

**APPLICATION FOR A FIVE-YEAR PROGRAMMATIC PERMIT
FOR SMALL TAKES OF MARINE MAMMALS INCIDENTAL TO
LAUNCHING OF SPACE LAUNCH VEHICLES,
INTERCONTINENTAL BALLISTIC AND SMALL MISSILES,
AND AIRCRAFT AND HELICOPTER OPERATIONS AT
VANDENBERG AIR FORCE BASE, CALIFORNIA**

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ACRONYMS AND ABBREVIATIONS

30 SW	30th Space Wing
30 SW/XP	30th Space Wing, Plans and Programs Office
ABL	Air-Borne Laser
ABR	Auditory Brainstem Response
BMDS	Ballistic Missile Defense System
CBC	Common Booster Core
DAT	Digital Audio Tape
dB	Decibel
EA	Environmental Assessment
EIS	Environmental Impact Statement
FTF	Flexible Target Family
FY	Fiscal Year
GBI	Ground Based Interceptor
GEM	Graphite Epoxy Motor
GMD	Ground-based Midcourse Defense
ICBM	Intercontinental Ballistic Missile
IRFNA	Inhibited Red Fuming Nitric Acid
KEI	Kinetic Energy Interceptor
kg	Kilogram
kHz	Kilohertz
km	Kilometer
lbs	Pounds
LF	Launch Facility
LFTS	Liquid Fueled Target System
Lmax	Maximum Fast A-weighted Sound Level
m	Meter
MDA	Missile Defense Agency
ms	Millisecond
MSRS	ManTech SRS Technologies, Inc.
NCI	Northern Channel Islands
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NMML	National Marine Mammal Laboratory
NOAA	National Oceanic and Atmospheric Administration
OSP	Orbital Suborbital Program
PAAT	Patriot as a Target
psf	Pounds per Square Foot
SEL	Sound Exposure Level
SLC	Space Launch Complex
SLM	Sound Level Meter
SLV	Space Launch Vehicle
SMI	San Miguel Island
SpaceX	Space Exploration Technologies

SPL	Sound Pressure Level
TP	Test Pad
U.S.	United States
VAFB	Vandenberg Air Force Base

1. DETAILED DESCRIPTION OF SPECIFIC ACTIVITY OR CLASS OF ACTIVITIES EXPECTED TO RESULT IN INCIDENTAL TAKING OF MARINE MAMMALS.

Vandenberg Air Force Base (VAFB; Figure 1) is headquarters to the 30th Space Wing (30 SW), the Air Force Space Command unit that operates VAFB and the Western Range. VAFB operates as a missile test base and aerospace center, supporting west coast space launch activities for the Air Force, Department of Defense, National Aeronautics and Space Administration, and commercial contractors. VAFB is the main west coast launch facility for placing commercial, government, and military satellites into polar orbit on expendable (unmanned) launch vehicles, and for testing and evaluation of intercontinental ballistic missiles (ICBM) and sub-orbital target and interceptor missiles. In addition to space vehicle and missile launch activities at VAFB, there are helicopter and aircraft operations for purposes such as search-and-rescue, delivery of space vehicle components, launch mission support, and security reconnaissance.

The following sections (Sections 1.1 through 1.3) provide details on the types of space launch vehicles (SLVs), missiles, and aircraft and helicopters used during activities requested to be covered under this permit and that have the potential to result in the incidental taking of marine mammals.

1.1. SPACE LAUNCH VEHICLES

There are currently six active SLV facilities at VAFB (VAFB 2007), used to launch satellites into polar orbit. These facilities support the launch programs for space vehicles including the Atlas V, Delta II, Delta IV, Falcon, Minotaur and Taurus. Two of these vehicles, including Atlas V and the Falcon, have yet to launch from VAFB. Atlas V is scheduled for its first launch in late February 2008, while the first Falcon launch is scheduled for August 2009 (30 SW 2008a).

In order to compare launch noise from past and current SLVs, as it was received near the north and south VAFB marine mammal haul-out sites, Tables 1 through 3 provide information on the sound exposure levels (SELs) that were measured during previous launch events. Table 1 provides a comparison of SELs as measured at the sound monitoring site by the south VAFB marine mammal haul-out site. Table 2 provides the SELs as measured at the sound monitoring site by the north VAFB Spur Road marine mammal haul-out site. Finally, Table 3 provides the SELs as measured at the sound monitoring site by the north VAFB Lion's Head marine mammal haul-out site. Further details on SELs are described by vehicle in the following sections.

1.1.1. Atlas V

The Atlas V vehicle will be launched from Space Launch Complex (SLC)-3E on south VAFB, the site of the previous Atlas IAS program. This SLC is approximately 9.9 kilometers (km) from the main haul-out area on VAFB, known as Rocky Point (Figure 2), which encompasses several smaller haul-outs. SLC-3E is approximately



Figure 1. Map of VAFB and coastal landmarks, and its location within California (inset).

Table 1. Sound levels from launches on VAFB, as measured by the digital audio tape recorder near the south VAFB marine mammal haul-out site.

Launch Vehicle	Satellite	Launch Complex	Launch Date	Dist. to Haul-out (km)	TSEL (dB)	CSEL (dB)	ASEL (dB)	TPeak (dB)	Lmax (dB)
Delta IV	DMSP-17	SLC-6	4-Nov-06	2.7	131.3	127.5	111.3	129.0	102.6
Titan IV	B-34	SLC-4E	5-Oct-01	8.5	130.2	124.2	104.5	125.0	100.6
Athena II	Ikonos-1	SLC-6	27-Apr-99	2.8	127.9	123.7	107.3	125.6	99.9
Delta IV	NROL-22	SLC-6	27-Jun-06	2.7	127.7	122.9	106.2	130.0	103.1
Titan IV	B-12	SLC-4E	22-May-99	8.5	127.6	121.9	103.6	123.7	97.0
Athena I	Lewis	SLC-6	22-Aug-97	2.8	127.0	121.3	107.3	126.8	101.0
Titan IV	B-28 NRO	SLC-4E	17-Aug-00	8.5	126.8	119.9	99.0	123.5	91.5
Athena II	Ikonos-2	SLC-6	24-Sep-99	2.8	125.9	123.4	107.8	124.6	102.2
Titan IV	A-18	SLC-4E	23-Oct-97	8.5	125.9	119.0	96.6	121.8	88.2
Atlas IIAS	AC-141 Terra	SLC-3E	18-Dec-99	9.9	124.2	113.6	87.3	120.3	76.4
Minotaur	MightySat	SLC-8	19-Jul-00	2.3	122.9	117.9	107.0	122.0	101.7
Titan II	G-7	SLC-4W	19-Jun-99	8.5	120.3	112.3	87.7	121.4	79.1
Minotaur	JAWSAT	SLC-8	26-Jan-00	2.3	119.4	116.6	105.4	125.0	103.4
Titan II	G-12	SLC-4W	13-May-98	8.5	119.3	115.0	95.4	113.0	85.9
Delta II	MS-9	SLC-2	17-May-98	22.0	118.1	103.1	72.4	113.9	61.8
Atlas IIAS	MLV-10	SLC-3E	8-Sep-01	9.9	118.0	112.1	88.5	112.6	80.8
Titan II	G-6	SLC-4W	4-Apr-97	8.5	116.5	112.4	88.5	111.3	76.1
Titan II	G-13	SLC-4W	21-Sep-00	8.5	116.3	109.6	83.5	109.5	74.9
Taurus	KOMPSAT	SLC-576	20-Dec-99	20.3	106.4	101.3	76.4	102.9	65.0

Notes: km = kilometers; TSEL = unweighted SEL; dB = decibels; CSEL = C-weighted SEL; ASEL = A-weighted SEL; Tpeak = unweighted peak sound level; Lmax = maximum fast A-weighted sound level.

11.1 km from the closest north VAFB haul-out, known as the Spur Road haul-out site (Figure 3) and 13.5 km from the next closest haul-out, the nearby Purisima Point haul-out site (Figure 3).

The Atlas V is a medium lift vehicle that can be flown in two series of configurations - the Atlas V400 series and the Atlas V500 series. Both series use the Standard Booster as the single body booster. The V400 series accommodates a 4.2 meter (m) payload fairing and as many as three solid rocket boosters. The V500 series accommodates a 5.4 m fairing and as many as five solid rocket boosters. The Atlas V400 series will lift as much as 7,800 kilograms (kg) into geosynchronous transfer orbit or as much as 13,620 kg into low earth orbit. The Atlas V500 series will lift as much as 8,700 kg into geosynchronous transfer orbit or as much as 21,050 kg into low earth orbit. The Atlas V consists of a common booster core (CBC; 3.8 m in diameter and 32.5 m high) powered by an RD180 engine that burns a liquid propellant fuel consisting of liquid oxygen and RP1 fuel (kerosene). The RD180 engine provides 840,000 pounds (lbs) of thrust on liftoff. There is a Centaur upper stage (3.1 m in diameter and 12.7 m high) powered by a liquid oxygen and liquid hydrogen fuel.

Table 2. Sound levels from launches on VAFB, as measured by the digital audio tape recorder near the north VAFB Spur Road marine mammal haul-out site.

Launch Vehicle	Satellite	Launch Complex	Launch Date	Dist. to Haul-out (km)	TSEL (dB)	CSEL (dB)	ASEL (dB)	TPeak (dB)	Lmax (dB)
Taurus	MTI	SLC-576	12-Mar-00	0.55	136.8	134.8	125.6	141.8	120.6
Taurus	STEX	SLC-576	3-Oct-98	0.55	136.7	134.7	124.8	142.1	121.4
Taurus	T6	SLC-576	21-Sep-01	0.50	135.8	133.8	123.8	141.5	119.8
Taurus	Lite	SLC-576	6-Feb-03	0.55	133.8	133.1	125.4	144.8	
Delta II	MS-9	SLC-2	17-May-98	1.92	128.9	126.7	116.9	137.3	112.5
Delta II	JASON/TIMED	SLC-2	7-Dec-01	2.00	127.7	125.8	114.8	133.0	111.0
Delta II	IMAGE	SLC-2	25-Mar-00	2.06	126.9	125.1	113.9	129.4	109.2
Delta II	Quickbird2	SLC-2	18-Oct-01	2.06	126.9	124.2	111.8	128.7	104.2
Delta II	Landsat	SLC-2	15-Apr-99	2.02	126.5	124.3	114.1	133.3	108.8
Atlas IIAS	AC-141 Terra	SLC-3E	18-Dec-99	11.10	117.2	110.0	86.1	113.0	75.2

Notes: km = kilometers; TSEL = unweighted SEL; dB = decibels; CSEL = C-weighted SEL; ASEL = A-weighted SEL; Tpeak = unweighted peak sound level; Lmax = maximum fast A-weighted sound level.

