category. To assess the potential impacts of inert munitions on marine mammals, the proposed inert munitions were categorized into four classes based on their impact energies, and the threshold distances for each class were modeled and calculated as described for the mission-day categories. Assumptions in the USAF model intentionally err on the side of overestimation. For example, the model conservatively assumes that (1) the water surface is flat (no waves) to allow for maximum energy reflectivity; (2) munitions striking targets confer all weapon energy into underwater acoustic energy; and (3) above or at surface explosions assume no energy losses from surface effects (*e.g.,* venting which dissipates energy through the ejection of water and release of detonation gases into the atmosphere).

Generally speaking, the USAF and NMFS anticipate more severe effects from takes resulting from exposure to higher received levels (though this is in no way a strictly linear relationship for behavioral effects throughout species, individuals, or circumstances) and less severe effects from takes resulting from exposure to lower received levels. However, there is also growing evidence of the importance of distance in predicting marine mammal behavioral response to sound—*i.e.,* sounds of a similar level emanating from a more distant source have been shown to be less likely to evoke a response of equal magnitude (DeRuiter 2012, Falcone *et al.* 2017). The estimated number of Level A harassment and Level B harassment takes does not necessarily equate to the number of individual animals the USAF expects to harass (which is likely slightly lower). Rather, the estimates are for the instances of take (*i.e.,* exposures above the Level A harassment and Level B harassment threshold) that are anticipated to occur annually and over the 7-year period. Some of the enumerated instances of exposure could potentially represent exposures of the same individual marine mammal on different days, meaning that the number of individuals taken is less than the number of instances of take, but the nature of the activities in this rule (*e.g.,* short duration, intermittent) and the distribution and behavior of marine mammals in the area do not suggest that any single marine mammal would likely be taken on more than a few days within a year. Further, any of these instances of take may represent either brief exposures (seconds) or, in some cases, several exposures within a day. Most explosives detonating at or near the surface have brief exposures lasting only a few milliseconds to minutes for the entire event. Explosive events may be a single event involving one explosion (single exposure) or a series of intermittent explosives (multiple explosives) occurring over the course of a day. Gunnery events, in some cases, may have longer durations of exposure to intermittent sound. In general, gunnery events can last intermittently up to 90 minutes total, but typically lasts approximately 30 minutes. Live firing is continuous, with pauses usually lasting well under 1 minute and rarely up to 5 minutes.

Behavioral Disturbance

Behavioral reactions from explosive sounds are likely to be similar to reactions studied for other impulsive sounds such as those produced by air guns. Impulsive signals, particularly at close range, have a rapid rise time and higher instantaneous peak pressure than other signal types, making them more likely to cause startle responses or avoidance responses. Most data has come from seismic surveys that occur over long durations (*e.g.,* on the order of days to weeks), and typically utilize large multi-air gun arrays that fire repeatedly. While seismic air gun data provides the best available science for assessing behavioral responses to impulsive sounds (*i.e.,* sounds from explosives) by marine mammals, it is likely that these responses represent a worst-case scenario compared to most USAF explosive noise sources, because the overall duration of exposure to a seismic airgun survey would be expected to be significantly longer than the exposure to sounds from any exercise using explosives.

Take estimates alone do not provide information regarding the potential fitness or other biological consequences of the reactions on the affected individuals. NMFS therefore considers the available activity-specific, environmental, and species-specific information to determine the likely nature of the modeled behavioral responses and the potential fitness consequences for affected individuals.

In the range of potential behavioral effects that might be expected to be part of a response that qualifies as an instance of Level B harassment by behavioral disturbance (which by nature of the way it is modeled/counted, occurs within one day), the less severe end might include exposure to comparatively lower levels of a sound, at a detectably greater distance from the animal, for a few or several minutes. A less severe exposure of this nature could result in a behavioral response such as avoiding an area that an animal would otherwise have chosen to move through or feed in for some amount of time or breaking off one or a few feeding bouts. More severe effects could occur when the animal gets close enough to the source to receive a comparatively higher level, or is exposed intermittently to different sources throughout a day. Such effects might result in an animal having a more severe flight response and leaving a larger area for a day or more or potentially losing feeding opportunities for a day. However, such severe behavioral effects are expected to occur infrequently since monitoring and mitigation requirements would limit exposures to marine mammals. Additionally, previous marine mammal monitoring efforts in the EGTTR over a number of years have not demonstrated any impacts on marine mammals.

The majority of Level B harassment takes are expected to be in the form of milder responses *(i.e.,* lower-level exposures that still rise to the level of take) of a generally shorter duration due to lower received levels that would occur at greater distances from the detonation site due to required monitoring and mitigation efforts. For example, the largest munitions (*e.g.* mission-day category A with 2,413 lb (1.094.6 kg) NEWi) feature up to 10 intermittent explosions over several hours. However, it is likely that animals would not be present in the PTS or TTS zones due to mitigation efforts, and this activity would occur on only a single day per year. Gunnery missions may last continuously up to 90 minutes, but most will be less than 30 minutes and the NEWi of such missions (*i.e.,* 191.6 to

61.1 lb (86.9 to 27.7 kg) are relatively small. We anticipate more severe effects from takes when animals are exposed to higher received levels or at closer proximity to the source. However, depending on the context of an exposure *(e.g.,* depth, distance, if an animal is engaged in important behavior such as feeding), a behavioral response can vary across species and individuals within a species. Specifically, given a range of behavioral responses that may be classified as Level B harassment, to the degree that higher received levels are expected to result in more severe behavioral responses, only a smaller percentage of the anticipated Level B harassment from USAF activities would be expected to potentially result in more severe responses. To fully understand the likely impacts of the predicted/authorized take on an individual (*i.e.,* what is the likelihood or degree of fitness impacts), one must look closely at the available contextual information presented above, such as the duration of likely exposures and the likely severity of the exposures (*e.g.,* whether they will occur for a longer duration over sequential days or the comparative sound level that will be received). Ellison *et al.* (2012) and Moore and Barlow (2013), among others, emphasize the importance of context (*e.g.,* behavioral state of the animals, distance from the sound source) in evaluating behavioral responses of marine mammals to acoustic sources.

Diel Cycle

Many animals perform vital functions, such as feeding, resting, traveling, and socializing, on a diel cycle (24-hour cycle). Behavioral reactions to noise exposure (such as disruption of critical life functions, displacement, or avoidance of important habitat) are more likely to be significant for fitness if they last more than one diel cycle or recur on subsequent days (Southall *et al.* 2007). Consequently, a behavioral response lasting less than one day and not recurring on subsequent days is not considered particularly severe unless it could directly affect reproduction or survival (Southall *et al.* 2007). It is important to note the difference between behavioral reactions lasting or recurring over multiple days and anthropogenic activities lasting or recurring over multiple days (*e.g.,* vessel traffic noise). The duration of USAF activities utilizing explosives vary by mission category and weapon type. There are a maximum of 230 mission days proposed in any given year, assuming every mission category utilizes all of their allotted mission days.

