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KAUAI TEST FACILITY TWO EXPERIMENT ROCKET CAMPAIGN
ENVIRONMENTAL ASSESSMENT

SANDIA NATIONAL LABORATORIES
ALBUQUERQUE, NEW MEXICO

1990

U.S. DEPARTMENT OF ENERGY
ALBUQUERQUE OPERATIONS
ALBUQUERQUE, NEW MEXICO

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Kauai Test Facility Two Experiment Rocket Campaign

ENVIRONMENTAL ASSESSMENT

1.0 NEED FOR ACTION

Sandia National Laboratories (SNL) has major research and development responsibilities for defense-oriented engineering and development. This primary mission has led to support capabilities in a number of scientific and advanced development areas.

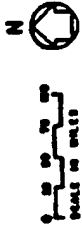
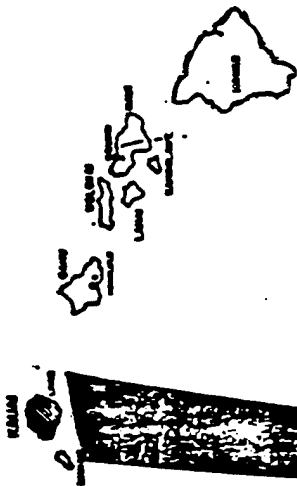
The Kauai Test Facility (KTF) is a Department of Energy (DOE) owned facility located at Barking Sands, on the west coast of the island of Kauai, Hawaii (Figs. 1 & 2). KTF is a tenant within the Department of Defense's (DoD) US Navy Pacific Missile Range Facility (PMRF). KTF administrative areas and principal launch field are at the northern end of PMRF. The KTF has a rocket preparation and launching capability for both rail-launched and vertical-launched rockets. Launches primarily support high altitude scientific research and re-entry vehicle systems and carry experimental non-nuclear payloads.

This environmental assessment (EA) has been prepared for the Two Experiment Rocket Campaign, during which the STRYPI/LACE (STRYPI is not an acronym - its the name of the rocket; LACE is the acronym for Low Altitude Compensation Experiment) and the RAP-501 (Rocket Accelerated Penetrator) will be flown in conjunction from the KTF in February 1991 to reduce costs. There have been numerous rocket campaigns at the KTF in prior years that have used the same motors to be used in the current two experiment rocket campaign. The main difference noted in this environmental documentation is that the two rockets have not previously been flown in conjunction. Previous National Environmental Policy Act (NEPA) approvals of launches using these motors were limited to different and separate campaigns with diverse sources of funding.

The STRYPI/LACE, designed to determine the spectral characteristics of rocket plumes, is part of an on-going program being conducted by the Naval Research Laboratory (NRL). Due to constraints on the life of the satellite used in the experiment, the rocket campaign is scheduled for February of 1991.

A separate experiment involving the RAP-501 is to be flown from KTF on a NIKE rocket to impact in the ocean as part of the Navy's BARSTER (Barking Sands Tactical Underwater Range) program. This experiment is part of an internal research and development program funded by the DOE Office of Military Applications within Defense Programs. This field exercise is to develop a pointed penetrator for water entry. Both rocket campaigns covered by the proposed action involve rail launched systems.