Table 3. Sound levels from launches on VAFB, as measured by the sound level meter near the north VAFB Lion's Head marine mammal haul-out site.

Launch Vehicle	Launch Complex	Launch Date	Dist. to Haul-out (km)	ASEL (dB)	Tpeak (dB)	Lmax (dB)
Minuteman III	LF-04	11-Jun-03	1.15	114.9	131.2	112.1
Peacekeeper	LF-02	12-Mar-03	3.70	106.1	128.8	100.9
BV	LF-23	16-Aug-03		105.5	125.9	102.5
Peacekeeper	LF-02	3-Jun-02	3.70	102.4	126.6	97.8
Minuteman III	LF-26	7-Jun-02	3.15	100.6	121.2	98.2

Notes: km = kilometers; dB = decibels; ASEL = A-weighted SEL; Tpeak = unweighted peak sound level; Lmax = maximum fast A-weighted sound level.



Figure 2. Map of main harbor seal haul-out area and active SLCs on south VAFB.



Figure 3. Map of harbor seal haul-out sites and active SLCs and launch facilities on north VAFB, as well as test pad TP-01.

While no Atlas Vs vehicles have been launched from SLC-3E as of mid-February 2008, two Atlas IIAS launch vehicles were previously launched from SLC-3E in December 1999 and September 2001. Launches of the smaller Atlas IIAS (47.4 m in length and 700,000 lbs of thrust) had A-weighted SEL ranging from 87.3 – 88.5 decibels (dB) (Thorson et al. 2000; Berg et al. 2001). The predicted noise level at the closest haul-out site for the Atlas V vehicle would be slightly louder than the noise levels from the Atlas IIAS. The predicted maximum sonic boom levels from an Atlas V launch impacting the northern Channel Islands (NCI) including San Miguel Island (SMI; Figure 4) would be 7.2 pounds per square foot (psf). The size of the actual sonic boom would depend on meteorological conditions, which can vary by day and season and with the trajectory of the vehicle. Acoustic measurement of the initial Atlas V launch is planned for VAFB and SMI.

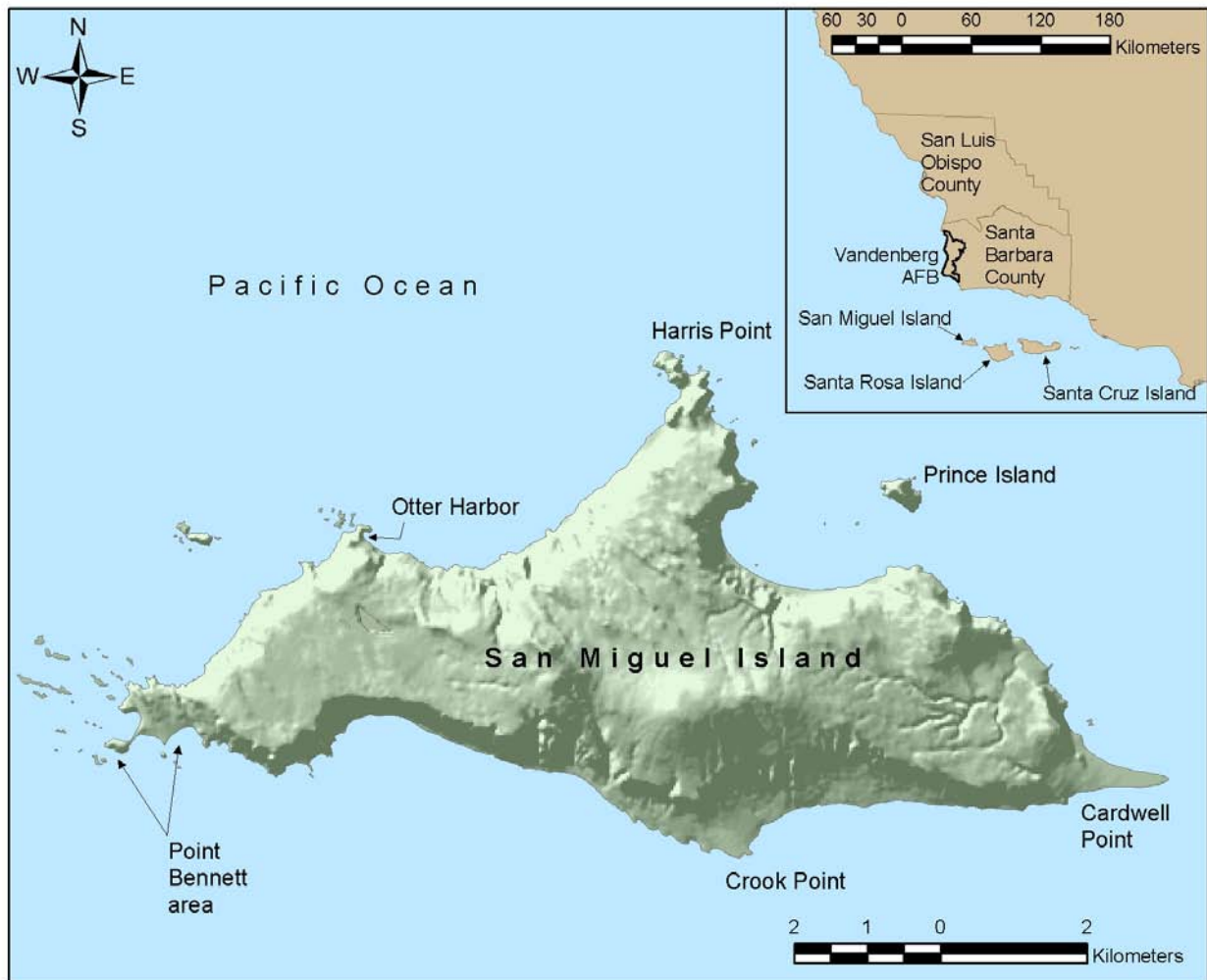


Figure 4. SMI and its major haul-out sites, and the NCI in relation to VAFB (inset).

1.1.2. Delta II

The Delta II is launched from SLC-2 on north VAFB (Figure 3) approximately 2.0 km from the Spur Road harbor seal haul-out site and 2.3 km from the Purisima Point haul-out site. The Delta II is a medium-sized launch vehicle approximately 38 m tall. The Delta II uses a Rocketdyne RS-27A main liquid propellant engine and additional solid rocket strap-on graphite epoxy motors (GEMs) during liftoff. A total of three, four or nine GEMs can be attached for added boost during liftoff. When nine GEMs are used, six are ignited at liftoff and three are lit once the rocket is airborne. When three or four GEMs are used they are all ignited at liftoff. The number of GEMs attached to each vehicle will determine the amount of sound power produced by the vehicle.

Eight Delta II launches have been acoustically quantified near the Spur Road harbor seal haul-out site. The Delta II is the second loudest of the SLVs at the Spur Road haul-out site, the Taurus vehicle being the loudest (Table 2). The Delta II has unweighted SEL measurements (based on the six initial acoustically-measured launches) ranging from 126.5 to 128.8 dB and averaging 127.4 dB, as measured by the digital audio tape (DAT) recorder. The C-weighted SEL ranged from 124.3 to 126.7 dB with an average of 125.4 dB (DAT). The A-weighted SEL measurements from both a sound level meter (SLM) and the DAT were similar and ranged from 111.8 to 118.2 dB and had an average of 114.5 dB (DAT). The maximum fast A-weighted sound level (Lmax) values ranged from 104.2 to 112.5 dB and averaged 109.5 dB.

Sonic booms have been measured on SMI from three Delta II launches: the EO-1, Iridium MS-12, and AURA (November 2000, February 2002, and July 2004 respectively). Both the Iridium MS-12 and AURA had two small sonic booms impact the Point Bennett area of SMI. Iridium MS-12 had peak overpressures of 0.47 and 0.64 psf and rise times of 18 and 91 milliseconds (ms), while AURA had peak overpressures of 0.79 and 1.34 psf and rise times of 9.5 and 10.5 ms. The Delta II EO-1 had a single sonic boom with a peak overpressure of 0.4 psf and rise time of .041 ms.

1.1.3. Delta IV

The Delta IV is launched from SLC-6, which is 2.8 km north of the main harbor seal haul-out site at South Rocky Point (Figure 2). The Delta IV family of launch vehicles consists of five launch vehicle configurations utilizing a CBC first stage (liquid fueled) and zero, two, or four strap on solid rocket GEMs. The Delta IV comes in four medium lift configurations and one heavy lift configuration consisting of multiple CBCs (

Table 4). The Delta IV can carry payloads from 4,210 to 13,130 kg into geosynchronous transfer orbit.

Previously the Athena launch vehicle was launched from SLC-6. The Athena was a much smaller vehicle than the Delta IV but was one of the top three loudest vehicles (Table 1) at the haul-out, given its close proximity. Because the Delta IV was predicted to be the loudest vehicle at the south VAFB harbor seal haul-out site, it was required that acoustic and biological monitoring be conducted for its first three launches. In addition, harbor seal hearing tests were required before and after each of the first three launches.

Table 4. Delta IV vehicle configurations and estimated maximum overpressures.

Launch Vehicle	Qty. CBC	Size Upper Stage	Qty. Solid Rocket Motor	Launch Weight	Est. Max. Overpressure
Medium	1	4 meter	0	1,016,750 lbs	4 psf ⁽¹⁾
M+(4,2)	1	4 meter	2	1,176,750 lbs	4-5 psf ⁽²⁾
M+(5,2)	1	5 meter	2	1,208,750 lbs	6.5 psf ⁽¹⁾
M+(5,4)	1	5 meter	4	1,368,750 lbs	7.2 psf ⁽¹⁾
Heavy	3	5 meter	0	2,890,250 lbs	8-9 psf ⁽³⁾

Notes:

1. United States (U.S.) Air Force 2000 (calculation).
2. PCBoom3 model.
3. Comparison to Titan IV data.

The first two Delta IV launches occurred in 2006. Although the Delta IV is larger than the Athena, it was found after its initial launch (NROL-22, June 2006) that the Delta IV had similar noise levels to the Athena vehicle. As measured by the DAT, the unweighted SEL was 127.7 dB, while the C-weighted SEL was 122.9 dB and the A-weighted SEL was 106.2 dB (Fillmore et al 2006). The Lmax was found to be 103.1 dB (Fillmore et al 2006).