Many mission days feature only a single or limited number of explosive munitions. Explosive detonations on such days would likely last only a few seconds. There are likely to be days or weeks that pass without mission activities. Because of their short activity duration and the fact that they are in the open ocean and animals can easily move away, it is similarly unlikely that animals would be exposed for long, continuous amounts of time, or repeatedly, or demonstrate sustained behavioral responses. All of these factors make it unlikely that individuals would be exposed to the exercise for extended periods or on consecutive days.

Temporary Threshold Shift

NMFS and the USAF have estimated that some species and stocks of marine mammals may sustain some level of TTS from explosive detonations. In general, TTS can last from a few minutes to days, be of varying degree, and occur across various frequency bandwidths, all of which determine the severity of the impacts on the affected individual, which can range from minor to more severe. Explosives are generally referenced as broadband because of the various frequencies. Table 32 indicates the number of takes by TTS that may be incurred by different species from exposure to explosives. The TTS sustained by an animal is primarily classified by three characteristics:

1. Frequency—Available data (of mid-frequency hearing specialists exposed to mid- or high-frequency sounds; Southall *et al.,* 2007) suggest that most TTS occurs in the frequency range of the source up to one octave higher than the source (with the maximum TTS at one-half octave above). TTS from explosives would be broadband.

2. Degree of the shift (*i.e.,* by how many dB the sensitivity of the hearing is reduced)—Generally, both the degree of TTS and the duration of TTS will be greater if the marine mammal is exposed to a higher level of energy (which would occur when the peak dB level is higher or the duration is longer). The threshold for the onset of TTS was discussed previously in this proposed rule. An animal would have to approach closer to the source or remain in the vicinity of the sound source appreciably longer to increase the received SEL. The sound resulting from an explosive detonation is considered an impulsive sound and shares important qualities (*i.e.,* short duration and fast rise time) with other impulsive sounds such as those produced by air guns. Given the anticipated duration and levels of sound exposure, we would not expect marine mammals to incur more than relatively low levels of TTS (*i.e.,* single digits of sensitivity loss).

3. Duration of TTS (recovery time)—In the TTS laboratory studies (as discussed in the Potential Effects of Specified Activities on Marine Mammals and their Habitat section of the proposed rule), some using exposures of almost an hour in duration or up to 217 SEL, almost all individuals recovered within 1 day (or less, often in minutes), although in one study (Finneran *et al.* 2007) recovery took 4 days. For the same reasons discussed in the Preliminary Analysis and Negligible Impact Determination - *Diel Cycle* section, and because of the short distance animals would need to be from the sound source, it is unlikely that animals would be exposed to the levels necessary to induce TTS in subsequent time periods such that their recovery is impeded.

The TTS takes would be the result of exposure to explosive detonations (broad-band). As described above, we expect the majority of these takes to be in the form of mild (single-digit), short-term (minutes to hours) TTS. This means that for one time a year, for several minutes, a taken individual will have slightly diminished hearing sensitivity (slightly more than natural variation, but nowhere near total deafness). The expected results of any one of these small number of mild TTS occurrences could be that (1) it does not overlap signals that are pertinent to that animal in the given time period, (2) it overlaps parts of signals that are important to the animal, but not in a manner that impairs interpretation, or (3) it reduces detectability of an important signal to a small degree for a short amount of time—in which case the animal may be aware and be able to compensate (but there may be slight energetic cost), or the animal may have some reduced opportunities (*e.g.,* to detect prey) or reduced capabilities to react with maximum effectiveness (*e.g.,* to detect a predator or navigate optimally). However, given the small number of times that any individual might incur TTS, the low degree of TTS and the short anticipated duration, and the low likelihood that one of these instances would occur across a time period in which the specific TTS overlapped the entirety of a critical signal, it is unlikely that TTS of the nature expected to result from the USAF's activities would result in behavioral changes or other impacts that would impact any such individual's reproduction or survival.

Auditory Masking

The ultimate potential impacts of masking on an individual (if it were to occur) are similar to those discussed for TTS, but an important difference is that masking only occurs during the time of the signal, versus TTS, which continues beyond the duration of the signal. Fundamentally, masking is referred to as a chronic effect because one of the key potential harmful components of masking is its duration—the fact that an animal would have reduced ability to hear or interpret critical cues becomes much more likely to cause a problem the longer it is occurring. Also inherent in the concept of masking is the fact that the potential for the effect is only present during the times that the animal and the source are in close enough proximity for the effect to occur (and further, this time period would need to coincide with a time that the animal was utilizing sounds at the masked frequency). As our analysis has indicated, because of the sound sources primarily involved in this rule, we do not expect the exposures with the potential for masking to be of a long duration. Masking is fundamentally more of a concern at lower frequencies, because low frequency signals propagate significantly further than higher frequencies and because they are more likely to overlap both the narrower low-frequency calls of mysticetes, as well as many non-communication cues, such as sounds from fish and invertebrate prey and geologic sounds that inform navigation. Masking is also more of a concern from continuous (versus intermittent) sources when there is no quiet time between a sound source within which auditory signals can be detected and interpreted. Explosions introduce low-frequency, broadband sounds into the environment, which could momentarily mask hearing thresholds in animals that are nearby, although sounds from missile and bomb explosions last for only a few seconds. Sound from gunnery ammunition, however, can last up to 90 minutes, although a 30-minute duration is more typical. Masking due to these relatively short duration detonations would not be significant. Effects of masking are only present when the sound from the explosion is present, and the effect is over the moment the sound is no longer detectable. Therefore, short-term exposure to the predominantly intermittent or single explosions are not expected to result in a meaningful amount of masking. For the reasons described here, any limited masking that could potentially occur from explosives would be minor, short-term and intermittent. Long-term consequences from physiological stress due to the sound of explosives would not be expected. In conclusion, masking is more likely to occur in the presence of broadband, relatively continuous noise sources, such as from vessels; however, the duration of temporal and spatial overlap with any individual animal would not be expected to result in more than short-term, low impact masking that would not affect reproduction or survival of individuals.

Auditory Injury (Permanent Threshold Shift)

Table 42 indicates the number of individuals of each species for which Level A harassment in the form of PTS resulting from exposure to or explosives is estimated to occur. The number of individuals to potentially incur PTS annually from explosives for each species ranges from 0 (Rice's whale) to 9 (bottlenose dolphin). As described previously, no species are expected to incur non-auditory injury from explosives.

As discussed previously, the USAF utilizes aerial, vessel and video monitoring to detect marine mammals for mitigation implementation, which is not taken into account when estimating take by PTS. Therefore, NMFS expects that Level A harassment is unlikely to occur at the authorized numbers. However, since it is difficult to quantify the degree to which the mitigation and avoidance will reduce the number of animals that might incur Level A harassment, NMFS proposes to authorize take by Level A harassment at the numbers derived from the exposure model. These estimated Level A harassment take numbers represent the maximum number of instances in which marine mammals would be reasonably expected to incur PTS, and we have analyzed them accordingly. In relation to TTS, the likely consequences to the health of an individual that incurs PTS can range from mild to more serious depending upon the degree of PTS and the frequency band. Any PTS accrued as a result of exposure to USAF activities would be expected to be of a small amount due to required monitoring and mitigation measures. Permanent loss of some degree of hearing is a normal occurrence for older animals, and many animals are able to compensate for the shift, both in old age or at younger ages as the result of stressor exposure (Green *et al.* 1987; Houser *et al.* 2008; Ketten 2012). While a small loss of hearing sensitivity may include some degree of energetic costs for compensating or may mean some small loss of opportunities or detection capabilities, at the expected scale it would be unlikely to impact behaviors, opportunities, or detection capabilities to a degree that would interfere with reproductive success or survival of any individuals.