HAWAIIAN ISLANDS



LOCATION MAP

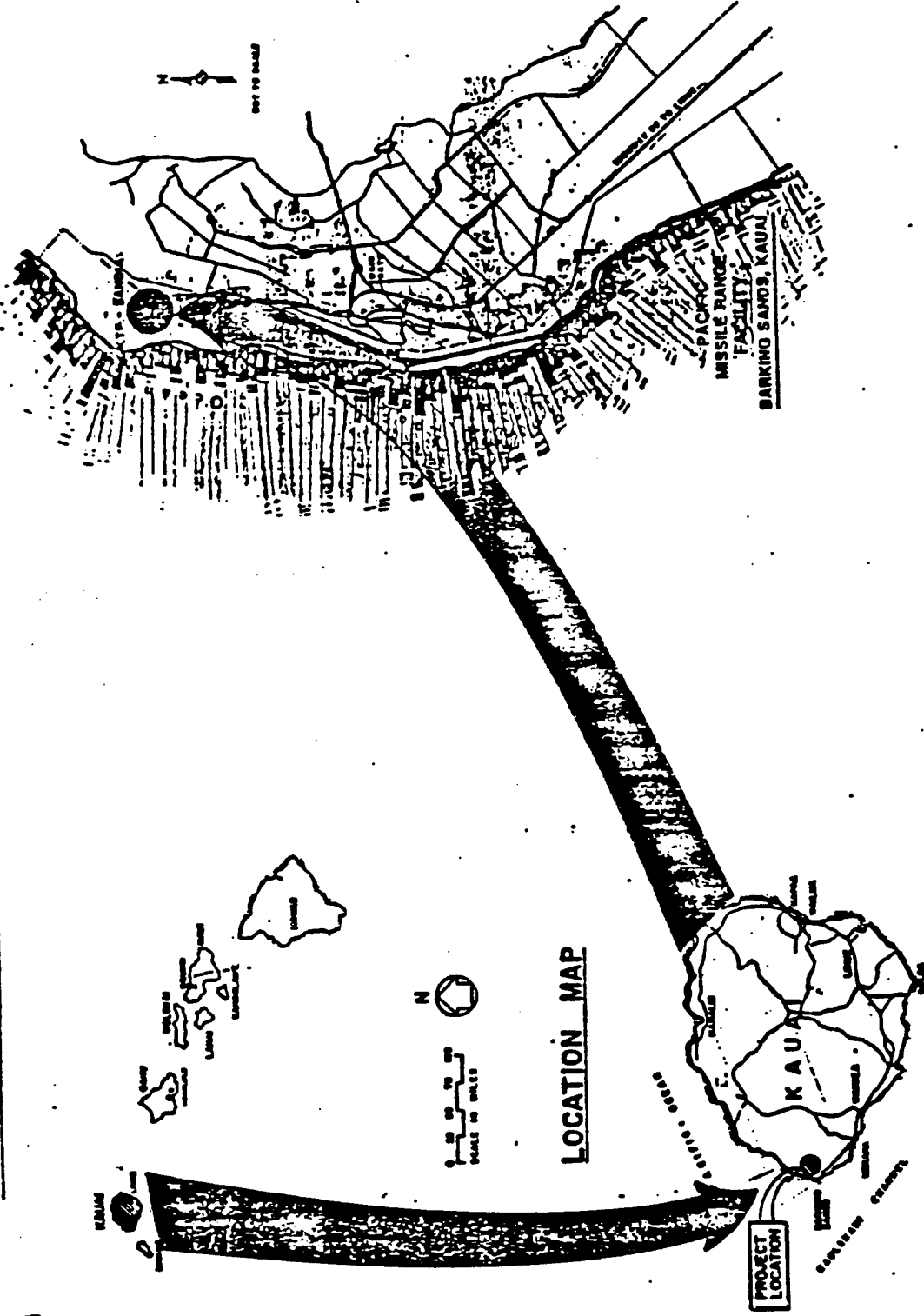


FIGURE 1

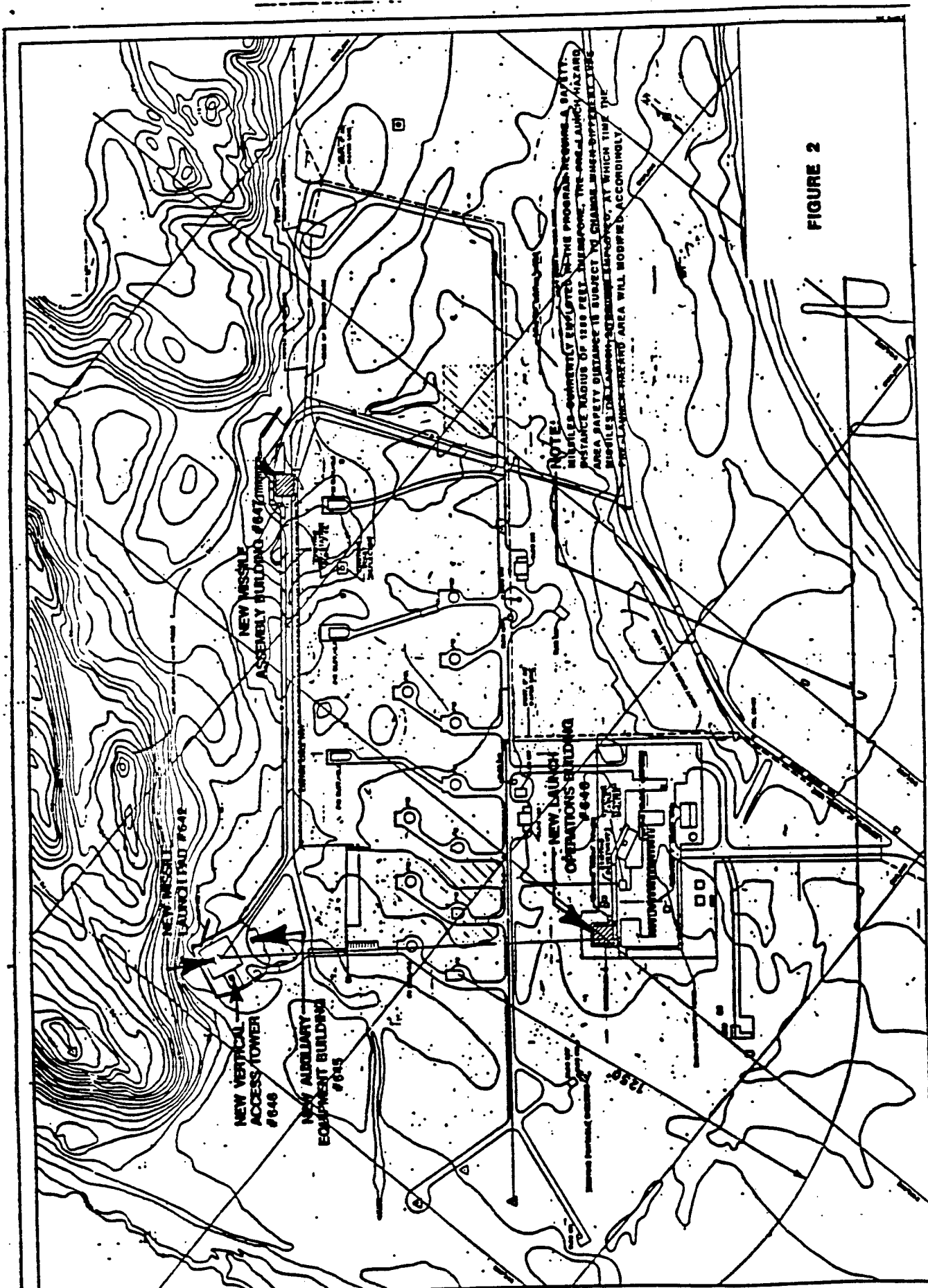


FIGURE 2

2.0 ALTERNATIVES

2.1 NO ACTION

The STRYPI/LACE experiment would not be flown. The project sponsors, the NRL and Strategic Defense Initiative Office (SDIO) personnel would not be able to obtain rocket plume measurements from above the earth's atmosphere.