During its second launch (DMSP-17, November 2006), the DAT recorder was located at the VAFB Boathouse (near where the harbor seal hearing tests were performed), rather than at the more usual sound monitoring location of Oil Well Canyon, where an SLM was placed. The DAT measured the unweighted SEL at 131.3 dB, the C-weighted SEL at 127.5 dB, and the A-weighted SEL at 111.3 dB. The Lmax was measured at 102.6 dB (Thorson et al 2007).

The Delta IV was predicted to create maximum sonic booms of as much as 7.2 psf for the largest of the medium configurations and 8 to 9 psf for the heavy configuration (

Table 4). The size of the actual sonic boom would depend on meteorological conditions, which can vary by day and season, and with the trajectory of the vehicle. A sonic boom greater than one psf was predicted for the initial Delta IV launch, thus acoustic monitoring was performed on SMI. An equipment malfunction resulted in uncertainty regarding the amplitude of the sonic boom that was recorded for the launch, and the peak overpressure from the boom could have ranged from 0.77 psf to as much as 3.36 psf. The rise time was able to be determined and was measured at 8.7 ms. Because a sonic boom was not predicted for the second Delta IV launch, monitoring was not performed on SMI.

Capture attempts of harbor seals for the initial Delta IV launch were unsuccessful; therefore, no hearing tests were performed on seals for that launch. Capture attempts for the second Delta IV launch were successful, and hearing tests were performed. There was no evidence that the launch noise from the Delta IV DMSP-17 caused a loss in harbor seal hearing acuity. However, given a two-hour delay in starting the hearing test due to safety constraints, it is possible that a mild temporary threshold shift could

have been fully recovered by the time the testing was started. Even so, no long-term hearing loss from the Delta IV launch noise was found (Thorson et al 2007).

The third Delta IV launch is currently scheduled for August 2008. Appropriate biological and acoustic monitoring, as well as hearing testing, are planned for this launch.

1.1.4. Falcon

The Falcon is the launch vehicle for Space Exploration Technologies (Space X). Space X is a commercial program planning to launch small payloads into low earth orbit from VAFB. While it has not been officially decided (30 SW 2008a), it is anticipated that Space X will utilize SLC-4E, instead of SLC-3W as originally planned (J. Rohr, 30 SW Plans and Program Office [30 SW/XP], pers. comm.) The Space X launch vehicle includes the Falcon I SLV, classified as a light-lift vehicle. It is a two-stage liquid oxygen and rocket grade kerosene powered launch vehicle and is 21.3 m in length and 1.7 m in diameter (Space X 2007). Beginning in 2009, the Falcon 1e vehicle will also be available. It is also 1.7 m in diameter, but will have an extended first stage and will be 26.8 m in length (Space X 2007). The Falcon I has a thrust of 105,500 lbs (in vacuum) and the Falcon 1e has 115,000 lbs (in vacuum) and are capable of delivering approximately 554 kg into sun synchronous low earth orbit (Space X 2007). The first Falcon launch from VAFB is currently scheduled for August 2009 (30 SW 2008a).

1.1.5. Minotaur

The Orbital Suborbital Program (OSP) launch vehicle, known as Minotaur I, is launched from SLC-8 on south VAFB (Figure 2), approximately 2.3 km from the south VAFB haul-out sites. The Minotaur I is a four stage, all solid propellant ground launch vehicle (Orbital Sciences Corporation 2006a). The launch vehicle consists of modified Minuteman II Stage I and Stage II segments, mated with Pegasus upper stages (Orbital Sciences Corporation 2006a). The Minotaur is a small vehicle, approximately 19.2 m tall (Orbital Sciences Corporation 2006b), with approximately 215,000 lbs of thrust.

Two Minotaur launches were acoustically monitored at VAFB (January 2000 and July 2000). The unweighted SEL measurements varied by 3.5 dB between the two launches and were measured to be 119.4 and 122.9 dB. The C-weighted SELs varied less and were measured at 116.6 and 117.9 dB. From the DAT and SLM measurements, the A-weighted SEL ranged from 104.9 to 107.0 dB. The launch noise reached an L_{max} level of 101.7 and 103.4 dB. No sonic booms of greater than one psf were predicted to impact the NCI for these two launches, nor for a third launch for which only biological monitoring was performed at VAFB given that acoustics had been previously quantified.

1.1.6. Taurus

The Taurus SLV is launched from 576E on north VAFB, approximately 0.5 km from the Spur Road harbor seal haul-out site and 2.3 km from the Purisima Point haul-out site (Figure 3). The standard Taurus is a small launch vehicle, at approximately 24.7 m tall and is launched in two different configurations (DARPA and standard) with different first stages providing 500,000 or 400,000 lbs of thrust, respectively. The different vehicle configurations have different thrust characteristics, with the standard configuration providing less thrust than DARPA.

The launch noise from five Taurus launches has been measured near the Spur Road haul-out site. The Taurus is the loudest of the launch vehicles at the Spur Road haul-out site, due to the close proximity of its launch pad to the haul-out site. The unweighted SEL measurements from the four initially measured Taurus vehicles ranged from 135.8 to 136.8 and averaged 136.4 dB. The C-weighted SEL measurements were slightly lower as expected, ranging from 133.8 to 134.8 dB and averaged 134.5 dB. The A-weighted SEL measurements ranged from 123.5 to 128.9 dB with an average of 126.6 dB (SLM). The Lmax values were measured to range from 118.3 to 122.9 dB and averaged 120.9 dB (SLM). No sonic booms greater than one psf were predicted to impact the NCI for any of the six Taurus launches monitored since 1998.

1.2. INTERCONTINENTAL BALLISTIC MISSILES AND MISSILE DEFENSE AGENCY INTERCEPTOR AND TARGET VEHICLES

There are a variety of small missiles launched from north VAFB, including the Minuteman III and several types of interceptor and target vehicles for the Missile Defense Agency (MDA) program. The Peacekeeper missile program was recently deactivated (J. Rohr, 30 SW/XP, pers. comm.) Active missile launch facilities (LFs) are spread throughout northern VAFB (Figure 3), and are within approximately 1.0 to 3.9 km of the Lion's Head haul-out site, and approximately 11.0 to 16.5 km north of the Spur Road and Purisima Point haul-out sites. In addition to the LFs, Test Pad (TP)-01 is present on north VAFB. Although not currently active or associated with a missile program, MDA may eventually utilize this pad (J. Rohr, 30 SW/XP, pers. comm.). The trajectories of ICBM and MDA launches are generally westward, and therefore do not cause sonic boom impacts on the NCI.

1.2.1. ICBMs

The Minuteman III missile is an ICBM developed as part of the United States strategic deterrence force. The Minuteman III is launched from an underground silo. It is composed of three rocket motors, and is 18.0 m in length by 1.7 m in diameter with a first stage thrust of 202,600 lbs.

The launch noise from the 7 June 2002 launch from LF-26 (Figure 3) was measured at the Lion's Head haul-out site. This LF is approximately 3.0 km away from the haul-out site. The A-weighted SEL measurement of the launch noise was 100.6 dB and the Lmax value of 98.2 dB.

The launch noise from the 24 May 2000 launch from LF-09 (Figure 3) was measured at the Spur Road haul-out site. At a distance of over 15 km from LF-09, the unweighted SEL measurement was 114.7 dB and the C-weighted SEL measurement was 111.6 dB. The A-weighted SEL measurement was 26 dB down from the unweighted value and was measured at 88.7 dB. The Lmax was measured to be 83.3 dB.

1.2.2. Missile Defense Agency Interceptor and Target Vehicles

The MDA continues development of various systems and elements, including the Ballistic Missile Defense System (BMDS), the Ground-based Midcourse Defense (GMD)

element of BMDS, the Kinetic Energy Interceptor (KEI) element, and the Air-Borne Laser (ABL) element.

The BMDS mission is to defend against threat missiles in each phase or segment of the missile's flight. There are three segments of this system in various stages of technology development: Boost Phase Defense, Midcourse Defense, and Terminal Defense. Each segment of the BMDS is being developed to destroy an attacking missile in the corresponding boost, mid-course, or terminal phase of its flight. MDA has been conducting and will continue to conduct BMDS testing at VAFB through 2014 and beyond.

The GMD element is designed to protect the United States in the event of a limited ballistic missile attack by destroying the threat missile in the mid-course phase of its flight. During the mid-course phase, which occurs outside the earth's atmosphere for medium and long-range missiles, the missile coasts in a ballistic trajectory. The missiles are comprised of a commercially available, solid propellant booster consisting of two or three stages, and an exo-atmospheric kill vehicle or emulator. A two-stage booster is being added to the current three-stage booster. The Ground Based Interceptor (GBI) was previously approved for launching from VAFB (Federal Register, 12 May 2003, Vol.68, No. 91). GBI flight tests are planned from LF-23. As a schedule risk mitigation, some limited testing may occur from LF-24 (currently being refurbished for use).

The second element of BMDS, the KEI element, includes development of the KEI booster and its flight tests. An Environmental Assessment (EA) is in preparation. MDA anticipates a minimum of three KEI launches per year from 2009 to at least 2012. Candidate launch sites include 576E, TP-01, and LF-06.

The third element of BMDS, the ABL element, is being developed to provide an effective defense to limited ballistic missile threats during the boost segment of an attacking missile's flight. A Final and a Supplemental Environmental Impact Statement (EIS; U.S. Air Force 1997a, 2002) were prepared for ABL, and other National Environmental Policy Act (NEPA) work is currently in progress for the various targets that could be used under ABL testing. Under the ABL program, there could be as many as 10 launches per year. Launches could occur from LF-06a, which would be a new LF, yet to be constructed, near the current LF-06. Possible launch vehicles could include Black Brant IX, Hera, Terrier/Orion, two-stage Terrier, Liquid Fueled Target System (LFTS), Terrier Lynx, Storm, ARIES, Castor I, Lance, Patriot PAC-2, STRYPI-II, and Hermes.

As a part of BMDS testing, MDA envisions launching a wide variety of target missiles from VAFB northern LFs on westerly trajectories. Table 5 identifies missiles being considered by MDA for use at VAFB. Many of the small missiles under 13 m, including the Hera, Lance, Patriot As A Target (PAAT), Black Brant, Terrier, SRTYPI II, Castor I, Storm, ARIES and Hermes, were covered under the Theater Ballistic Missile Targets Programmatic EA (U.S Air Force 1997b). They are included in this document because of their launch site's proximity to the Lion's Head harbor seal pupping site that was established in 2002. Those missiles, in addition to missiles already approved for VAFB (such as Minuteman missiles and the three-stage GBIs), and the new generation of

Table 5. Identification of MDA missiles considered for use at VAFB.