Physiological Stress Response

Some of the lower level physiological stress responses (*e.g.,* orientation or startle response, change in respiration, change in heart rate) discussed in the Potential Effects of Specified Activities on Marine Mammals and their Habitat would likely co-occur with the predicted harassments, although these responses are more difficult to detect and fewer data exist relating these responses to specific received levels of sound. However, we would not expect the USAF's generally short-term and intermittent activities to create conditions of long-term, continuous noise leading to long-term physiological stress responses in marine mammals that could affect reproduction or survival.

TABLE 41—ANNUAL ESTIMATED TAKES BY LEVEL A AND LEVEL B HARASSMENT FOR MARINE MAMMALS IN THE EGTTR AND THE NUMBER INDICATING THE INSTANCES OF TOTAL TAKE AS A PERCENTAGE OF STOCK ABUNDANCE

Common name	Stock/DPS	Proposed annual take by Level A and Level B harassment			Total take	Abundance (2021 SARS)	Takes as a percentage of abundance
		Behavioral disturbance	TTS	PTS			
Common bottlenose dolphin.	Northern Gulf of Mexico Continental Shelf.	817	319	9	1145	63,280	1.8
Atlantic spotted dolphin.	Northern Gulf of Mexico.	100	39	1	140	21,506	0.6

TABLE 41—ANNUAL ESTIMATED TAKES BY LEVEL A AND LEVEL B HARASSMENT FOR MARINE MAMMALS IN THE EGTTR AND THE NUMBER INDICATING THE INSTANCES OF TOTAL TAKE AS A PERCENTAGE OF STOCK ABUNDANCE—Continued

Common name	Stock/DPS	Proposed annual take by Level A and Level B harassment			Total take	Abundance (2021 SARS)	Takes as a percentage of abundance
		Behavioral disturbance	TTS	PTS			
Rice's whale *	....	4	2	0	6	51	11.8

* ESA-listed species in EGTTR

Assessing the Number of Individuals Taken and the Likelihood of Repeated Takes

The estimated takes by Level B harassment shown in Table 40 represent instances of take, not the number of individuals taken (the much lower and less frequent takes by Level A harassment are far more likely to be associated with separate individuals). As described previously, USAF modeling uses the best available science to predict the instances of exposure above certain acoustic thresholds, which are quantified as harassment takes. However, these numbers from the model do not identify whether and when the enumerated instances occur to the same individual marine mammal on different days, or how any such repeated takes may impact those individuals. One method that NMFS can use to help better understand the overall scope of the impacts is to compare the total instances of take against the abundance of that species (or stock if applicable). For example, if there are 100 estimated harassment takes in a population of 100, one can assume either that every individual will be exposed above acoustic thresholds in no more than 1 day, or that some smaller number will be exposed in one day but a few individuals will be exposed multiple days within a year and a few not exposed at all. Abundance percentage comparisons are less than 8 percent for all authorized species and stocks. This means that: (1) not all of the individuals will be taken, and many will not be taken at all; (2) barring specific circumstances suggesting repeated takes of individuals, the average or expected number of days taken for those individuals taken is one per year; and (3) we would not expect any individuals to be taken more than a few times in a year. There are often extended periods of days or even weeks between individual mission days, although a small number of mission-days may occur consecutively. Marine mammals proposed to be authorized for take in this area of the Gulf of Mexico have expansive ranges and are unlikely to congregate in a small area that would be subject to repeated mission-related exposures for an extended time.

To assist in understanding what this analysis means, we clarify a few issues related to estimated takes and the analysis here. An individual that incurs PTS or TTS may sometimes, for example, also be subject to direct behavioral disturbance at the same time. As described above in this section, the degree of PTS, and the degree and duration of TTS, expected to be incurred from the USAF's activities are not expected to impact marine mammals such that their reproduction or survival could be affected. Similarly, data do not suggest that a single instance in which an animal incurs PTS or TTS and also has an additional direct behavioral response would result in impacts to reproduction or survival. Accordingly, in analyzing the numbers of takes and the likelihood of repeated and sequential takes, we consider all the types of take, so that individuals potentially experiencing both threshold shift and direct behavioral responses are appropriately considered. The number of Level A harassment takes by PTS are so low for dolphin species (and zero for Rice's whale) compared to abundance numbers that it is considered highly unlikely that any individual would be taken at those levels more than once.

Occasional, milder behavioral reactions are unlikely to cause long-term consequences for individual animals or populations, and even if some smaller subset of the takes are in the form of longer (several hours or a day) and more severe responses, if they are not expected to be repeated over sequential days, impacts to individual fitness are not anticipated. Nearly all studies and experts agree that infrequent exposures of a single day or less are unlikely to impact an individual's overall energy budget (Farmer *et al.* 2018; Harris *et al.* 2017; NAS 2017; New *et al.* 2014; Southall *et al.* 2007; Villegas-Amtmann *et al.* 2015).

Impacts to Marine Mammal Habitat

Any impacts to marine mammal habitat are expected to be relatively minor. Noise and pressure waves resulting from live weapon detonations are not likely to result in long-term physical alterations of the water column or ocean floor. These effects are not expected to substantially affect prey availability, are of limited duration, and are intermittent. Impacts to marine fish were analyzed in our Potential Effects of Specified Activities on Marine Mammals and their Habitat section as well as in the 2002 (REA)(USAF 2022). In the REA, it was determined that fish populations were unlikely to be affected and prey availability for marine mammals would not be impaired. Other factors related to EGTTR activities that could potentially affect marine mammal habitat include the introduction of metals, explosives and explosion by-products, other chemical materials, and debris into the water column and substrate due to the use of munitions and target vessels. However, the effects of each were analyzed in the REA and were determined to be not significant.

Species/Stock-Specific Analyses

This section builds on the broader discussion above and brings together the discussion of the different types and amounts of take that different species are likely to incur, the applicable mitigation, and the status of the species to support the negligible impact determinations for each species. We have described (above in the Preliminary Analysis and Negligible Impact Determination section) the unlikelihood of any masking having effects that would impact the reproduction or survival of any of the individual marine mammals affected by the USAF's activities. We also described in the Potential Effects of Specified Activities on Marine Mammals and their Habitat section of the proposed rule the unlikelihood of any habitat impacts having effects that would impact the reproduction or survival of any of the individual marine mammals affected by the USAF's activities. There is no predicted non-auditory tissue damage from explosives for any species, and limited takes of dolphin species by PTS are predicted. Much of the discussion below focuses on the Level B harassment (behavioral disturbance and TTS) and the mitigation measures that reduce the probability or severity of effects. Because there are species-specific considerations, these are discussed below where necessary.