The RAP-501 field exercise would not be conducted until a later date, depriving the Office of Military Application within DOE's Defense Programs of early access to the data that the experiment is designed to yield. Rescheduling the RAP-501 would increase program costs because DOE would not be able to utilize SDIO funded deployment of operational personnel.

2.2 THE PROPOSED ACTION

The proposed action is to conduct a two experiment rocket campaign, scheduled to be flown from the KTF in February of 1991.

Both experiments in the proposed rocket campaign would utilize rocket systems which have flown from the facility on numerous previous occasions. Since 1965, 22 STRYPI and 117 NIKE rocket systems have been flown from KTF carrying a variety of experimental payloads. The environmental consequences of utilization of the rocket motors have been addressed in previous environmental documentation (THORNY MERIT action description memorandum (ADM) and accompanying memorandum-to file (MTF) dated Oct. 20, 1988; the NUBE Rocket Launch ADM dated Sept. 21, 1988; the NIKE Powered Rocket Sled Tests ADM dated June 20, 1986) and are the subject of a comprehensive site-wide Environmental Assessment (site-wide EA) currently being prepared by the DOE. There have been no environmental or safety problems associated with the various past rocket launches at KTF.

Hardware required at the KTF to support the STRYPI/LACE and RAP-501 rocket launches is shipped from Albuquerque, NM, in compliance with all Department of Transportation (DOT) regulations. For the two subject programs, shipment will be by dedicated military aircraft. This shipment will arrive directly at the main runway of the PMRF and be transported by trained Navy personnel to the KTF (a maximum over the road distance of less than one mile).

Once equipment and personnel arrive at the KTF, the operation is timewise divided into three discrete parts as far as safety is concerned. The first part involves assembly of the rocket systems through placement on the launcher and countdown rehearsals. During this period, the rocket systems are physically separated from the electronics necessary for ignition (i.e. they are not armed). For the programs of interest, this

portion of the operation extends for a nominal three week period. The second part consists of the last one to two hours of the individual countdowns during which time arming and launch of the rocket systems is accomplished. The third and final time part involves the actual flight. This time period of on the order of 25 seconds for RAP-501 and approximately twelve minutes for STRYPI/LACE. Each of these parts is discussed separately.

The third part of the launch operations involves flight safety. This portion begins with the successful initiation of a flight. Flight safety at the KTF is the responsibility of the US Navy. The PMRF is subservient to the Pacific Missile Test Center (PMTC) at Pt. Mugu, CA. Sandia National Laboratories has prepared a flight safety package for both STRYPI/LACE and RAP-501 and has submitted them to the PMTC for approval. PMTC administratively provides flight approval for operations on the PMRF and supports these operations by having a flight safety officer at the PMRF during launch. For STRYPI/LACE, this flight safety officer will be with Sandia personnel in the KTF Launch Operations Building. Before a countdown begins for a launch, the Navy sends out a surveillance aircraft to look for shipping in the predicted impact areas for the various rocket motor stages and the payload. A notice to mariners is always put out by the Navy several days in advance of the launch operation. If the rocket flight poses a safety hazard to any shipping located by the aircraft in the predicted impact areas, the Navy orders the launch attempt aborted. STRYPI/LACE is much more complex than the RAP-501 rocket test and an onboard computer provides flight control. If the computer malfunctions, i.e. the rocket is not properly pointed, the ground command which permits the flight to proceed will not be transmitted to the rocket and the flight will be aborted.

The operations which occur during assembly of the rocket systems include such items as motor preparation, fin alignment, motor igniter installation, payload assembly and performance verification, installation of electro-explosive devices, assembly of the payload to the upper stages, pressurization of attitude control systems, and placement of the rocket system on the launcher. Finally, rehearsal countdowns are performed in preparation for the actual launch. Hazardous operations performed include such items as lifting of rocket motors with cranes and hoists, lifting of inert hardware with these same cranes and hoists, continuity measurements of bridgewires associated with the electro-explosive devices, application of high pressures, hands on operations involving the motors and electro-explosive devices, etc. Assurance of safe operations is accomplished through implementation of procedures such as load testing of all cranes, hoists, and handling equipment; proof testing all pressure systems; isolating stray voltages from all the explosives through shorting, shielding, and grounding; precluding the application of power or any power switching to the rocket system with any personnel in defined hazard areas; and

precluding high intensity radiation sources from being utilized in proximity to any explosives. Field meters in the launch area continually monitor for incipient lightning and detected voltage potentials above a prescribed threshold (2000 V/m) require cessation of all work on explosives in buildings which are not constructed as grounded metal shells. Guidance for the application of preventive measures to assure safe operations is found in Sandia National Laboratories Environment Safety and Health Manual (SAND 88-1161) and the DOE Explosives Safety Manual Revision 5, May 1990. In addition, Safe Operating Procedures (SOPs) are generated unique to each test program. For each program of interest, a "top SOP" has been generated identifying hazards unique to it. Subservient SOPs are then written containing procedures to mitigate these hazards. For STRYPI/Lace, 14 SOPs exist to mitigate these hazards. For RAP-501, the number is eight. All of these procedures have been approved by supervision responsible for the operation as well as Sandia National Laboratories Safety Engineering Division.