Missiles	Height (m)	Diameter (m)
KEI 3-Stage Booster	N/A	N/A
HERMES	4.0	0.6
PAAT	5.3	0.6
Lance	6.6	0.6
Aries	8.2	1.1
STRYPI II	9.3	0.8
SR-19	10.0	1.3
Storm	10.0	1.0
LV-2	10.4	1.9
Terrier/Lynx	10.7	0.5
Terrier/Orion	10.7	0.5
Two-Stage Terrier	10.7	0.5
Orbital Boost Vehicle	11.3	0.9
Castor I	11.6	0.8
LFTS (also LPT)	11.6	N/A
SR-19/M57	11.6	1.3
HERA	12.1	1.3
KEI 2-Stage Booster	12.2	1.0
SR19/SR73	12.4	1.3
Black Brant 9	13.6	0.4
LV-3	15.1	1.9
Terrier/Black Brant	15.3	0.5
SR19/SR19	15.5	1.3
Booster Verification Test	15.8	1.4
Castor IVB	15.8	1.0
GBI 2-Stage	16.5	1.3
GBI 3-Stage	16.5	1.3
Minuteman II Stack	18.2	1.7
Minuteman III	18.2	1.7
Peacekeeper	21.8	2.3

Note: N/A = Not available at this time.

missiles from the MDA, such as the KEI and the GBI two-stage, are to be covered under this application for the five-year programmatic permit.

Additional new missile entries to Table 5 since the previous permit application was submitted include liquid-fueled target missile known as the LFTS and the Flexible Target Family (FTF) targets. The LFTS target missile is a single-stage, short range, ballistic missile with a non-separating payload. The missile is fueled by kerosene, initiator fuel, and an oxidizer (Inhibited Red Fuming Nitric Acid [IRFNA]). The FTF target missiles include the LV-2 and the LV-3 missiles, which are solid-fueled. All of the missiles identified in Table 5 have been (or are currently being) assessed in NEPA analyses for use at VAFB. Applicable NEPA documents include MDA's Flexible Target Family EA (MDA 2007b), MDA's Small Target Missile Launch Site EA (In preparation for 2008), MDA's KEI Initial Development and Test EA (In preparation for 2008), MDA's Airborne Laser Debris Management EA (MDA 2007a), the U.S. Air Force's Orbital/Suborbital Program EA (U.S. Air Force 2006), and the U.S. Air Force's Theater Ballistic Missile Targets Programmatic EA (U.S. Air Force 1997b).

As shown in Table 5, all of the target and interceptor missiles are smaller than the Minuteman III or Peacekeeper missiles previously or currently launched from VAFB. The MDA notes that the actual heights of the missiles shown in Table 5 will vary depending on the payload and associated electronic packages (e.g., flight termination system) or special modifications. Many of the missile types have interchangeable first or second stage motors; therefore, most may have similar noise characteristics, depending on their configuration. Missiles for which acoustic measurements have previously been made, as well as vehicle size are included in Table 6.

Table 6. Comparison of size and sound produced by acoustically measured MDA missiles and the Minuteman and Peacekeeper vehicles.

Missile	Program	Height (m)	Diameter (m)	A-weighted Sound Exposure Level (dB)	Lmax (dB)
Orbital Boost Vehicle	GBI	11.3	0.9	114.5	113.8
Booster Verification Test	GBI	15.8	1.4	114.7	113.8
Minuteman III	USAF Strategic Deterrence Force	18.0	1.7	117.7	112.2
Peacekeeper	USAF Strategic Deterrence Force	21.8	2.3	122.5	117.0

Note: The Minuteman III and Peacekeeper missiles are provided as a comparison to the smaller MDA missiles. Sound levels are from actual launches and were extrapolated to the distance of 1 km to compare each missile.

The main missile programs and missile types are described herein, but others may be implemented before this permit expires. The Air Force would notify the National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS) of any new missile programs that would be implemented at VAFB. Completely new types of missiles would be monitored acoustically and biologically, during their first launch, if it occurs outside of the pupping season, using the standard launch monitoring protocol for VAFB. However, configuration changes in existing missiles would only be monitored during the pupping season, as is done for all other missile launches.

The MDA's BMDS test plans, including those involving tests from VAFB, are subject to constant change as the BMDS is being developed through spiral evolution. Therefore, it is difficult for the MDA to predict with any accuracy its future launch schedule or number of launches over the next five years. However, due to test resource limitations, the MDA does not envision conducting more than three missile tests per quarter (on average) over the next five years from VAFB, and none of the missiles would be larger than the Minuteman III. This limitation (i.e., one missile per quarter and none being larger than the Minuteman III) can be used to establish the envelope of potential impacts posed by the MDA testing at VAFB over the next five years.

1.3. AIRCRAFT OPERATIONS

The VAFB runway, located on north VAFB (Figure 3), supports various aircraft operations further described below. Aircraft operations include tower operations, such as take offs and landings (training operations) from the airfield, and range operations, such as overflights and flight tests. Using data from fiscal years (FY) 2003, 2006 and 2007 (FY 2004 and 2005 data not available), the number of tower operations averaged 12, 325 operations per FY, while range operations averaged 502 operations per FY.

1.3.1. Flight Test Operations

VAFB is a limited site for flight testing and evaluation of fixed-wing aircraft. Three approved routes are used that avoid the established pinniped haul-out sites. Aircraft flown through VAFB airspace and supported by 30 SW include, but are not limited to, B1 and B2 bombers, F-15, F-16, and F-22 fighters, V/X-22, Unmanned Aerial Vehicles, and KC-135 tankers.

1.3.2. Fixed-Wing Aircraft Operations

Various fixed-wing aircraft (jet and propeller aircraft) use VAFB for a variety of purposes, including delivery of space or missile vehicle components, launching of space vehicles at high altitude (e.g. the Pegasus), and emergency landings. All aircraft are required to remain outside of the 1,000-foot bubble around pinniped rookeries or haul-out sites, except when performing a life-or-death rescue mission, when responding to a security incident, or during an aircraft emergency. There have been no observed impacts to pinnipeds from fixed-wing aircraft operations during launch monitoring or pinniped surveys.

1.3.3. Helicopter Operations

The number of helicopter operations at VAFB decreased in 2008 with the deactivation VAFB helicopter squadron. However other squadrons and units continue to use VAFB for purposes which include, but are not limited to, transit through, exercises, and launch mission support. All helicopters are required to remain outside of the 1,000-foot bubble around pinniped rookeries or haul-out sites. Exceptions may occur when performing a life-or-death rescue mission, when responding to a security incident, or during an aircraft emergency. There have been no observed impacts to pinnipeds from helicopter operations during launch monitoring or pinniped surveys.

2. DATES AND DURATION OF ACTIVITIES AND SPECIFIC GEOGRAPHICAL REGION WHERE THEY WILL OCCUR.

Launch activities and aircraft operations could occur at any time of the day or night during the period to be covered under this permit (7 February 2009 through 6 February 2014). Launch activities would occur at VAFB (launch noise considerations) and in the area of the NCI, California (sonic boom considerations). Aircraft activities would occur

only at VAFB. VAFB and the NCI, as well as their marine mammal haul-out sites, are further described below.

2.1. VANDENBERG AIR FORCE BASE

VAFB is composed of approximately 99,000 acres of land and approximately 40 miles (65 km) of coastline on the coast of central California, within Santa Barbara County (Figure 1). The most common marine mammal inhabiting the VAFB coastline is the Pacific harbor seal (*Phoca vitulina richardii*). Harbor seals are local to the area, rarely traveling more than 50 km from the haul-out site. They haul out on small offshore rocks or reefs and sandy or cobblestone cove beaches. There are four main harbor seal haul-out sites on VAFB; three are on north VAFB and one is on south VAFB.

On north VAFB, harbor seals primarily use the offshore rocky area near Spur Road; the Purisima Point reef; and the offshore rocky area of Lion's Head (Figure 3). The Spur Road and Purisima Point haul-out sites are in the vicinity of the Delta II launch site, SLC-2, and the Taurus launch site, referred to as 576E. The Lion's Head haul-out site is located in the vicinity of the LFs. As many as 110 seals may haul out at Spur Road and as many as 45 seals may haul out at Purisima Point (SRS Technologies 2003b). Based on monthly counts conducted in 2005 through 2007, only one to two pups were observed at the Spur Road and Purisima Point haul-out sites. As many as 17 seals may haul out at Lion's Head, with as many as three pups (Thorson et al. 2004). These three sites are mostly to completely under water at higher tides (above 1.2 m), preventing seals from hauling out at those times.

The main haul-out area on south VAFB, from the VAFB Harbor north to South Rocky Point beach, is comprised of many sand and cobblestone coves and rocky ledges, with most seals found between Harbor Seal Beach and South Rocky Point (approximately 1.5 km of coastline; Figure 2). The raised rocky ledge of Flat Iron Rock provides an area to haul out during most tides (except for very high tides combined with high swells and wind); therefore, this area is used more often and by more seals than any other VAFB haul-out site. Weaned pups, juveniles and some adult females use Weaner Cove, just to the north of Flat Iron Rock, throughout most of the year. During periods of high winds, seals may move from Flat Iron Rock into the more protected Weaner Cove. Peak numbers, as many as 515 seals hauled out at one time (SRS Technologies 2003b), usually occur at the south VAFB haul-out site in the afternoon (1100 to 1600 Pacific Time), but the number of seals present is also influenced by a combination of high tides and large swells, high temperature, or strong winds (SRS Technologies 2003b). During the pupping season (March through June), as many as 49 mother-pup pairs can be found hauled out in the area just north of Harbor Seal Beach and at Weaner Cove, making these areas the main pupping sites on VAFB (SRS Technologies 2003b). During molting (May through July) adult and some juvenile harbor seals primarily use the Flat Iron Rock area, while weaned pups, juveniles and a few adult females use the coves just north and south of Flat Iron Rock (SRS Technologies 2002).

2.2. NORTHERN CHANNEL ISLANDS

The NCI are located approximately 50 km south of the southern point on VAFB (Figure 4, inset). Three islands, San Miguel, Santa Cruz and Santa Rosa, make up the main NCI, with SMI being the primary site for pinniped rookeries. The NCI are part of the Channel Islands National Park and the Channel Islands National Marine Sanctuary.