Rice's Whale

The Gulf of Mexico Bryde's whale was listed as an endangered subspecies under the ESA in 2019. NMFS revised the common and scientific name of the listed animal in 2021 to Rice's whale and classification to a separate species to reflect the new scientifically accepted taxonomy and nomenclature. NMFS has identified the core distribution area in the northern Gulf of Mexico where the Rice's whale is primarily found and, further, LaBreque *et al.* (2015) identify the area as a small and resident BIA. The Rice's whale has a very small estimated population size (51, Hayes *et al.* 2021) with limited distribution.

NMFS is proposing to allow for the authorization of two annual takes of Rice's whale by Level B harassment in the form of TTS and four annual takes by Level B harassment in the form of behavioral disturbance. The implementation of the required mitigation is expected to minimize the severity of any behavioral disturbance and TTS of Rice's whales. When we look at the northern Gulf of Mexico where the USAF has been intensively training and testing with explosives in the EGTTR for a number of years, there are no data suggesting any long-term consequences to reproduction or survival rates of Rice's whale from explosives.

Rice's whale will benefit from the mitigation measures proposed to limit impacts to the species. As a mitigation measure to prevent any PTS and limit TTS and behavioral impacts to the Rice's whale, the USAF will restrict the use of live munitions in the western part of each LIA based on the setbacks from the 100-m isobath presented earlier. The USAF will also prohibit the use of inert munitions in Rice's whale habitat (100–400 m depth) throughout the EGTTR. The less impactful 105 mm Training Round must be used by the USAF for nighttime missions and all gunnery missions must be conducted 500 m landward of the 100-m isobath. Furthermore, depending on the mission category, vessel-based, aerial, or video feed monitoring would be required. Noise from explosions is broadband with most energy below a few hundred Hz; therefore, any reduction in hearing sensitivity from exposure to explosive sounds is likely to be broadband with effects predominantly at lower frequencies. The limited number of Rice's whales, estimated to be two animals, that do experience TTS from exposure to explosives may have reduced ability to detect biologically important sounds (*e.g.,* social vocalizations). However, any TTS that would occur would be of short duration.

Research and observations show that if mysticetes are exposed to impulsive sounds such as those from explosives, they may react in a variety of ways, which may include alerting, startling, breaking off feeding dives and surfacing, diving or swimming away, changing vocalization, or showing no response at all (DOD 2017; Nowacek 2007; Richardson 1995; Southall *et al.* 2007). Overall, and in consideration of the context for an exposure, mysticetes have been observed to be more reactive to acoustic disturbance when a noise source is located directly in their path or the source is nearby (somewhat independent of the sound level) (Dunlop et al. 2016; Dunlop *et al.* 2018; Ellison *et al.* 2011; Friedlaender *et al.* 2016; Henderson *et al.* 2019; Malme *et al.* 1985; Richardson *et al.* 1995; Southall *et al.* 2007a). Animals disturbed while engaged in feeding or reproductive behaviors may be more likely to ignore or tolerate the disturbance and continue their natural behavior patterns. Because noise from most activities using explosives is short term and intermittent, and because detonations usually occur within a small area (most of which are set back from the primary area of Rice's whale use), behavioral reactions from Rice's whales, if they occur at all, are likely to be short term and of little to no significance.

As described, the anticipated and proposed take of Rice's whale is of a low magnitude and severity that is not expected to impact the reproduction or survival of any individuals, much less population rates of recruitment or survival. Accordingly, we have found that the take allowable and proposed for authorization under the rule will have a negligible impact on Rice's whales.

Delphinids

Neither the common bottlenose dolphin (Northern Gulf of Mexico continental shelf stock) or Atlantic spotted dolphin (Gulf of Mexico stock) are listed as strategic or depleted under the MMPA, and no active unusual mortality events (UME) have been declared. No mortality or non-auditory injury is predicted or proposed for authorization for either of these species. There are no areas of known biological significance for dolphins in the EGTTR. Repeated takes of the same individual animals would be unlikely. The number of PTS takes from the proposed activities are low (one for Atlantic spotted dolphin; nine for common bottlenose dolphin). Because of the low degree of PTS discussed previously (*i.e.,* low amount of hearing sensitivity loss), it is unlikely to affect reproduction or survival of any individuals. Regarding the severity of individual takes by Level B harassment by behavioral disturbance, we have explained the duration of any exposure is expected to be between seconds and minutes (*i.e.,* relatively short duration) and the severity of takes by TTS are expected to be low-level, of short duration and not at a level that will impact reproduction or survival.

As described, the anticipated and proposed take of dolphins is of a low magnitude and severity such that it is not expected to impact the reproduction or survival of any individuals, much less population rates of recruitment or survival. Accordingly, we have found that the take allowable and proposed for authorization under the rule will have a negligible impact on common bottlenose dolphins and Atlantic spotted dolphins.

Determination

Based on the analysis contained herein of the likely effects of the specified activity on marine mammals and their habitat, NMFS preliminarily finds that the total marine mammal take from the specified activities will have a negligible impact on all affected marine mammal species. In addition as described previously, the USAF's proposed implementation of monitoring and mitigation measures would further reduce impacts to marine mammals.

Unmitigable Adverse Impact Determination

There are no relevant subsistence uses of the affected marine mammal stocks or species implicated by this action. Therefore, NMFS has preliminarily determined that the total taking of affected species or stocks would not have an unmitigable adverse impact on the availability of the species or stocks for taking for subsistence purposes.

Endangered Species Act

Section 7(a)(2) of the Endangered Species Act of 1973 (ESA, 16 U.S.C. 1531 *et seq.*) requires that each Federal agency ensure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of designated critical habitat. To ensure ESA compliance for the issuance of LOAs, NMFS consults internally whenever we propose to authorize take for endangered or threatened species, in this case with the NMFS Office of

Protected Resources Interagency Cooperation Division.

NMFS is proposing to authorize take of the Rice's whale, which is listed under the ESA. The Permits and Conservation Division has requested initiation of section 7 consultation with the Interagency Cooperation Division for the issuance of this proposed rule. NMFS will conclude the ESA consultation prior to reaching a determination regarding the proposed issuance of the authorization.

National Marine Sanctuaries Act

NMFS will work with NOAA's Office of National Marine Sanctuaries to fulfill our responsibilities under the National Marine Sanctuaries Act as warranted and will complete any NMSA requirements prior to a determination on the issuance of the final rule and LOA.

Classification

Executive Order 12866

The Office of Management and Budget has determined that this proposed rule is not significant for purposes of Executive Order 12866.