The STRYPI/LACE experiment would be flown on a SNL-developed STRYPI rocket system. The experiment will be part of an on-going program being conducted by the NRL, under SDIO sponsorship, to determine the optical characteristics of rocket plumes. The Ultraviolet Plume Instrument (UVPI) portion of the LACE Satellite is an NRL effort designed to obtain rocket plume measurements from above the earth's atmosphere. The UVPI has a limited remaining life and, to date, has had only moderate success in obtaining plume data from targets of opportunity. SDIO is funding this project to take full advantage of the remaining life in the LACE satellite by dedicating a 3-stage STRYPI sounding rocket which will provide plumes for UVPI measurements. After motor burnout, the STRYPI payload would re-enter the earth's atmosphere at a velocity greater than 4.0 km/sec. Recent studies indicate, and preliminary measurements confirm, that the ultraviolet (UV) emission from shock heated atmospheric constituents should be intense and readily observable from above the ozone layer (40 km). Instruments provided by Utah State University's Space Dynamics Laboratory would be incorporated into the payload to make in situ measurements of the Bow-Shock UV radiation in conjunction with UVPI.

Due to the complexity of the UVPI sensor and limited redundancy due to constraints on the satellite, the expected lifetime of the UVPI sensor has been calculated to be between six months and one year. Because of the high cost of the satellite program (approximately \$108,000,000) and the limited expected life, SNL is pursuing this project in the most expeditious manner possible. SNL was requested by SDIO to participate due, in part, to the availability of spare hardware from an earlier SDIO program which launched an identical STRYPI rocket from KTF in 1988. These parts will greatly reduce fabrication time for a rocket system with the required characteristics. Even under these circumstances, the scheduled test date in February 1991 will mark

the one year anniversary of the satellite launch. Funding for the program is being provided by SDIO and the total anticipated cost of the effort is \$4,358,000.

RAP-501 is a separate experiment, to be flown from KTF on a NIKE rocket to impact in the Navy's BARSTER instrumented underwater range. The schedule for this experiment is not as critical as that for the STRYPI/LACE. Hydrophones would be utilized by the Navy to track the underwater trajectory of the vehicle and to aid in recovery of the payload. For the past several years, SNL has been developing a new weapon design suitable for high speed water or ice entry. The use of a pointed penetrator configuration for water entry is a departure from the more traditional blunt nose body, but this vehicle has characteristics that can reduce the cost and complexity while enhancing the overall performance. The current experiment is the fifth test series to demonstrate the new design. This flight marks the eleventh flight to water impact of the vehicle. The purpose of this test is to measure the base pressure at and during high velocity (1,000 feet per second) water entry, and to demonstrate an underwater recovery system which is designed to float the test unit back to the surface after water entry.

The development of the water entry vehicle is an internal research and development program funded by the DOE's Office of Military Application within Defense Programs. The RAP-501 field exercise is being conducted in conjunction with the STRYPI/LACE experiment in order to reduce cost by taking advantage of the jointly funded deployment of operational personnel. The estimated cost of the test is \$500,000. To date the total cost of the development program is approximately \$5,000,000.

The STRYPI/LACE vehicle will launch from Pad 1 and the RAP-501 will launch from Pad 19. Both of these pads are in the main launch field and both have been the site of numerous previous launches.

2.3 ALTERNATIVES ELIMINATED FROM CONSIDERATION

Consideration was given to launching the experiments from an alternative location. Flight safety constraints dictate that Wallops Island, Virginia, is the only other known, readily available, US launch location with existing STRYPI launch facilities which could support trajectories parallel to the LACE satellite orbit. Satellite expected lifetime and limited funding require that maximum utilization be made of existing hardware in the STRYPI rocket. Launching from Wallops Island would require a redesign of the rocket motor sequencer system and a complete re-engineering and validation of the navigation software. In addition, Wallops Island has no down range telemetry station to receive critical bow shock telemetry data during the third stage burn and resultant up range motor plume attenuation. The

facility also lacks the underwater hydrophone range required for the RAP-501 experiment.

Additional considerations which figured into the selection of KTF as the launch facility were the time saving that could be achieved from utilizing the engineering experience base which resulted when an identical STRYPI flew a nearly identical mission from KTF in 1988, and the presence of the LACE readout and satellite control facility on Maui which will take data and direct the satellite during the STRYPI flight. KTF has unique attributes that led the sponsors of the experiment to choose the facility for the campaign. Due to the constraints on the life of the LACE satellite, time is critical to success of the mission. There is no known alternate facility where flight hardware could be assembled and flown before the end of the expected satellite lifetime.