The main concern on the NCI from VAFB launch activities is potential impacts from sonic booms created during launches of SLVs from VAFB. During the period of 1997 through 2005, and in 2007 there were no sonic booms above 2.0 psf recorded on the NCI. Small sonic booms between 1 and 2 psf usually elicit a heads up response or slow movement toward and entering the water, particularly for pups. In 2006, due to an equipment malfunction, there was uncertainty about the peak overpressure from the Delta IV NROL-22 launch, which could have ranged between 0.77 and 3.36 psf. During the 1996 Titan IV K-22 launch, sonic booms of 1.0 to 9.2 psf reached SMI and caused many sea lions and some elephant seals to enter the water near the loudest sonic boom (Stewart, Thorson and Francine 1996). There were no injuries or mortalities as a result of that sonic boom, or the reactions by pinnipeds on SMI.

Research activities on the NCI will continue under the current Scientific Research Permit (#859-1680-01) issued to the U.S. Air Force, 30 SW, VAFB on 10 December 2007, as well as under any future permits granted.

2.2.1. San Miguel Island

On SMI, commonly found species of pinnipeds include California sea lions (*Zalophus californianus*), northern elephant seals (*Mirounga angustirostris*), northern fur seals (*Callorhinus ursinus*) and Pacific harbor seals. Guadalupe fur seals (*Arctocephalus townsendi*) and Steller sea lions (*Eumetopias jubatus*) have bred in the past on SMI, but sightings have been rare since the mid-1980's. The main rookeries of sea lions, elephant seals and fur seals are found at Point Bennett on the west end of SMI (Figure 4). California sea lions occur at Point Bennett, along the south side of the island, to Cardwell Point, on the east. Northern elephant seals occur at Point Bennett and from Crook Point to Cardwell Point, with small numbers along the north coast. Northern fur seals occur in the Point Bennett area. Harbor seals occur along the north coast and from Crook Point to Cardwell Point.

There are approximately 23,000 California sea lion pups (Sharon Melin, NMFS/National Marine Mammal Laboratory [NMML], pers. comm.), over 10,000 elephant seal pups (Lowry 2002) and over 4,000 fur seal pups born on SMI each year (Carretta et al. 2007). Pacific harbor seals pup on the north and east end of SMI; 2,500 northern elephant seals and several hundred sea lions also pup on the east end of SMI at Cardwell Point (Lowry 2002). Most sea lions and elephant seals on the south and east end of SMI are non-breeding (juvenile or molting) animals. This area is composed of high cliffs with small sandy coves where several hundred seals haul out. From approximately December through July, pupping and breeding activities overlap between the four main species (Table 7).

Currently, the main impacts to species on SMI are: environmental conditions, food limitations (i.e. El Niño or fisheries interactions), and competition with other pinniped

species for breeding space. For all species, adverse impacts to populations occur periodically because of a decrease in the availability of food items, due to El Niño events. Commercial fisheries have impacted Steller sea lion and northern fur seal populations (Sydeman and Allen 1999). Competition among pinniped species is occurring as the growing populations of sea lions and elephant seals displace less aggressive harbor seals for haul-out space.

2.2.2. Santa Cruz Island

On Santa Cruz Island the main species of marine mammal inhabiting the island is the harbor seal. California sea lions and northern elephant seals rarely haul out on Santa Cruz Island, except when sick or injured. There are approximately 1,050 harbor seals found on Santa Cruz Island during the spring aerial surveys (Lowry and Carretta 2003). Based sonic boom prediction models from for previous launches, the majority of sonic booms produced by launches from VAFB do not impact Santa Cruz Island.

Table 7. Summary of the pupping (birthing and nursing period), breeding, and molting seasons of the four main pinniped species on SMI.

Species	Pupping Season	Breeding Season	Molting Season
California sea lion	May - July	May - August	August – December
Northern fur seal	May – July	May - July	August - October
Northern elephant seal	December - March	December - March	April - August
Pacific harbor seal	March - May	March - June	May - July

2.2.3. Santa Rosa Island

On Santa Rosa Island, the main species of marine mammals inhabiting the island are the harbor seal and the northern elephant seal. 1,567 elephant seal pups were born on Santa Rosa in 2001 (Lowry 2002). There are approximately 900 harbor seals found on Santa Rosa Island during the spring aerial surveys (Lowry and Carretta 2003). Some California sea lions pup on Santa Rosa, but it has not been established as a rookery yet. Pinnipeds generally use the west end of the island, adjacent to SMI. Based sonic boom prediction models from for previous launches, the majority of sonic booms produced by launches from VAFB do not impact Santa Rosa Island.

3. SPECIES AND NUMBERS OF MARINE MAMMALS LIKELY TO BE FOUND WITHIN THE ACTIVITY AREA.

3.1. PACIFIC HARBOR SEAL (*Phoca vitulina richardii*)

3.1.1. VAFB

As many as 515 harbor seals haul out daily on south VAFB and as many as 155 seals on north VAFB (SRS Technologies 2003b). The population on VAFB increased from 1997 through 2002; from 2003 through 2006 there was little change, and a decrease was seen in the population in 2007. It is possible that the El Niño in 2007, while mild (NOAA 2007), may have led to the lower counts of harbor seals. There was also a strong domoic acid event along the central California coast which may have affected population numbers. The total population of harbor seals on north and south VAFB in 2002 was calculated at 1,115 seals using ground counts during the molting season, and a correction factor of 1.7 times the ground count based on radio telemetry.

3.1.2. NCI

At least 700 harbor seals used SMI, 1,000 used Santa Cruz Island, and 900 used Santa Rosa Island, during the 2002 aerial counts (Lowry and Carretta 2003). These counts are just of harbor seals hauled out on shore and do not reflect the total population using that area. The harbor seal population on the NCI appears to be stable with little change from 1990 through 2002 (Lowry and Carretta 2003).

3.2. CALIFORNIA SEA LION (*Zalophus californianus*)

3.2.1. VAFB

Fewer than 100 sea lions are found seasonally on VAFB. Sea lions may sporadically haul out to rest when foraging or transiting through the area, but generally spend little time there. Areas used for hauling out include Rocky Point, Point Arguello, and Point Pedernales on VAFB, and Point Sal just north of VAFB (Figure 1).

In 2002, small numbers of sea lions hauled out on the VAFB boat harbor jetty during a period when large numbers of bait fish had moved in close to shore in that area. Large numbers of pinnipeds and cetaceans were seen in the area and some sea lions used the jetty as a temporary haul-out site during fish runs and for several days afterward. During the 2003 California sea lion pupping season, five sea lion pups were born at the Rocky Point haul-out site but were abandoned soon after birth (SRS Technologies 2004b). This may have been a result of the El Niño conditions or the prevalence of domoic acid poisoning that existed in 2003, and which affected sea lions at that time. No sea lion pups were born on VAFB in 2004 through 2007.

3.2.2. NCI

SMI is one of the major California sea lion rookeries, along with San Nicolas Island, with about 23,000 pups born each year. Because sonic booms from VAFB launches usually do not impact Santa Cruz and Santa Rosa Islands, it is expected that launches from VAFB will mainly affect SMI only, where pup production is stable at 23,000 pups annually.

3.3. NORTHERN ELEPHANT SEAL (*Mirounga angustirostris*)

3.3.1. VAFB

As many as 188 northern elephant seals may be found seasonally on VAFB. Weaned elephant seal pups making their first foraging trips occasionally haul out for one to two days at VAFB before continuing on their migration. Table 8 details the numbers of elephant seals seen at VAFB from 2003 through 2007. Numbers during spring molts varied with the highest numbers observed during the molt in 2004, but have since then decreased significantly to only six seals in 2007. The highest fall haul-out count (144 animals) was recorded during the first year of occurrence, in 2005, and the lowest was observed in 2007 with only two seals. No adults have been observed at VAFB, and no elephant seals were present at VAFB during the 2003 through 2007 winter breeding seasons. As of January 2008, no adult elephant seals had shown up for the breeding season. The nearest regularly used elephant seal haul-out site (non-breeding) is at Point Conception, 25 km south of VAFB (Figure 1). As many as 35 juvenile and sub-adult males seals haul out there.

3.3.2. NCI

Elephant seals primarily use SMI and Santa Rosa Island for breeding and hauling out to rest or to molt. As many as 12,000 elephant seal pups are born on SMI, and as many as 1,500 elephant seal pups are born on Santa Rosa Island (Lowry 2002).

3.4. NORTHERN FUR SEAL (*Callorhinus ursinus*)

3.4.1. VAFB

There are no reports of northern fur seals on VAFB.

Table 8. Elephant seal observations at VAFB for 2003 through 2007.

Year	Spring Molt Count	Fall Haul-out Count
2003 ⁽¹⁾	98	--
2004 ⁽²⁾	188	--
2005 ⁽³⁾	96	144
2006 ⁽⁴⁾	32	18
2007 ⁽⁵⁾	6	2

Notes:

1. SRS Technologies 2003b.
2. SRS Technologies 2004a.
3. SRS Technologies 2006.
4. SRS Technologies 2007.
5. ManTech SRS Technologies Inc. 2008a.

3.4.2. NCI

Northern fur seals are only found on the west end of SMI at Point Bennett and Castle Rock, just offshore of SMI. The San Miguel stock is approximately 9,424 fur seals (Carretta et al. 2007).

3.5. STELLER SEA LION (*Eumetopias jubatus*)

3.5.1. VAFB

There are no reports of Steller sea lions on VAFB.

3.5.2. NCI

A single observation of a sub adult male Steller sea lion on SMI was made in the spring of 1998 prior to the breeding season (Thorson et al. 1999a). Previously, the last observation of a Steller sea lion was made in the mid-1980's.

3.6. GUADALUPE FUR SEAL (*Arctocephalus townsendi*)

3.6.1. VAFB

There are no reports of Guadalupe fur seals on VAFB.

3.6.2. NCI

Zero to two Guadalupe fur seals are seen each year at SMI, generally in the summer (Melin and DeLong 1999; Sharon Melin, NMFS/NMML, pers. comm.).

4. DESCRIPTION OF THE STATUS, DISTRIBUTION, AND SEASONAL DISTRIBUTION OF AFFECTED SPECIES OR STOCKS OF MARINE MAMMALS LIKELY TO BE AFFECTED BY SUCH ACTIVITIES.