Regulatory Flexibility Act

Pursuant to the Regulatory Flexibility Act (RFA), the Chief Counsel for Regulation of the Department of Commerce has certified to the Chief Counsel for Advocacy of the Small Business Administration that this proposed rule, if adopted, would not have a significant economic impact on a substantial number of small entities. The RFA requires Federal agencies to prepare an analysis of a rule's impact on small entities whenever the agency is required to publish a notice of proposed rulemaking. However, a Federal agency may certify, pursuant to 5 U.S.C. 605(b), that the action will not have a significant economic impact on a substantial number of small entities. The USAF is the sole entity that would be affected by this rulemaking, and the USAF is not a small governmental jurisdiction, small organization, or small business, as defined by the RFA. Any requirements imposed by an LOA issued pursuant to these regulations, and any monitoring or reporting requirements imposed by these regulations, would be applicable only to the USAF. NMFS does not expect the issuance of these regulations or the associated LOA to result in any impacts to small entities pursuant to the RFA. Because this action, if adopted, would directly affect the USAF and not a small entity, NMFS concludes that the action would not result in a significant economic impact on a substantial number of small entities.

List of Subjects in 50 CFR Part 218

Exports, Fish, Imports, Incidental take, Indians, Labeling, Marine mammals, Penalties, Reporting and recordkeeping requirements, Seafood, Sonar, Transportation, USAF.

Dated: January 30, 2023.

Samuel D. Rauch, III,

Deputy Assistant Administrator for Regulatory Programs, National Marine Fisheries Service.

For the reasons set out in the preamble, NMFS proposes to amend 50 CFR part 218 is proposed to be amended as follows:

PART 218—REGULATIONS GOVERNING THE TAKING AND IMPORTING OF MARINE MAMMALS

■ 1. The authority citation for part 218 continues to read as follows:

Authority: 16 U.S.C. 1361 *et seq.*, unless otherwise noted.

■ 2. Revise subpart G to read as follows:

Subpart G—Taking and Importing Marine Mammals; U.S. Air Force's Eglin Gulf Test and Training Range (EGTTR)

Sec.
218.60 Specified activity and geographical region.
218.61 Effective dates.
218.62 Permissible methods of taking.
218.63 Prohibitions.
218.64 Mitigation requirements.
218.65 Requirements for monitoring and reporting.
218.66 Letters of Authorization.
218.67 Renewals and modifications of Letters of Authorization.
218.68 [Reserved]
218.69 [Reserved]

§ 218.60 Specified activity and geographical region.

(a) Regulations in this subpart apply only to the U.S. Air Force (USAF) for the taking of marine mammals that occurs in the area described in paragraph (b) of this section and that occurs incidental to the activities listed in paragraph (c) of this section.

(b) The taking of marine mammals by the USAF under this subpart may be authorized in a Letter of Authorization (LOA) only if it occurs within the Eglin Gulf Test and Training Range (EGTTR). The EGTTR is located adjacent to Santa Rosa, Okaloosa, and Walton Counties and includes property on Santa Rosa Island and Cape San Blas. The EGTTR is the airspace controlled by Eglin AFB over the Gulf of Mexico, beginning 3 nautical miles (nmi) from shore, and the underlying Gulf of Mexico waters. The EGTTR extends southward and westward off the coast of Florida and encompasses approximately 102,000 square nautical miles (nmi^2). It is subdivided into blocks of airspace that consist of Warning Areas W–155, W–151, W–470, W–168, and W–174 and Eglin Water Test Areas 1 through 6. The two primary components of the EGTTR Complex are Live Impact Area and East Live Impact Area.

(c) The taking of marine mammals by the USAF is only authorized if it occurs incidental to the USAF conducting training and testing activities, including air warfare and surface warfare training and testing activities.

§ 218.61 Effective dates.

Regulations in this subpart are effective for seven years from the date of issuance.

§ 218.62 Permissible methods of taking.

(a) Under an LOA issued pursuant to § 216.106 of this subchapter and § 218.66, the Holder of the LOA (hereinafter "USAF") may incidentally, but not intentionally, take marine mammals within the area described in § 218.60(b) by Level A and Level B harassment associated training and testing activities described in § 218.60(c) provided the activity is in compliance with all terms, conditions, and requirements of the regulations in this subpart and the applicable LOA.

(b) The incidental take of marine mammals by the activities listed in § 218.60(c) is limited to the species and stocks listed in Table 1 of this section.

TABLE 1 TO § 218.62(b)

Common name	Scientific name	Stock
Atlantic spotted dolphin	*Stenella frontalis*	Northern Gulf of Mexico.
Common Bottlenose dolphin	*Tursiops truncatus*	Northern Gulf of Mexico Continental Shelf.
Rice's whale	*Balaenoptera ricei*	No Stock Designated.

§ 218.63 Prohibitions.

Except for permissible incidental take described in § 218.62 and authorized by an LOA issued under § 216.106 of this section and § 218.66, no person in connection with the activities listed in § 218.66 may do any of the following in connection with activities listed in § 218.60(c):

(a) Violate, or fail to comply with, the terms, conditions, or requirements of this subpart or an LOA issued under § 216.106 of this section and § 218.66;

(b) Take any marine mammal not specified in § 218.62(b);

(c) Take any marine mammal specified in § 218.62(b) in any manner other than as specified in the LOA issued under § 216.106 of this subchapter and § 218.66;

(d) Take a marine mammal specified in § 218.62(b) after NMFS determines such taking results in more than a negligible impact on the species or stock of such marine mammal.

§ 218.64 Mitigation requirements.

When conducting the activities identified in § 218.60(c), the mitigation measures contained in this part and any LOA issued under § 216.106 of this subchapter and § 218.66 must be implemented. These mitigation measures include, but are not limited to:

(a) Operational measures. Operational mitigation is mitigation that the USAF must implement whenever and wherever an applicable training or testing activity takes place within the EGTTR for each mission-day category.

(1) Pre-mission Survey.

(i) All missions must occur during daylight hours with the exception of gunnery training and Hypersonic Active Cruise Missile (HACM) Tests, and other missions that can have nighttime monitoring capabilities comparable to the nighttime monitoring capabilities of gunnery aircraft.

(ii) USAF range-clearing vessels and protected species survey vessels must be onsite 90 minutes before mission to clear prescribed human safety zone and survey the mitigation zone for the given mission-day category.

(iii) For all live missions except gunnery missions, USAF Protected Species Observers (PSOs) must monitor the mitigation zones as defined in Table 2 for the given mission-day category for a minimum of 30 minutes or until the entirety of the mitigation zone has been surveyed, whichever comes first.

(A) The mitigation zone for live munitions must be defined by the mission-day category that most closely corresponds to the actual planned mission based on the predicted net explosive weight at impact (NEWi) to be released, as shown in Table 2.

(B) The mitigation zone for inert munitions must be defined by the energy class that most closely corresponds to the actual planned mission, as shown in Table 3.

(C) The energy of the actual mission must be less than the energy of the identified mission-day category in terms of total NEWi as well as the largest single munition NEWi.

(D) For any inert mission other than gunnery missions PSOs must at a minimum monitor out to the mitigation zone distances shown in Table 3 that applies for the corresponding energy class.