3.0 DESCRIPTION OF THE AFFECTED ENVIRONMENT

Kauai, with a total area of 627 square miles (1,620 sq km), is the fourth largest of the eight main islands of the Hawaiian archipelago. The island was formed by a single great shield volcano. Currently, tectonic activity is nearly absent in Kauai and the island is in Seismic Zone 0, a region expected to receive little or no damage from earthquakes. Northeasterly tradewinds prevail over Kauai during all months of the year.

The PMRF, within which the KTF is located, stretches eight miles (13 km) and is situated on the peripheral extension of the Mana Plain, a flat-lying coastal area, in a relatively flat, open park-like setting with a northeast to southwest orientation.

The majority of fauna on the KTF, which is regularly mowed, consists of an open, woody scrub or ruderal community of plants.

The air at the KTF is in attainment of all air quality standards promulgated by the EPA and the state of Hawaii.

4.0 ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION

4.1 ATMOSPHERIC EMISSIONS

The ADM and accompanying MTF cited above for the THORNY MERIT rocket launch operation from KTF conducted in January 1989 was approved as sufficient NEPA documentation by the DOE Albuquerque Operations Office in Oct. 20, 1988. The MTF dealt with utilization of the same STRYPI rocket system as that described in this EA and noted for this launch series that the effluents from the motors, which constitute the major environmental impact of such utilization, were exhaust gases and smoke of a type routinely encountered at FMRF.

Release to the atmosphere will take place for the first stage booster which consists of the simultaneous firing of a CASTOR motor and two RECRUIT motors. The second stage ANTARES motor and the third stage STAR motor will both have exoatmospheric burns and will consequently result in no release to the atmosphere. The CASTOR and RECRUIT motors burn immediately off the launcher and distribute exhaust products over the length of their respective burns. The RECRUITS burn for approximately two seconds until the vehicle reaches an altitude of approximately 505 feet. The CASTOR burn time is 40.7 seconds which distributes exhaust products to an altitude of 101,171 feet.

Exhaust components released to the atmosphere for STRYPI motors are as follows:

CASTOR (Total Propellant Weight = 7313 lbs.)

- 1) Al2O326.45 wt %
- 2) CO27.95 wt %
- 3) CO24.31 wt %
- 4) H22.45 wt %
- 5) H2O8.40 wt %
- 6) HCl21.71 wt %
- 7) N28.71 wt %

RECRUIT (Total Propellant Weight = 264 lbs.)

- 1) CO5.67 wt %
- 2) CO225.94 wt %
- 3) FeCl23.18 wt %
- 4) H20.43 wt %
- 5) H2O25.37 wt %
- 6) H2S4.25 wt %
- 7) HCl21.19 wt %
- 8) MgO0.96 wt %
- 9) N29.28 wt %
- 10) S22.51 wt %
- 11) SO21.26 wt %
- 12) Other0.14 wt %

Like the STRYPI, the environmental impact of the NIKE motors has been described in the environmental documentation cited above. As stated in the ADM for SNL rocket sled operations the major impact is the release of exhaust products to the atmosphere. These products are routinely encountered at PMRF. The NIKE booster of the RAP-501 represents an atmospheric burn of approximately 3.5 seconds. Exhaust products will consequently be distributed in the atmosphere from sea level up to an altitude of approximately 1300 feet.

Exhaust products for the NIKE motor are as follows:

NIKE (Total Propellant Weight = 750 lbs.)

- 1) CO54.36 wt %
- 2) CO218.12 wt %

- 3) H2 1.74 wt %
- 4) H2O13.01 wt %
- 5) N212.27 wt %
- 6) Pb0.50 wt %

Flotation in the recovery system is provided by a hot gas generator which is fueled by a small amount of ammonium nitrate. The combustion products of the gas generator are as follows:

Recovery System (Total Propellant Weight = 2.8 lbs.)

- 1) N229.96 wt %
- 2) CO4.49 wt %
- 3) CO231.93 wt %
- 4) H2 2.15 wt %
- 5) H2O27.53 wt %
- 6) NH30.78 wt %
- 7) CH40.01 wt %
- 8) Solids3.41 wt %

Due to prevailing northeasterly tradewinds in the vicinity of KTF, launch emissions are quickly dispersed and ambient concentrations diluted such that no air quality problems are anticipated. The atmospheric dispersion afforded by these conditions and the mobile source of the emissions are sufficient to minimize impacts on the environment. As shown in Section 4.9.2, even if all the propellant is consumed at once, Threshold Limit Values (TLV) are not exceeded.

The impact of the HCl of propellant exhaust concerning chlorine and its capability to catalytically destroy ozone is discussed in Appendix A.

An analysis of STRYPI trajectory data shows that most of the HCl in the rocket exhaust is emitted in the lower atmosphere where it is not of important concern. About 31% of the total HCl generated is injected into the upper atmosphere where 1) it would temporarily increase the burden in the upper atmosphere by less than one part in a million and 2) where the HCl is more efficiently removed by natural processes than most chlorine containing chemical species.

The lead content, amounting to 3.73 lbs., of the NIKE combustion product is the only identified item in the rocket emissions that represents a reportable release under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980. Releases of lead greater than one pound must be reported. Procedures are in place to properly report these releases to the National Response Center and through the DOE Albuquerque Operations Office to state of Hawaii and local response centers.