4.1. PACIFIC HARBOR SEAL (CALIFORNIA STOCK)

Status: The California population of harbor seals is considered a separate stock from harbor seals in Oregon and Washington (Carretta et al. 2001). Not all harbor seals, including pups, are on shore at one time; therefore, correction factors that take into account the number of harbor seals at sea during the molting season are used to calculate the total population. Correction factors vary from 1.21 to 2.0 (Hanan 1996, Boveng 1988, Huber 1995, SRS Technologies 2001). Based on the most recent harbor seal counts (Lowry et al. 2005) and a revised correction factor by Hanan of 1.3, the estimated population of harbor seals in California is 34,233 (Carretta et al. 2007). Using Hanan's (1996) correction factor of 1.2, the minimum size of the California harbor seal population is 31,600 (Carretta et al. 2007). Net production rates appeared to be decreasing from 1982 to 1994 and the population may be approaching its environmental carrying capacity (Carretta et al. 2007). In contrast, the harbor seal population at VAFB had been increasing at a rate of 12.7% annually but may be stabilizing now with little growth in the last four years (ManTech SRS Technologies Inc. [MSRS] 2008b). The California stock of harbor seals is not considered threatened or endangered under the Endangered Species Act and is not depleted or considered a strategic stock under the Marine Mammal Protection Act (Carretta et al. 2007).

Distribution: Harbor seals are found hauled out in estuaries, on offshore islands and mainland coves, beaches and offshore rocks and reefs along the California coast. Harbor seals occur both in remote locations (e.g. Channel Islands) as well as in populated areas (San Francisco Bay and La Jolla), but generally avoid populated areas that are prone to disturbance. Haul-out behavior is also influenced by tide and swell in some locations, weather conditions, and prey availability. Harbor seals generally forage locally (within 50 km) as opposed to elephant seals that are long distance foragers (as far as 2000 km).

Seasonal Distribution: Harbor seals forage locally; therefore there is no long-term migration or the foraging sojourns seen in other pinniped species. The population of harbor seals hauling out begins to increase during the pupping season (January through June). The start of pupping season varies with latitude, with southern California starting in January, and central California in March and April. The number of seals hauled out

reaches its peak during May through July when seals haul out more often and for longer periods to molt.

4.2. CALIFORNIA SEA LION

Status: The California sea lion subspecies, *Zalophus californianus californianus*, extends from Baja California, Mexico to southwestern Canada, although breeding only occurs from the Gulf of California in Mexico, through southern California. The United States stock begins at the California/Mexico border and extends north to Canada (Forney et al. 2000a) with the major rookeries at San Miguel and San Nicolas Islands. The California sea lion is not considered threatened or endangered under the Endangered Species Act and is not depleted or considered a strategic stock under the Marine Mammal Protection Act (Carretta et al. 2007).

The population of sea lions in the United States stock is calculated using the number of pups counted in July and the proportion of pups on shore (22.8 to 23.9% of the population). With El Niño events (1983, 1992, 1993, and 1998) removed from 1975 – 2001 time series data, pup counts have increased at an annual rate of 6.1% (Carretta et al. 2007). The population estimates are calculated to range between 244,000 to 237,000 (Carretta et al. 2007). A minimum population size was determined from counts of all age and sex classes ashore at major rookeries and haul-outs during the 2001 breeding season, and was estimated at 138,881 (Carretta et al. 2007).

Distribution: The breeding range of the California sea lion's California stock extends from the Mexican border north to Año Nuevo Island in central California. San Miguel and San Nicolas Islands are the main breeding rookeries for the California sea lion with approximately 23,000 pups born annually.

Seasonal Distribution: The breeding season begins in late May with pupping completed by early July. Females arrive on the beach, give birth within several days of arriving, and mate about 7 days after birth. Females then go to sea for several days to forage and periodically return to nurse their pup. This pattern continues for 8 to 12 months when the next pup is born. Adult males remain on territory through the breeding season and then leave in late July to forage, with most animals moving north. Juveniles may also move north, and large numbers of juveniles and sub adult males may be found on haul-outs in the fall during the molt.

4.3. NORTHERN ELEPHANT SEAL (CALIFORNIA BREEDING STOCK)

Status: The California breeding stock of the northern elephant seal begins at the United States-Mexico border with breeding continuing north to the south-east Farallon Islands. The total population of the California stock of northern elephant seals was estimated at 101,000 in 2001, based on a pup count of 28,845 and using a multiplier of 3.5 for a growing population (Carretta et al. 2007). On SMI, as many as 17,000 pups are born each year, and as many as 40,000 total elephant seals are hauled out during the peak of the breeding season in January. The northern elephant seal is not considered threatened or endangered under the Endangered Species Act and is not depleted or

considered a strategic stock under the Marine Mammal Protection Act (Carretta et al. 2007)

Distribution: The breeding distribution of the California stock of the northern elephant seal extends from the Channel Islands, mainly San Miguel and San Nicolas Islands, north to the south-east Farallon Islands. Northern elephant seals utilize both offshore islands (San Miguel, San Nicolas, Año Nuevo, and south-east Farallon Islands) and mainland sites (Point Piedras Blancas, Año Nuevo, and Point Reyes) for breeding, molting and resting. Females migrate north to forage, staying south of 45° latitude and moving off the continental shelf, while males migrate to the Gulf of Alaska and Aleutian Islands. Juveniles also tend to move north but not as far as the adults.

Seasonal Distribution: The breeding season extends from December through March. Females leave to forage and return to molt from April through June. Males return to molt in July through August. Juveniles return to molt in April through June, and many haul out again in the fall to rest. Molting or resting elephant seals use the traditional breeding sites but also use sites to the north, including areas in Oregon and Washington.

4.4. NORTHERN FUR SEAL (SAN MIGUEL STOCK)

Status: Fur seals are mostly found on the Pribilof Islands in the Bering Sea. In 1997, the total population of the San Miguel stock was calculated at 12,272 based on a pup count of 3,068 and an expansion factor of 4.0. In 1998, an El Niño year, the San Miguel stock pup count decreased by 79.6% to only 627 pups, but had increased to 1,084 pups in 1999. The population on the island has been steadily increasing with the exception of 1983 and 1998, both El Niño years. The San Miguel stock was estimated to be 9,424 northern fur seals in 2005, based on a count of 2,356 pups (Carretta et al. 2007). The San Miguel stock of the northern fur seal is not considered threatened or endangered under the Endangered Species Act and is not depleted or considered a strategic stock under the Marine Mammal Protection Act (Carretta et al. 2007).

Distribution: Fur seals are sighted at sea. Injured or sick fur seals occasionally strand along the central and northern California coast.

Seasonal Distribution: SMI is the only breeding area of San Miguel stock. Northern fur seals pup from June through July and breed from June through August on SMI. Mothers alternate periods of foraging at sea and returning to nurse the pup for approximately 4 months, when the pup is weaned. Some pups and juveniles may be present throughout the year at SMI, but males leave after the breeding season (late July), and females leave after weaning the pup (October).

4.5. STELLER SEA LION (EASTERN UNITED STATES STOCK)

Status: Steller sea lions range from Japan through Alaska, and down the west coast of the United States into California. Using 2005 pup counts available by region from aerial surveys across the range of the eastern stock, the eastern stock total population is estimated to be 47,885, and a minimum population is estimated at 44,555 (not corrected

for animals at sea) (Angliss and Outlaw 2007). The last comprehensive census in California was completed in 1996, and 2,042 Steller sea lions were counted including pups and non-pups. The Steller sea lion population in California has declined from historic numbers by 50% during 1980-2001 (Angliss and Outlaw 2007). Currently, the population in northern California appears stable; however, pup production has been declining since 1990 at a rate of 5.0% annually at Año Nuevo Island (central California) since 1990 (Angliss and Outlaw 2007). Overall, the Steller sea lion eastern stock has been increasing. Steller sea lions have been increasing in the areas of Southeast Alaska, British Columbia and Oregon, but declining in California. The Steller sea lion is considered threatened under the Endangered Species Act and is designated as depleted and a strategic stock under the Marine Mammal Protection Act (Angliss and Outlaw 2007).

Distribution: Steller sea lions range from Japan, through the Aleutian Islands, southeast Alaska, south to British Columbia and California. The population is broken into two stocks, the western United States stock extending west from Cape Suckling, Alaska (144° W) and the eastern United States stock extending east and south from Cape Suckling. Año Nuevo Island, in central California, is the southernmost breeding rookery although historically, they bred at SMI prior to 1980. Currently, Steller sea lions are rarely seen in the NCI.

Seasonal Distribution: Steller sea lions pup in May through July at the Año Nuevo rookery in central California. Females alternate between foraging periods at sea, and returning to the rookery to nurse their pup. Females continue this pattern until the pups are weaned at about 6 to 11 months. Adult males remain on the rookery throughout the breeding season, and then leave by September, migrating north to forage. Small numbers of juveniles and sub-adult males may be present at the rookery throughout the year.

4.6. GUADALUPE FUR SEAL

Status: Gallo (1994) estimated the Guadalupe fur seal population at 7,408 in 1993, by multiplying the number of pups by a factor of 4.0. Based on counts from several researchers since 1988 at different times of the year, Gallo calculated an exponential increase of 13.7% annually (Gallo 1994). A single pup was born on SMI in 1997, but no others since. The Guadalupe fur seal is listed as threatened under the Endangered Species Act and as depleted and a strategic stock under the Marine Mammal Protection Act (Forney et al. 2000b).

Distribution: Guadalupe fur seals breed primarily on Isla Guadalupe and Isla Benito del Este in Baja California, Mexico. Observations of single fur seals are not uncommon on San Miguel and San Nicolas Islands. Melin and DeLong (1999) reported one mother and pup at SMI.

Seasonal Distribution: Guadalupe fur seals give birth in June through July, and may nurse their pup for as long as 11 months. Guadalupe fur seals are generally non-migratory, but small numbers may move up to California and occasionally to SMI.

5. TYPE OF INCIDENTAL TAKING AUTHORIZATION BEING REQUESTED AND THE METHOD OF INCIDENTAL TAKING.

Pinnipeds will be taken by incidental harassment (i.e., lift head, move toward the water or enter the water) by noise or visual disturbance from SLV and missile launches, and aircraft and helicopter operations. The following information provides background on marine mammal response to launch noise that have been gathered under the previous five-year programmatic permit held by VAFB, as well as their scientific research permit (Permit No. 859-1680-00) for a research program to determine the short and long-term effects of space vehicle launch noise and sonic booms on affected marine mammals. Research activities on VAFB will continue under the current scientific research permit extension (Permit No. 859-1680-01) issued to the U.S. Air Force, 30 SW, VAFB on 10 December 2007, as well any future permits granted.

5.1. MARINE MAMMAL RESPONSE TO LAUNCH NOISE

Seals may leave the haul-out site and enter the water due to the noise created by launch vehicles during launch operations. The percentage of seals leaving the haul-out increases with noise level up to approximately 100 dB A-weighted SEL, after which almost all seals leave, although data has shown that some percentage of seals have remained on shore during launches. Time-lapse video photography during four launch events revealed that the seals that reacted to the launch noise, but did not leave the haul-out, were all adults. Because adult seals reacted less strongly than other younger seals, this suggests that adults had likely experienced other launch disturbances and had habituated to them.