(E) Missions falling under mission-day categories A, B, C, and J, and all other missions when practicable must allot time to provide PSOs to vacate the human safety zone. While exiting, PSOs must observe the monitoring zone out to corresponding mission-day category as shown in Table 1 to § 218.64(a)(1)(iv).

(iv) For all missions except gunnery missions, PSOs and vessels must exit and remain outside the human safety zone designated by the USAF at least thirty minutes prior to live weapon deployment.

TABLE 1 TO § 218.64(a)(1)(iv)—PRE-MISSION MITIGATION AND MONITORING ZONES (IN m) FOR LIVE MISSIONS IMPACT AREA

Mission-day category	Mitigation zone	Monitoring zone [5 6]
A	1,130	TBD
B	1,170	TBD
C	1,090	TBD
D	950	TBD
E	950	TBD
F	710	TBD
G	[1] 9,260	550
H	[2] 9,260	450
I	280	TBD
J	1,360	TBD
K	520	TBD
L	700	TBD
M	580	TBD
N	500	TBD
O	370	TBD
P	410	TBD
Q	[3] 9,260	490
R	[4] 280 and 9,260	TBD
S	860	TBD

[1] For G, double the Level A harassment threshold distance (PTS) is 0.548 km, but G is AC–130 gunnery mission with an inherent mitigation zone of 9.260 km/5 nmi.

[2] For H, double the Level A harassment threshold distance (PTS) is 0.450 km, but H is AC–130 gunnery mission with an inherent mitigation zone of 9.260 km/5 nmi.

[3] For Q, double the Level A harassment threshold distance (PTS) is 0.494 km, but Q is AC–130 gunnery mission with an inherent mitigation zone of 9.260 km/5nmi.

[4] R has components of both gunnery and inert small diameter bomb. Double the Level A harassment threshold distance (PTS) is 0.278 km, however, for gunnery component the inherent mitigation zone would be 9.260 km.

[5] The Monitoring Zone for non-gunnery missions is the area between the Mitigation Zone and the Human Safety Zone and is not standardized, as the Human Safety Zone is not standardized. The Human Safety Zone is determined per each mission by the Test Wing Safety Office based on the munition and parameters of its release (to include altitude, pitch, heading, and airspeed).

[6] Based on the operational altitudes of gunnery firing, and the only monitoring during mission coming from onboard the aircraft conducting the firing, the Monitoring Zone for gunnery missions will be a smaller area than the Mitigation Zone and be based on the field of view from the aircraft. These observable areas will at least be double the Level A harassment threshold distance (PTS) for the mission-day categories G, H, and Q (gunnery-only mission-day categories).

TABLE 2 TO § 218.64(a)(1)(iv)—PRE-MISSION MITIGATION AND MONITORING ZONES (IN m) FOR INERT MISSIONS IMPACT AREA

Inert impact class (lb TNTeq)	Mitigation zone	Monitoring zone [1]
2	160	TBD
1	126	TBD
0.5	100	TBD
0.15	68	TBD

[1] The Monitoring Zone for non-gunnery missions is the area between the Mitigation Zone and the Human Safety Zone and is not standardized, as the Human Safety Zone is not standardized. HSZ is determined per each mission by the Test Wing Safety Office based on the munition and parameters of its release (to include altitude, pitch, heading, and airspeed).

(v) Missions involving air-to-surface gunnery operations must conduct aerial monitoring of the mitigation zones, as described in the Table 4.

TABLE 3 TO § 218.64(a)(1)(v)—AERIAL MONITORING REQUIREMENTS FOR AIR-TO-SURFACE GUNNERY OPERATIONS

Aircraft	Gunnery round	Mitigation zone	Monitoring altitude	Operational altitude
AC–30 Gunship.	30 mm; 105 mm (FU and TR)	5 nmi (9,260 m)	6,000 ft (1,828 m)	15,000 ft (4,572 m) to 20,000 ft (6,096 m).
CV–22 Osprey	.50 caliber	3 nmi (5,556 m)	1,000 ft (3,280 m)	1,000 ft (3,280 m).

FU = Full Up; TR = Training Round.

(2) Mission postponement, relocation, or cancellation.

(i) If marine mammals other than the two authorized dolphin species for which take is authorized are observed in either the mitigation zone or monitoring zone by PSOs, then mission activities must be cancelled for the remainder of the day.

(ii) The mission must be postponed, relocated or cancelled if either of the two authorized dolphin species are visually detected in the mitigation zone during the pre-mission survey. Postponement must continue until the animals are confirmed to be outside of the mitigation zone and observed by a PSO to be heading away from the mitigation zone or until the animals are not seen again for 30 minutes.

(iii) The mission must be postponed if marine mammal indicators (*i.e.,* large schools of fish or large flocks of birds) are observed feeding at the surface within the mitigation zone. Postponement must continue until these potential indicators are confirmed to be outside the mitigation zone.

(iv) If either of the two authorized dolphin species are observed in the monitoring zone by PSOs when observation vessels are exiting the human safety zone, and if PSOs determine the marine mammals are heading toward the mitigation zone, then missions must either be postponed, relocated, or cancelled based on mission-specific test and environmental parameters. Postponement must continue until the animals are confirmed by a PSO to be heading away from the mitigation zone or until the animals are not seen again for 30 minutes.

(v) Aerial-based PSOs must look for potential indicators of protected species presence, such as large schools of fish and large, active groups of birds.

(vi) If protected marine species or potential indicators are detected in the monitoring area during pre-mission surveys or during the mission by aerial-based or video-based PSOs, operations must be immediately halted until the mitigation zone is clear of all marine mammals, or the mission must be relocated to another target area.

(3) Vessel avoidance measures.

(i) Vessel operators must follow Vessel Strike Avoidance Measures.

(A) When a marine mammal protected species is sighted, vessels must attempt to maintain a distance of at least 150 ft (46 m) away from protected species and 300 ft (92 m) away from whales. Vessels must reduce speed and avoid abrupt changes in direction until the animal(s) has left the area.

(B) If a whale is sighted in a vessel's path or within 300 feet (92 m) from the vessel, the vessel speed must be reduced and the vessel's engine must be shifted to neutral. The engines must not be engaged until the animals are clear of the area.

(C) If a whale is sighted farther than 300 feet (92 m) from the vessel, the vessel must maintain a distance of 300 feet greater between the whale and the vessel's speed must be reduced to 10 knots or less.

(D) Vessels are required to stay 500 m away from the Rice's whale. If a baleen whale cannot be positively identified to species level then it must be assumed to be a Rice's whale and the 500 m separation distance must be maintained.

(E) Vessels must avoid transit in the Core Distribution Area (CDA) and within the 100–400 m isobath zone outside the CDA. If transit in these areas is unavoidable, vessels must not exceed 10 knots and transit at night is prohibited.

(F) An exception to any vessel strike avoidance measure is for instances required for human safety, such as when members of the public need to be intercepted to secure the human safety zone, or when the safety of a vessel operations crew could be compromised.

(4) Gunnery-specific Mitigation.

(A) 105–mm training rounds (TR) must be used during nighttime gunnery missions.

(B) Ramp-up procedures. Within a mission, firing must start with use of the lowest caliber munition and proceed to increasingly larger rounds.