4.2 NOISE

While no direct measurements of noise levels have been made for either STRYPI or NIKE rockets at KTF, measurements for similar systems at other locations have indicated levels less than 115 dBA at one mile from the source. This data plus the short burn times of the first stage boosters, indicates it is highly unlikely that the launches will exceed the 115 dBA standard limit for 15-minute exposure for any exposed personnel. Earmuffs and earplugs would be used to mitigate occupational exposures as necessary (see 4.8 for further discussion).

There have been a large number of launches of each of these systems from KTF with no known complaints from the public regarding noise. For the proposed two rocket campaign, the nearest people without hearing protection would be located no less than 2,000 ft from the launch area.

Very little is known about the effect of launch noise on marine species. However, because the individual launch periods are of short duration and low frequency, the noise generated by the experiment is not expected to be of major consequence.

4.3 CULTURAL RESOURCES

Subsurface testing within the KTF has produced evidence of subsurface cultural materials. However, a 100 percent pedestrian survey of the KTF did not reveal any evidence of archaeological surface features or artifacts. Consultation is continuing with the Hawaii State Historic Preservation Officer so that archaeological resources are protected during any future construction activities. Because the proposed action does not involve any ground disturbing activities, no archaeological resources will be impacted due to the proposed activities. There is a potential for buried cultural resources and burial sites at the KTF. A burial treatment plan has been developed by the Commanding Officer, PMRF in consultation with the Hawaii State Historic Preservation Officer. The purpose of the plan, prepared in compliance with federal historic preservation statutes, is to assure dignified and culturally appropriate treatment of any native Hawaiian human remains inadvertently encountered as a result of construction projects, erosion, or any other natural or human activity. Cultural resource compliance documentation is contained in Appendix B.

4.4 BIOLOGICAL RESOURCES

The proposed action does not involve construction activities that would disturb topsoil and accompanying vegetation. Although nine federally listed threatened or endangered wildlife species are known to occur in the KTF area, no mitigation measures will be required as a result of these experiments.

Newell's shearwater (*Puffinus auricularis newelli*) is an endangered and threatened species with a known breeding range that includes Kauai. Newell's shearwater is a pelagic (open sea) species that comes to shore to breed from April to November. Adult and fledglings fly between nesting areas in the mountains and feeding areas in the ocean at night. The concern in regards to the rocket launching affecting the shearwater is that the birds may be attracted to project floodlights and be disoriented by the lights simulating the reflection of the moon on the water. This disorientation could cause the birds to collide with poles, power lines and trees as they fly at low elevations toward the light. However, because the proposed experiment is scheduled at a time when the birds do not come ashore, it will not be necessary to extinguish or shield floodlights or other non-essential lights.

Appendix C contains concurrence letters from the US Fish and Wildlife Service regarding recent biological assessments for the PMRF. The appended letter of July 20, 1990 states: "Unless absolutely necessary, flood lights and other non-essential lights should be extinguished during the few weeks each year when fledgling shearwaters fly from the upper interior portions of Kauai to the sea. This period is usually in the early Fall (October)."

4.5 SOCIOECONOMIC IMPACTS

The experiments involve no new construction activities and thus will not result in an influx of construction workers. During the KTF launches, 50-75 temporary professional or support personnel will be added to the existing KTF work force of 14 permanent staff personnel. The traffic volume increase in the local area during the operational phase will be both small and temporary in nature. Sufficient hotel and motel accommodations are available in the area to accommodate the influx of professional and support personnel during the launches. Thus, there will be no burden placed on the tourist industry.

4.6 LAND USE

Land use and recreational access to beach areas will be adversely affected when the rocket boosters are on the launch pad. The proposed experiments will restrict access for between 5-14 days. The Explosive Safety Quantity Distance (ESQD) for these motors is 1250 feet which requires that approximately 2500 feet of beach will be affected whenever motors are on the launcher. This distance represents approximately 1/16 of the PMRF beach front. The impact of the closure is minimized by the fact that this beach is not heavily utilized by the public and it is normally closed during PMRF duty hours. At one hour prior to launch approximately 3 miles of beach will be cleared of all personnel to accommodate a pie-shaped ground hazard area (GHA) which has minimum radius of 2000 feet around the launcher in the opposite

direction of the flight path. None of the closed area will extend beyond the boundaries of PMRF. This adverse effect is not considered to be major in view of the considerable alternate recreational access available at other locations on the island of Kauai.

4.7 COASTAL ZONE MANAGEMENT

DOE-supported activities at the KTF must be consistent with the federal consistency regulations found at 15 CFR Part 930 of the National Oceanic and Atmospheric Administration (NOAA). The State of Hawaii Coastal Zone Management (CZM) Program is approved by NOAA. Consequently, the CZM Program requires all federal activities affecting Hawaii's coastal zone to be consistent with the States's federally approved CZM program.

Appendix D contains a letter sent to SNL to the effect that the PMRF conducts planning, management, development, and regulatory activities consistent with the State of Hawaii CZM program. This determination applies to the KTF because the facility is a tenant of the PMRF.

4.8 OCCUPATIONAL SAFETY AND HEALTH

For all activities related to rocket launches and fuel handling and storage, the KTF complies with DOE, DoD, and US Navy safety requirements. Among these requirements are rules that establish safe separation distances for both ordnance workers and the general public as a function of the type and quantity of ordnance present.