The louder the launch noise, the longer it takes for seals to begin returning to the haul-out site, and for the numbers to return to pre-launch levels. Seals may begin to return to the haul-out site within 2 to 55 minutes of the launch disturbance and the haul-out site usually returned to pre-launch levels with 45 to 120 minutes. The two Athena IKONOS launches had A-weighted SELs of 107.3 and 107.8 dB at the closest haul-out site; seals began to haul-out again approximately 16 to 55 minutes post-launch (Thorson et al. 1999a; 1999b). In contrast, noise levels from an Atlas launch and several Titan II launches had A-weighted SELs ranging from 86.7 to 95.7 dB at the closest haul-out, and seals began to return to the haul-out site within 2 to 8 minutes post-launch (Thorson and Francine 1997; Thorson et al. 2000).

5.2. HAUL-OUT BEHAVIOR AND POPULATION DYNAMICS

During the scientific research program, haul-out behavior was determined by capturing and attaching radio frequency transmitters to the hind flippers of 41 harbor seals. Twenty-four seals were tagged in the Rocky Point area of south VAFB, and 17 were tagged at Point Conception (control site; Figure 1). The tagged seals ranged in age from pups (4 months) through adults. A radio receiver-scanner and electronic data logger were stationed on the cliffs above each haul-out site, and recorded the presence of any radio tagged seal every 15 minutes while the seals are hauled out of the water.

The time of arrival, time of departure, and time on shore, could be calculated from the data collected by the telemetry system.

The main influence on the daily haul-out patterns of harbor seals on south VAFB was the time of day ($r^2 = 0.72$; $n = 423$) rather than tide height ($r^2 = 0.23$; $n = 423$), as the peak number of seals hauled out occurred daily between 1100 and 1700 hours. Haul-out behavior was also influenced by combinations of high tide and large swell, or high temperature and no wind. Either of these combinations may cause seals not to haul out at all, or to leave the haul-out site early. Seals remained on shore for 8.1 ± 1.6 hours (range 1.2 - 14.7 hours). There was no significant difference in the time of day or duration of hauling out between south VAFB and Point Conception (t-test, $P > .05$).

Site fidelity, which is defined herein as an individual's continued use of the same haul-out area for at least six months, was high at both south VAFB and Point Conception. The mean site fidelity at VAFB was 77% (adults 84%, juveniles 72% and pups 63%), and at Point Conception was 71% (adults 81%, juveniles 74% and pups 53%). The trend of increasing site fidelity with age is common in all harbor seal populations, as young seals cannot compete for haul-out space with adults, and move to other less preferred haul-out sites (Kovacs et al. 1990; Suryan and Harvey 1998). There have been four juveniles tagged at Point Conception that have moved to VAFB but no juveniles have moved from VAFB to Point Conception.

The total population of harbor seals at VAFB in 2002 was estimated to be 1,115 (850 on south VAFB and 265 on north VAFB; SRS Technologies 2003a), using telemetry data to correct for seals that were at sea during the census. A correction factor of 1.7 times the ground count was used. From 2000 through 2007 there were three to seven SLV launches per year (average of 4.4 SLV launches annually), and there appeared to be only short-term disturbance effects to harbor seals as a result of launch noise. The harbor seal population increased from 1997 to 2002 at an annual rate of 12.7%; however, the number of total harbor seals on south VAFB was lower in 2007 (356 seals) than 2006 (511 seals). The only decrease in the population during the 1997 to 2002 period occurred during the 1998 El Niño season, when there was a 13.6% decrease from the previous year. The number of harbor seal pups observed increased at a rate of 26.7% annually through 2003, except during the El Niño events. The number of pups on south VAFB continued to increase from 2004 through 2006 (high of 53 pups) but fell again in 2007 (38 pups). Pup production grew at a rate of 7.9% at Point Conception through 2006 except during El Niño events. Point Conception has limited area where females and pups can haul out without being harassed by other seals, or exposed to high tides and swells. There are more haul-out areas for females with pups at VAFB; therefore only an El Niño type disturbance, which includes weather and food availability effects, should affect pup production at VAFB.

5.3. AUDITORY BRAINSTEM RESPONSE TESTS

To determine if harbor seals experience changes in their hearing sensitivity as a result of launch noise, Auditory Brainstem Response (ABR) testing was conducted on 18 harbor seals for four Titan IV launches, one Taurus launch, and one Delta IV launch.

Following standard ABR testing protocol, the ABR was measured from one ear of each seal using sterile, sub-dermal, stainless steel electrodes. A conventional electrode array was used, and low-level white noise was presented to the non-tested ear to reduce any electrical potentials generated by the non-tested ear. A Bio-logic Systems Corporation evoked potential computer produced the click and 8 kilohertz (kHz) tone burst stimuli, through standard audiometric headphones. Over 1,000 ABR waveforms were collected and averaged per trial. Initially the stimuli were presented at sound pressure levels (SPL) loud enough to obtain a clean reliable waveform, and then decreased in 10 dB steps until the response was no longer reliably observed. Once response was no longer reliably observed, the stimuli were then increased in 10 dB steps to the original SPL. By obtaining two ABR waveforms at each SPL, it was possible to quantify the variability in the measurements.

Good replicable responses were measured from most of the seals, with waveforms following the expected pattern of an increase in latency and decrease in amplitude of the peaks, as the stimulus level was lowered. One seal had substantial decreased acuity to the 8 kHz tone-burst stimuli prior to the launch. The cause of this hearing loss was unknown, but was most likely congenital or from infection. Another seal had a great deal of variability in waveform latencies in response to identical stimuli. This animal moved repeatedly during testing, which may have reduced the sensitivity of the ABR testing on this animal for both the click and 8 kHz tone burst stimuli. Two of the seals were released after pre-launch testing but prior to the launch of the Titan IV B-34, as the launch was delayed for many days, and five days is the maximum duration to hold the seals.

Detailed analysis of the changes in waveform latency and waveform replication of the ABR measurements for the 14 seals, showed no detectable changes in the seals' hearing sensitivity as a result of exposure to the launch noise. The delayed start (1.75 to 3.5 hours after the launches) for ABR testing allows for the possibility that the seals may have recovered from a temporary threshold shift before testing began. However, it can be said with confidence that the post-launch tested animals did not have permanent hearing changes due to exposure to the launch noise from the Titan IV, Taurus, or Delta IV SLVs.

6. AGE, SEX, AND REPRODUCTIVE CONDITION, NUMBER OF MARINE MAMMALS BY SPECIES THAT MAY BE TAKEN BY EACH TYPE OF TAKING, AND NUMBER OF TIMES SUCH TAKINGS BY EACH TYPE OF TAKING ARE LIKELY TO OCCUR.

6.1. NUMBER OF SLV AND MISSILE LAUNCHES

The number of SLV and missile launches per year at VAFB is variable and launch planning is a fluid process. Launch delays, which can last from one day to significant periods of time such as a year or more, can result from complex engineering issues that

arise during the launch process. Delays are also an inevitable part of a process that is, in part, dependent on acceptable meteorological conditions.

Although these issues are a recognized part of launch planning, VAFB's Range Scheduling Office schedules and tracks launches several years in advance. Manifests that predict approximately four years in advance are updated on a weekly basis.

The following table (Table 9) summarizes information from the most current manifests (dated 1 February 2008) available at the time this application was developed in order to provide best estimate available for upcoming years, with the understanding that launches may be added or eliminated in the future. As was submitted under the previous programmatic permit, VAFB would like to maintain a maximum number of 30 launches per year to be covered under this permit, to accommodate any potential changes in the manifests.

Table 9. Estimated numbers of launches from 2008 through 2014.

Fiscal Year	Estimated # of SLV Launches	Estimated # of ICBM and Missile Launches	Total
2008	7	6	13
2009	11	6	17
2010	5	5	10
2011	3	4	7
2012	7	4	11
2013	7	6	13
2014	4	7	11

Notes: Based on 30 SW 2008a and b.

6.2. AIRCRAFT OPERATIONS

All aircraft, including helicopters, will continue to be required to remain outside of the 1,000-foot bubble around pinniped rookeries or haul-out sites, except when performing a life-or-death rescue mission, when responding to a security incident, or during an aircraft emergency.

6.3. VANDENBERG AIR FORCE BASE

Harbor seals: As many as 600 harbor seals per launch may be taken. Depending on the type of rocket being launched, the time of day, time of the year, weather conditions, tide and swell conditions, the number of seals that may be taken will range between 0 and 600. Launches and aircraft operations may occur at any time of the year so any age classes and gender may be taken. Aircraft operations may occur frequently but will avoid pinniped haul-out areas and are not likely to disturb pinnipeds.

California sea lions: As many as 200 sea lions per launch may be taken. Sea lions at VAFB are usually juveniles of both sexes and sub-adult males that haul-out in the fall during the post breeding dispersal. Births generally do not occur at VAFB but five pups

were observed at VAFB in 2003, an El Niño year, although all were abandoned by their mothers and died within several days of birth. Sick or emaciated weaned pups may also haul out briefly.

Northern elephant seals: As many as 200 elephant seals per launch may be taken. Weaned elephant seal pups, juveniles, or young adults of both sexes, may occasionally haul out at VAFB for several days to rest, or as long as 30 days to molt. Injured or sick seals may also haul out briefly.

Northern fur seals: There are no reports of northern fur seals at VAFB; therefore it is unlikely that any fur seals will haul out.

Steller sea lion: There are no reports of Steller sea lions at VAFB; therefore it is unlikely that any Steller sea lions will haul out.

Guadalupe fur seal: There are no reports of Guadalupe fur seals at VAFB; therefore, it is unlikely that any will haul out.

6.4. NORTHERN CHANNEL ISLANDS

Sonic booms created by SLVs may impact marine mammals on the NCI, particularly SMI. Missile launches utilize westward trajectories, so do not cause sonic boom impacts to the NCI.

The PCBoom sonic boom modeling program will continue to be used to predict the area of sonic boom impact and magnitude of the sonic boom on the NCI based on the launch vehicle, speed, trajectory, and meteorological conditions. Prior to each SLV launch a predictive sonic boom map of the impact area and magnitude of the sonic boom will be generated. Based on previous monitoring of sonic booms created by SLVs on SMI (Thorson et al. 1999a; 1999b), it is estimated that as much as approximately 25% of the marine mammals may be disturbed on SMI (Thorson et al. 1999a; 1999b). Most sonic booms that reach SMI are small (<1.0 psf), although larger sonic booms are possible, but rarely occur. A conservative take estimate of as much as 25% of the animals present is used for each species per launch.