(C) Any pause in live fire activities greater than 10 minutes must be followed by the re-initiation of protected species surveys.

(b) Geographic mitigation measures.

(1) Use of live munitions is restricted in the western part of the existing LIA and proposed East LIA such that activities may not occur seaward of the setbacks from the 100 m-isobath shown in Table 5.

TABLE 4 TO § 218.64(b)(1)—SETBACK DISTANCES TO PREVENT PERMANENT THRESHOLD SHIFT IMPACTS TO THE RICE'S WHALE

User group	Mission-day category	NEWi (lb)	Setback from 100-meter isobath (km)
53 WEG	A	2,413.6	7.323
	B	2,029.9	6.659
	C	1,376.2	5.277
	D	836.22	3.557
	E	934.9	3.192
AFSOC	F	584.6	3.169
	I	29.6	0.394
96 OG	J	946.8	5.188
	K	350	1.338

TABLE 4 TO § 218.64(b)(1)—SETBACK DISTANCES TO PREVENT PERMANENT THRESHOLD SHIFT IMPACTS TO THE RICE'S WHALE—Continued

User group	Mission-day category	NEWi (lb)	Setback from 100-meter isobath (km)
	L	627.1	3.315
	M	324.9	2.017
	N	238.1	1.815
	O	104.6	0.734
	P	130.8	0.787
	Q	94.4	0.667
	R	37.1	0.368
NAVSCOLEOD	S	130	1.042

(2) All gunnery missions must be conducted at least 500 meters landward of the 100–m isobath.

(3) Use of live munitions must be restricted to the LIA and East LIA and is prohibited from the area between the 100–m and 400–m isobaths.

(4) Use of inert munitions is prohibited between the 100–m and 400–m isobaths throughout the EGTTR.

(5) Live Hypersonic Attack Cruise Missiles (HACMs) must be fired into the EGTTR inside of the LIAs and outside of the area between 100–m to 400–m isobaths

(6) Live HACMs (Mission-day category K) must have a setback of 1.338 km from the 100–m isobath.

(7) Inert HACMs may be fired into portions of the EGTTR outside the LIAs but must be outside the area between the 100–m and 400–m isobaths.

(4) Environmental mitigation.

(i) Sea state conditions—Missions must be postponed or rescheduled if conditions exceed Beaufort sea state 4, which is defined as moderate breeze, breaking crests, numerous white caps, wind speed of 11 to 16 knots, and wave height of 3.3 to 6 feet.

(ii) Daylight Restrictions—All live missions except for nighttime gunnery and hypersonic weapon missions will occur no earlier than 2 hours after sunrise and no later than 2 hours before sunset.

§ 218.65 Monitoring and Reporting

Requirements

(a) PSO Training. All personnel who conduct protected species monitoring must complete Eglin Air Force Base's (AFB) Marine Species Observer Training Course.

(1) Any person who will serve as a PSO for a particular mission must have completed the training within a year prior to the mission.

(2) For missions that require multiple survey platforms to cover a large area, a Lead Biologist must be designated to lead the monitoring and coordinate sighting information with the Test Director or Safety Officer.

(b) Vessel-based Monitoring.

(1) Survey vessels must run predetermined line transects, or survey routes that will provide sufficient coverage of the survey area.

(2) Monitoring must be conducted from the highest point feasible on the vessels.

(3) There must be at least two PSOs on each survey vessel.

(4) For missions that require multiple vessels to cover a large survey area, a Lead Biologist must be designated.

(i) The Lead Biologist must coordinate all survey efforts.

(ii) The Lead Biologist must compile sightings information from other vessels.

(iii) The Lead Biologist must inform Tower Control if the mitigation and monitoring zones are clear or not clear of protected species.

(iv) If the area is not clear, the Lead Biologist must provide recommendations on whether the mission should be postponed or canceled.

(v) Tower Control must relay the Lead Biologist's recommendation to the Safety Officer. The Safety Officer and Test Director must collaborate regarding range conditions based on the information provided.

(vi) The Safety Officer must have the final authority on decisions regarding postponements and cancellations of missions.

(c) Aerial-based monitoring.

(1) All mission-day categories require aerial-based monitoring, assuming assets are available and when such monitoring does not interfere with testing and training parameters required by mission proponents.

(2) Gunnery mission aircraft must also serve as aerial-based monitoring platforms.

(3) Aerial survey teams must consist of Eglin Natural Resources Office personnel or their designees aboard a non-mission aircraft or the mission aircrew.

(4) All aircraft personnel on non-mission and mission aircraft who are acting in the role of a PSO must have completed Eglin AFB's Marine Species Observer Training course.

(5) One trained PSO in the aircraft must record data and relay information on species sightings, including the species (if possible), location, direction of movement, and number of animals, to the Lead Biologist.

(6) For gunnery missions, after arriving at the mission site and before initiating gun firing, the aircraft must fly at least two complete orbits around the target area out to the applicable monitoring zone at a minimum safe airspeed and appropriate monitoring altitude.

(7) Aerial monitoring by aircraft must maintain a minimum ceiling of 305 m (1,000 feet) and visibility of 5.6 km (3 nmi) for effective monitoring efforts and flight safety as show in Table 5.

(8) Pre-mission aerial surveys conducted by gunnery aircrews in AC–130s must extend out 5 nmi (9,260 m) from the target location while aerial surveys in CV–22 aircraft must extend out from the target location to a range of 3 nmi (5,556 m) as shown in Table 4.

(9) If the mission is relocated, the pre-mission survey procedures must be repeated in the new area.

(10) If multiple gunnery missions are conducted during the same flight, marine species monitoring must be conducted separately for each mission;

(11) During nighttime missions, night-vision goggles must be used.

(12) During nighttime missions, low-light electro-optical and infrared sensor systems on board the aircraft must be used for protected species monitoring.

(13) HACM tests and any other missions that are conducted at nighttime must be supported by AC–130 aircraft with night-vision instrumentation or other platforms with

comparable nighttime monitoring capabilities.

(14) For HACM missions, the pre-mission survey area must extend out to, at a minimum, double the Level A harassment (PTS) threshold distance for delphinids (0.52 km). A HACM test would correspond to mission-day category K, which is estimated to have a PTS threshold distance of 0.26 km.

(d) Video-based monitoring.

(1) All mission-day categories require video-based monitoring when practicable except for gunnery missions.

(2) A trained PSO (the video camera PSO) must monitor the live video feeds from the Gulf Range Armament Test Vessel (GRATV) transmitted to the Central Control Facility (CCF).

(3) The video camera PSO must report any protected marine species sightings to the Safety Officer, who will also be at the CCF.

(4) The video camera PSO must have open lines of communication with the PSOs on vessels to facilitate real-time reporting of marine species sightings.

(5) Direct radio communication must be maintained between vessels, GRATV personnel, and Tower Control throughout the mission.

(6) If a protected marine species is detected on the live video by a PSO prior to weapon release, the mission must be stopped immediately by the Safety Officer.