Launch personnel would be protected by the launch operations building in the event of a post-launch rocket failure. All other personnel would be outside of the ground hazard area.

Although the noise emissions from 320 rocket boosters launched from the KTF over the past 28 years have not been individually monitored, a sophisticated computer model has been used to estimate noise levels as part of the site-wide EA currently being prepared. The model predicts that workers at the KTF launch complex could be subjected to unacceptable short-term (30 seconds or less) noise exposure. In those situations, noise exposures will be mitigated by the use of personal protective equipment (such as earplugs and earmuffs) for workers not protected from noise due to their work stations being located within the Launch Operations Building or other buildings.

4.9 OTHER SAFETY CONSIDERATIONS OF THE STRYPI/LACE AND RAP-501 ROCKET LAUNCHES AT THE KAUAI TEST FACILITY (KTF)

Hardware required at the KTF to support the STRYPI/LACE and RAP-501 rocket launches is shipped from Albuquerque, NM, in compliance with all Department of Transportation (DOT)

regulations. For the two subject programs, shipment will be by dedicated military aircraft. This shipment will arrive directly at the main runway of the PMRF and be transported by trained Navy personnel to the KTF (a maximum over the road distance of less than one mile).

Once equipment and personnel arrive at the KTF, the operation is timewise divided into three discrete parts as far as safety is concerned. The first part involves assembly of the rocket systems through placement on the launcher and countdown rehearsals. During this period, the rocket systems are physically separated from the electronics necessary for ignition (i.e. they are not armed). For the programs of interest, this portion of the operation extends for a nominal three week period. The second part consists of the last one to two hours of the individual countdowns during which time arming and launch of the rocket systems is accomplished. The third and final time part involves the actual flight. This time period is on the order of 25 seconds for RAP-501 and approximately twelve minutes for STRYPI/LACE. Each of these parts is discussed separately.

4.9.1 FIRST PART OF THE LAUNCH

The operations which occur during assembly of the rocket systems include such items as motor preparation, fin alignment, motor igniter installation, payload assembly and performance verification, installation of electro-explosive devices, assembly of the payload to the upper stages, pressurization of attitude control systems, and placement of the rocket system on the launcher. Finally, rehearsal countdowns are performed in preparation for the actual launch. Hazardous operations performed include such items as lifting of rocket motors with cranes and hoists, lifting of inert hardware with these same cranes and hoists, continuity measurements of bridgewires associated with the electro-explosive devices, application of high pressures, hands on operations involving the motors and electro-explosive devices, etc.

Assurance of safe operations is accomplished through implementation of procedures such as load testing of all cranes, hoists, and handling equipment; proof testing all pressure systems; isolating stray voltages from all the explosives through shorting, shielding, and grounding; precluding the application of power or any power switching to the rocket system with any personnel in defined hazard areas; and precluding high intensity radiation sources from being utilized in proximity to any explosives. Field meters in the launch area continually monitor for incipient lightning and detected voltage potentials above a prescribed threshold (2000 V/m) require cessation of all work on explosives in buildings which are not constructed as grounded metal shells. Guidance for the application of preventive measures to assure safe operations is found in Sandia National Laboratories Environment Safety and Health Manual (SAND88-1161)

and the DOE Explosives Safety Manual Revision 5, May 1990. In addition, Safe Operating Procedures (SOPs) are generated unique to each test program. For each program of interest, a "top SOP" has been generated identifying hazards unique to it. Subservient SOPs are then written containing procedures to mitigate these hazards. For STRYPI/Lace, 14 SOPs exist to mitigate these hazards. For RAP-501, the number is eight. All of these procedures have been approved by supervision responsible for the operation as well as Sandia National Laboratories Safety Engineering Division.

4.9.2 SECOND PART OF THE LAUNCH

During the second part of the launch, the last one to two hours of the individual STRYPI/LACE or RAP-501 final countdowns, the rocket systems sequentially undergo preliminary and final arming. Preliminary arming involves completion of required firing circuits by inserting a plug in the flight fireset associated with the upper stages of the rocket system (RAP-501 is a one-stage system). Even then, these stages are precluded from firing by a relay in a control box which must be activated during a later portion of the countdown and an acceleration switch which must sense motion of the rocket system. No single order failure can cause a catastrophic failure. The final portion of the countdown involves completing firing circuits of the first stage motor by insertion of a plug in the first stage fireset which is in an auxiliary building approximately 60 feet from the rocket system.

During first stage arming of either of the rocket systems, a key necessary for power to be applied to the fireset as well as a required relay closure is under the positive control of a Test Director in the Launch Operations Building. Only three people are in proximity to the rocket system during any arming procedure: a Pad Chief responsible for overall safety, the person performing the arming, and a third person checking that the arming SOPs are being appropriately followed. All other personnel are either in the Launch Operations Building or far enough from the rocket system to be considered in a nonhazardous area.

By-products of a STRYPI/LACE premature detonation on the launch pad would be blast and debris and an exhaust plume. The Launch Operations Building is designed to withstand a 3 psi overpressure from a premature detonation. The total propellant weight associated with STRYPI/LACE is approximately 11,000 pounds. A premature detonation on the pad of STRYPI/LACE would induce pressure loading on the Launch Operations Building of less than 1 psi. A minimum factor of safety afforded to personnel contained in the building would be three. All building occupants are afforded fragmentation protection against any debris which would result from a detonation in the launch field. No risk would occur. The RAP-501 would burn (as opposed to the detonation on

the pad that would occur with the STRYPI/LACE) and would be of no safety concern to occupants in the Launch Operations Building.