Harbor seals: As many as 200 harbor seals of all age classes and sexes may be taken per launch on the NCI. The number of harbor seals taken will depend on the type of SLV, location of the sonic boom, weather conditions that influence the size of the sonic boom, the time of day, and time of year. The number of harbor seals that may be taken will range between 0 and 200.

California sea lions: As many as 5,800 sea lion pups and 2,500 juvenile and adult sea lions of either sex may be taken on the NCI per launch. The number of sea lions taken will depend on the type of SLV, location of the sonic boom, weather conditions that influence the size of the sonic boom, the time of day, and time of year. The number of sea lions that may be taken will range between 0 and 8,300.

Northern elephant seals: As many as 3,000 northern elephant seal pups and 10,000 northern elephant seals of all age classes and sexes may be taken per launch on the NCI. The number of seals taken will depend on the type of SLV, location of the sonic boom, weather conditions that influence the size of the sonic boom, the time of day, and

time of year. The number of elephant seals that may be taken will range between 0 and 13,000.

Northern fur seals: As many as 300 northern fur seal pups, and 1,100 juvenile and adult northern fur seals of both sexes may be taken per launch at SMI. The number of fur seals taken will depend on the type of launch vehicle, location of the sonic boom, weather conditions that influence the size of the sonic boom, the time of day, and time of year. The number of fur seals that may be taken will range between 0 and 1,100.

Steller sea lions: Because the last observation of a Steller sea lion on the NCI occurred in 1998, no takes of Steller sea lions are anticipated.

Guadalupe fur seal: Because only one to two non-breeding Guadalupe fur seals occur at the NCI for a short period of time each year, no takes of Guadalupe fur seals are anticipated.

7. ANTICIPATED IMPACT OF THE ACTIVITY UPON SPECIES OR STOCK.

There is no anticipated impact on any of the species or stocks of marine mammals listed in this application from launches at VAFB. There will only be brief disturbances that may cause pinnipeds to temporarily leave the haul-out site and enter the water. Under the scientific research permit issued to the U.S. Air Force, 30 SW, research will continue to be conducted concurrently, to determine if there are any impacts to the haul-out and reproductive behavior, population dynamics and hearing abilities of pinnipeds exposed to rocket launch noise and sonic booms.

8. ANTICIPATED IMPACT OF ACTIVITIES ON AVAILABILITY OF SPECIES OR STOCKS OF MARINE MAMMALS FOR SUBSISTENCE USES.

Not applicable. There is no subsistence use of marine mammals in the vicinity of VAFB or the NCI.

9. ANTICIPATED IMPACT OF ACTIVITIES UPON THE HABITAT OF MARINE MAMMAL POPULATIONS, AND LIKELIHOOD OF RESTORATION OF AFFECTED HABITAT.

Not applicable. Activities are not anticipated to impact marine mammal habitats. Restoration activities would not be necessary.

10. ANTICIPATED IMPACT OF LOSS OR MODIFICATION OF THE HABITAT ON THE MARINE MAMMAL POPULATIONS INVOLVED.

Not applicable. No loss or modification of marine mammal habitat is anticipated. Populations would not be affected by a habitat loss.

11. AVAILABILITY AND FEASIBILITY OF EQUIPMENT, METHODS, AND MANNER OF CONDUCTING ACTIVITY OR OTHER MEANS OF EFFECTING THE LEAST PRACTICABLE ADVERSE IMPACT UPON AFFECTED SPECIES OR STOCKS, THEIR HABITAT, AVAILABILITY FOR SUBSISTENCE USES.

The myriad of operations and requirements associated with each SLV and missile launch preclude the ability to easily alter or modify launch schedules. Launch dates are often scheduled months or years in advance. As the launch date approaches, small technical issues and concerns frequently create short-term alterations to the launch schedule, or delay launches for long periods. Therefore, it is not practicable to modify launch schedules. Required monitoring and procedures in place for marine mammal protection, ensure the least practicable adverse impacts from launches to marine mammals and their habitats on VAFB and the NCI.

The use of approved aircraft routes for testing and evaluation, as well as the requirement to remain outside of the 1,000-foot bubble around pinniped rookeries or haul-out sites, except in emergency situations, ensures the least practicable adverse impact from aircraft operations to marine mammals and their habitats on VAFB.

12. PLAN OF COOPERATION OR INFORMATION ON MEASURES TAKEN TO MINIMIZE ADVERSE EFFECTS ON AVAILABILITY OF MARINE MAMMALS FOR SUBSISTENCE USES WHERE PROPOSED ACTIVITY WOULD TAKE PLACE IN OR NEAR TRADITIONAL ARCTIC SUBSISTENCE HUNTING AREA AND/OR AFFECT THE AVAILABILITY OF SPECIES OR STOCKS OF MARINE MAMMALS FOR ARCTIC SUBSISTENCE USES.

Not applicable. The proposed activities would not take place in or near a traditional Arctic subsistence hunting area, or affect the availability of a species or stock of marine mammals for Arctic subsistence uses.

13. SUGGESTED MEANS OF ACCOMPLISHING NECESSARY MONITORING AND REPORTING THAT WILL RESULT IN INCREASED KNOWLEDGE OF SPECIES, LEVELS OF TAKING OR IMPACTS ON POPULATIONS OF MARINE MAMMALS EXPECTED TO BE PRESENT DURING ACTIVITIES AND SUGGESTED MEANS OF MINIMIZING BURDENS BY COORDINATION.

The monitoring and reporting protocol proposed in this application is similar to that used during the former five-year programmatic permit, and meets the requirements contained within the Letter of Authorization issued to the U.S. Air Force (13 March 2007). The research program begun in 1997 to study the effects of SLV and missile launch noise and sonic booms on the behavior, hearing ability, and population dynamics of pinnipeds at VAFB and the northern Channel Islands will continue under the current scientific research permit extension (Permit No. 859-1680-01), issued to the U.S. Air Force, 30 SW, VAFB, on 10 December 2007, as well any future permits granted.

13.1. SUMMARY OF MONITORING PROTOCOLS FOR VAFB

For launches that occur during the harbor seal pupping season (1 March to 30 June), monitoring will be conducted by at least one NOAA NMFS-approved marine mammal observer, trained in marine mammal science, at each appropriate pinniped monitoring location, to record the effects of launches on pinniped populations.

Monitoring at the haul-out site closest to the appropriate launch facility will commence at least 72 hours prior to the launch and continue until at least 48 hours after the launch. During the pupping season, a follow-up survey will be made within two weeks of the launch to ensure that there were no adverse effects to marine mammals.

During the pupping season, and for launches that occur during daylight, the above monitoring will be supplemented with video recording of mother-pup seal responses to the launch.

Acoustic and biological monitoring will be conducted for new SLVs and ICBMs during at least the first launch, whether it occurs within the pupping season or not. Also, the remaining third, of the three initial Delta IV launches, will be monitored, and ABR testing of seals in close proximity to the launch is planned.

Monitoring for each launch will include multiple surveys each day that record, when possible, the species, number of animals, general behavior, presence of pups, age class, gender, and reaction to launch noise (only during the harbor seal pupping season), sonic booms, or other natural or human-caused disturbances. Environmental conditions such as tide, wind speed, air temperature, and swell will also be recorded.

A report detailing the collected information will be submitted to the NOAA NMFS within 120 days of each monitored launch.

13.2. SUMMARY OF MONITORING PROTOCOLS FOR THE NCI

Using a sonic boom prediction model to determine the location of sonic booms in the vicinity of the NCI, biological and acoustic monitoring will be conducted on the NCI (San Miguel, Santa Cruz, and/or Santa Rosa Islands) whenever a sonic boom greater than 1.0 psf is predicted to impact one of the islands.

Monitoring will be conducted at the closest significant haul-out site to the sonic boom impact area.

Monitoring will be conducted by at least one NOAA NMFS-approved marine mammal observer, trained in marine mammal science.

Monitoring will commence at least 72 hours prior to the launch and continue until at least 48 hours after the launch, unless no sonic boom is detected by the monitors and the acoustic recording equipment, at which time monitoring would be stopped.

Monitoring for each launch will include multiple surveys each day that record, when possible, the species, number of animals, general behavior, presence of pups, age class, gender, and reaction to launch noise, sonic booms or other natural or human-caused disturbances. Environmental conditions such as tide, wind speed, air temperature, and swell will also be recorded. Due to the large numbers of pinnipeds found on some beaches of SMI, smaller focal groups should be monitored in detail rather than the entire beach population. A general estimate of the entire beach population should be made once a day and their reaction to the launch noise noted.

During the pupping season, and for launches that occur during daylight, the above monitoring will be supplemented with photography or video recording of mother-pup seal responses to the launch.

During the pupping season of any species affected by a launch (Table 7), a follow-up survey will be made within two weeks of the launch to ensure that there were no adverse effects on any marine mammals.

A report detailing the collected information will be submitted to the NOAA NMFS within 120 days of each monitored launch.

14. SUGGESTED MEANS OF LEARNING OF, ENCOURAGING, AND COORDINATING RESEARCH OPPORTUNITIES, PLANS, AND ACTIVITIES RELATED TO REDUCING SUCH INCIDENTAL TAKING AND EVALUATING ITS EFFECTS.

Prior to each launch that may impact the NCI, Channel Islands National Park personnel are briefed on the type of launch, time and date of launch and anticipated effects. Marine mammal monitors work with the National Park Service to monitor the effects of launch noise and sonic booms on pinnipeds. When launches may impact SMI, the NMFS/NMML research group is briefed on the type of launch, time and date of launch and anticipated effects. When possible the marine mammal monitors coordinate travel

to SMI and use of the NMFS research station, with the NMFS researchers and National Park Service personnel. Harbor seal census data from VAFB and Point Conception have been provided to NMFS Southwest region and to other researchers working with the Pacific Fisheries Research Council. Information on pinniped responses to launch noise was provided to NMFS Office of Science and Technology (Southall et al. 2007).

15. SECTION 7 CONSULTATION AND BIOLOGICAL OPINIONS

Section 7 consultations for the southern sea otter (*Enhydra lutris nereis*) were completed with the U.S. Fish and Wildlife Service. Biological Opinions are in effect for current launch programs on VAFB with the potential to affect southern sea otters (U.S. Fish and Wildlife Service 1999, 2001). No other threatened or endangered marine mammals are expected to be taken under the described activities.

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