(7) Supplemental video monitoring by additional aerial assets must be used when practicable (*e.g.,* balloons, unmanned aerial vehicles).

(e) Post-mission monitoring.

(1) All marine mammal sightings must be documented on report forms that are submitted to the Eglin Natural Resources Office after the mission.

(2) For gunnery missions, following each mission, aircrews must conduct a post-mission survey beginning at the operational altitude and continuing through an orbiting descent to the designated monitoring altitude. The post-mission survey area will be the area covered in 30 minutes of observation in a direction down-current from the impact site or the actual pre-mission survey area, whichever is reached first.

(3) During post-mission monitoring, PSOs must survey the mission site for any dead or injured marine mammals. The post-mission survey area will be the area covered in 30 minutes of observation in a direction down-current from the impact site or the actual pre-mission survey area, whichever is reached first.

(f) The USAF must submit an annual draft monitoring report to NMFS within 90 working days of the completion of each year's activities authorized by the LOA as well as a comprehensive summary report at the end of the project. The annual reports and final comprehensive report must be prepared and submitted within 30 days following resolution of any NMFS comments on the draft report. If no comments are received from NMFS within 30 days of receipt of the draft report, the report will be considered final. If comments are received, a final report addressing NMFS comments must be submitted within 30 days after receipt of comments. The annual reports must contain the informational elements described below, at a minimum. The comprehensive 7-year report must include a summary of the monitoring information collected over the 7-year period (including summary tables), along with a discussion of the practicability and effectiveness of the mitigation and monitoring and any other important observations or discoveries.

(1) Dates and times (begin and end) of each EGTTR mission;

(2) Complete description of mission activities;

(3) Complete description of pre-and post-monitoring activities occurring during each mission;

(4) Environmental conditions during monitoring periods including Beaufort sea state and any other relevant weather conditions such as cloud cover, fog, sun glare, and overall visibility to the horizon, and estimated observable distance;

(5) Upon observation of a marine mammal, the following information should be collected:

(i) Observer who sighted the animal and observer location and activity at time of sighting;

(ii) Time of sighting;

(iii) Identification of the animal (*e.g.,* genus/species, lowest possible taxonomic level, or unidentified), observer confidence in identification, and the composition of the group if there is a mix of species;

(iv) Distances and bearings of each marine mammal observed in relation to the target site;

(v) Estimated number of animals including the minimum number, maximum number, and best estimate);

(vi) Estimated number of animals by cohort (*e.g.,* adults, juveniles, neonates, group composition etc.);

(vii) Estimated time that the animal(s) spent within the mitigation and monitoring zones;

(viii) Description of any marine mammal behavioral observations (*e.g.,* observed behaviors such as feeding or traveling);

(ix) Detailed information about implementation of any mitigation (*e.g.,* postponements, relocations and cancellations), and

(x) All PSO datasheets and/or raw sightings data.

(6) The final comprehensive report must include a summary of data collected as part of the annual reports.

(g) In the event that personnel involved in the monitoring activities discover an injured or dead marine mammal, the USAF must report the incident to NMFS Office of Protected Resources (OPR), and to the NMFS Southeast Region Marine Mammal Stranding Network Coordinator, as soon as feasible. If the death or injury was likely caused by the USAF's activity, the USAF must immediately cease the specified activities until NMFS OPR is able to review the circumstances of the incident and determine what, if any, additional measures are appropriate to ensure compliance with the terms of this rule and the LOA issued under § 216.106 of this subchapter and § 218.66.

(1) The USAF will not resume their activities until notified by NMFS. The report must include the following information:

(i) Time, date, and location (latitude/longitude) of the first discovery (and updated location information if known and applicable);

(ii) Species identification (if known) or description of the animal(s) involved;

(iii) Condition of the animal(s) (including carcass condition if the animal is dead);

(iv) Observed behaviors of the animal(s), if alive;

(v) If available, photographs or video footage of the animal(s); and

(vi) General circumstances under which the animal was discovered.

(2) [Reserved]

§ 218.66 Letters of Authorization.

(a) To incidentally take marine mammals pursuant to the regulations in this subpart, the USAF must apply for and obtain an LOA in accordance with § 216.106 of this section.

(b) An LOA, unless suspended or revoked, may be effective seven years from the date of issuance.

(c) Except for changes made pursuant to the adaptive management provision of § 218.67(b)(1), in the event of projected changes to the activity or to mitigation, monitoring, or reporting required by an LOA issued under this subpart, the USAF must apply for and obtain a modification of the LOA as described in § 218.67.

(d) Each LOA will set forth:

(1) Permissible methods of incidental taking;

(2) Geographic areas for incidental taking;

(3) Means of effecting the least practicable adverse impact (*i.e.,* mitigation) on the species or stocks of marine mammals and their habitat; and

(4) Requirements for monitoring and reporting.

(e) Issuance of the LOA(s) must be based on a determination that the level of taking is consistent with the findings made for the total taking allowable under the regulations in this subpart.

(f) Notice of issuance or denial of the LOA(s) will be published in the **Federal Register** within 30 days of a determination.

§ 218.67 Renewals and modifications of Letters of Authorization.

(a) An LOA issued under § 216.106 of this subchapter and § 218.66 for the activity identified in § 218.60(c) may be modified upon request by the applicant, consistent with paragraph (b), provided that any requested changes to the activity or to the mitigation, monitoring, or reporting measures (excluding changes made pursuant to the adaptive management provision in paragraph (c)(1) of this section) do not change the underlying findings made for the regulations and do not result in more than a minor change in the total estimated number of takes (or distribution by species or years). NMFS may publish a notice of proposed LOA in the **Federal Register**, including the associated analysis of the change, and solicit public comment before issuing the LOA.

(b) An LOA issued under § 216.106 of this section and § 218.66 may be modified by NMFS under the following circumstances:

(1) *Adaptive management.* After consulting with the USAF regarding the practicability of the modifications, NMFS may modify (including adding or removing measures) the existing mitigation, monitoring, or reporting measures if doing so creates a reasonable likelihood of more effectively accomplishing the goals of the mitigation and monitoring.

(i) Possible sources of data that could contribute to the decision to modify the mitigation, monitoring, or reporting measures in an LOA include:

(A) Results from USAF's annual monitoring report and annual exercise report from the previous year(s);

(B) Results from other marine mammal and/or sound research or studies;

(C) Results from specific stranding investigations; or

(D) Any information that reveals marine mammals may have been taken in a manner, extent, or number not authorized by the regulations in this subpart or subsequent LOAs.

(ii) If, through adaptive management, the modifications to the mitigation, monitoring, or reporting measures are substantial, NMFS will publish a notice of a new proposed LOA in the **Federal Register** and solicit public comment.

(2) *Emergencies.* If NMFS determines that an emergency exists that poses a significant risk to the well-being of the species of marine mammals specified in LOAs issued pursuant to § 216.106 of this section and § 218.66, an LOA may be modified without prior public notice or opportunity for public comment. Notice will be published in the **Federal Register** within thirty days of the action.

§ 218.68 [Reserved]

§ 218.69 [Reserved]

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