

launches may provide a potential secondary source of incidental harassment of seals and sea lions. The physical presence of aircraft could also lead to non-acoustic effects on marine mammals involving visual or other cues. There are no anticipated effects from human presence on the beaches, since movements of personnel are restricted near the launch sites two hours prior to launches for safety reasons.

Reactions of pinnipeds on the western end of SNI to Vandal target launches have not been well-studied, but based on monitoring studies conducted under the IHA for this activity on SNI in 2001 and 2002, and on other rocket launch activities and their effects on pinnipeds in the Channel Islands (Stewart *et al.*, 1993), anticipated impacts can be predicted. In general, studies have shown that responses of pinnipeds on beaches to acoustic disturbance arising from rocket and target missile launches are highly variable. This variability may be due to many factors, including species, age class, and time of year. Among species, northern elephant seals seem very tolerant of acoustic disturbances (Stewart, 1981), whereas harbor seals (particularly outside the breeding season) seem more easily disturbed. Research and monitoring at Vandenberg Air Force Base found that prolonged or repeated sonic booms, very strong sonic booms, or sonic booms accompanying a visual stimulus, such as a passing aircraft, are most likely to stimulate seals to leave the haul-out area and move into the water. During three launches of Vandal missiles from SNI, California sea lions near the launch track line were observed from video recordings to be disturbed and to flee (both up and down the beach) from their former resting positions. Launches of the smaller BQM-34 targets from NAS have not normally resulted in harbor seals leaving their haul-out area at the mouth of Mugu Lagoon, which is approximately 3.2 km (2 mi) from the launch site. An Exocet missile launched from the west end of SNI appeared to cause far less disturbance to hauled out California sea lions than Vandal launches.

Given the variability in pinniped response to acoustic disturbance, as supported by recent IHA monitoring (Lawson *et al.*, 2002), the Navy (NAWS, 2002) conservatively assumes that biologically significant disturbance (i.e., Level B harassment) will sometimes occur upon exposure to launch sounds with SEL's of 100 dBA (re 20 micro-Pa²-sec) or higher for California sea lions and northern elephant seals and 90 dBA for Pacific harbor seals. A biologically significant disturbance has been defined

by NMFS in several previous rulemakings (e.g., 66 FR 43442, August 17, 2001; 67 FR 46712, July 16, 2002) as a disturbance of a behavior pattern that has the potential to have an effect on the reproduction or survival of the animal or the species.

A conservative estimate of the SEL at which TTS (Level B harassment) may be elicited in harbor seals, California sea lions and northern elephant seals has been determined to be 145 dB (re 20 micro-Pa²-sec) and 165 dB (re 20 micro-Pa²-sec), respectively (Lawson *et al.*, 1998). The sound levels necessary to elicit mild TTS in captive California sea lions and harbor seals exposed to impulse noises, such as sonic booms, were tens of decibels higher (Bowles *et al.*, 1999) than sound levels measured during Vandal launches (Burgess and Greene, 1998; Greene, 1999). This evidence, in combination with the known sound levels produced by vehicles launched from SNI (described later in this document), suggests that no pinnipeds will be exposed to TTS-inducing SELs during planned launches.

Based on modeling of sound propagation in a free field situation, Burgess and Greene (1998) data were used by the Navy to predict that Vandal target launches from SNI could produce a 100-dBA acoustic contour that extends an estimated 4,263 m (13,986 ft) perpendicular to its launch track. In other words, Vandal target launch sounds are predicted to exceed the SEL (100 dBA) disturbance criteria out to a distance of 4,263 m (13,986 ft) from the ALC. Northern elephant seals, harbor seals, and California sea lions haul out in areas within the perimeter of this 100-dBA contour for Vandal launches. For BQM-34 launches from ALC, the Navy assumes that the 100 dBA contour extends an estimated 1,372 m (4,500 ft), perpendicular to its launch track (C. Malme, Engineering and Scientific Services, Hingham, MA, unpublished data). Along the launch track and ahead of the BQM-34, the 100 dBA contour extends a shorter distance (549 m or 1,800 ft). For the smaller BQM-74 and Exocet missiles, the Navy predicts that the 100 dBA contours will be smaller still. The free field modeling scenario used to predict these acoustic contours does not account for transmission losses caused by wind, intervening topography, and variations in launch trajectory or azimuth. Therefore, the predicted 100 dBA contours may be smaller at certain beach locations and for different launch trajectories.

In general, the extremely rapid departure of the Vandal and smaller targets means that pinnipeds could be

exposed to increased sound levels for very short time intervals (a few seconds) potentially leading to alert and startle responses from individuals on haul out sites in the vicinity of launches. Some animals may flee to the water. Since recorded observations of the responses of pinnipeds to Vandal launches along with post-launch surveys at the SNI haulouts have not shown injury, mortality, or extended biological disturbance, the Navy anticipates that the effects of the planned target launches will have no more than a negligible impact on pinniped populations.

Since the launches are relatively infrequent, and of brief duration, it is unlikely that the pinnipeds near the launch site will become habituated to launch sounds. Pinnipeds that haul out on beaches at the western end of SNI for extended periods, or that return to haul-out sites regularly over the course of the year, may be exposed to sounds of more than a single launch, and may be "harassed" more than once each year. However, given the infrequency and brevity of these events, it is unlikely that much, if any, habituation to target missile launch activities has occurred.

In addition, the infrequent and brief nature of these sounds will cause masking for not more than a very small fraction of the time (usually less than 2 seconds per launch) during any single day. Therefore, the Navy assumes that these occasional and brief episodes of masking will have no significant effects on the abilities of pinnipeds to hear one another or to detect natural environmental sounds that may be relevant to the animals.

Numbers of Marine Mammals Expected to Be Taken by Harassment

NAWS provisionally estimates that the following numbers of pinnipeds may be subject to Level B harassment annually: 1,403 northern elephant seals, 457 harbor seals, and 1,637 California sea lions. To determine the number of takings by harassment annually, one would need to multiply those numbers by the number of launches conducted annually. The animals affected may be the same animals or may be different animals, depending upon site fidelity of the species. Based on the results of recent monitoring of the haulouts, the estimated number of potential harassment takes would be significantly less than authorized under the two recent IHAs.