The major products from the combustion of the rocket motors due to a premature pad detonation associated with STRYPI/LACE would be oxides of nitrogen, hydrogen chloride, aluminum oxide, iron oxide, magnesium oxide, carbon dioxide, and carbon monoxide. A nominal wind speed at launch might be 3.7 m/s. Two commonly utilized standards by which hazardous concentrations are measured in toxic plumes are the short term Immediately Dangerous to Life and Health (IDLH) level, above which exposure for any period greater than five minutes is unacceptable, and the Threshold Limit Value (TLV), which is the eight hour time-weighted average occupational level. The plume from a catastrophic rocket failure would involve a large thermal pulse with resulting cloud lofting and would be characterized by a rapid dispersion of combustion products measured in minutes as opposed to hours. Concentration values at distances from a postulated accident scene were determined assuming a Gaussian puff dispersion for each of the three major plume constituents which are Al₂O₃, NO₂, and HCl. These calculations show that the IDLH values would not be reached, even within the 2000 ft boundary of the Ground Hazard Area (GHA) for either NO₂ or HCl. An IDLH value has not been published for Al₂O₃. Time weighted average exposures were calculated in the worst case downwind direction for comparison with the TLV at the boundary of the 2000 ft GHA for all three major components. The calculations show that no TLVs would be exceeded for exposure times equivalent to those for determining TLVs. The model outputs are summarized in the following table and indicates that catastrophic failure of the rocket system would not result in unacceptable exposure of unprotected personnel.

CATASTROPHIC ROCKET FAILURE
ESTIMATED PRODUCT COMPONENT CONCENTRATIONS

Constituent	IDLH (ppm)	IDLH Distance From Accident (Feet)	Average Exposure At GHA Boundary (ppm)	TLV (ppm)
NO ₂	150	*	2.6	5
HCl	150	*	2.5	5
Al ₂ O ₃	N/A	N/A	0.5	9

* IDLH values never reached

Since the Ground Hazard Area is cleared of all nonessential personnel prior to launch activities, no individuals will be exposed to concentrations greater than either the IDLH or the TLV. Essential operational personnel are protected inside structures where the intake of outside air is curtailed during an accident situation. During all launch operations at KTF, both

Explosive Ordnance Disposal (EOD) and Fire Protection teams with breathing apparatus are available at the GHA boundary for emergency response and rescue operations. Communications are maintained with local radio nets, telephones and a site-wide public address system.

4.9.3 THIRD PART OF THE LAUNCH

The third part of the launch operations involves flight safety. This portion begins with the successful initiation of a flight. Flight safety at the KTF is the responsibility of the Navy. The PMRF is subservient to the Pacific Missile Test Center (PMTIC) at Pt. Mugu, CA. Sandia National Laboratories has prepared a flight safety package for both STRYPI/LACE and RAP-501 and has submitted them to the PMTC for approval. PMTC administratively provides flight approval for operations on the PMRF and supports these operations by having a flight safety officer at the PMRF during launch. For STRYPI/LACE, this flight safety officer will be with Sandia personnel in the KTF Launch Operations Building.

Before a countdown begins for a launch, the Navy sends out a surveillance aircraft to look for shipping in the predicted impact areas for the various rocket motor stages and the payload. A notice to mariners is always put out by the Navy several days in advance of the launch operation. If the rocket flight poses a safety hazard to any shipping located by the aircraft in the predicted impact areas, the Navy orders the launch attempt aborted. STRYPI/LACE is much more complex than the RAP-501 rocket test and an onboard computer provides flight control. If the computer malfunctions, i.e. the rocket is not properly pointed, the ground command which permits the flight to proceed will not be transmitted to the rocket and the flight will be aborted.

Mitigation of accident potential, to the maximum extent possible, is accomplished through planned and approved procedures, equipment qualification, facility design, and Navy range surveillance. Sandia has produced two probabilistic calculations which quantify the anticipated success of these mitigation measures. The first is the probability of some portion of the rocket system impacting land. The second is the probability of a fatality to a non-participant. Under any circumstances, the maximum probability of land impact is less than 7 in 10,000 and the maximum probability of injury or death to a non-participant is less than 3 in 10,000,000 for STRYPI/LACE. Both of these values are 0 for RAP-501. These calculations are based upon analyses performed by staff at SNL, Albuquerque.

5.0 CONCLUSIONS

No significant environmental impacts would result from the proposed action. This project will have no adverse effect on significant cultural resources. As the federal "lead agency" for the KTF, the DOE is responsible for protecting prehistoric and historic resources that may be disturbed by construction or operations.

The proposed action involves no construction. Appendix B contains a letter (January 7, 1991) which states:

". . . that the launch scheduled for the 15th of February has been the type of launch that has taken place since ca. 1963. It is our understanding that this project and similar launches involve no new ground disturbing activities. Therefore, it will have "no adverse effect" on significant historic sites."

The project will have no adverse effect on threatened or endangered species. The DOE must comply with the Endangered Species Act (ESA) when planning federal actions or "major construction activities." The key provision of the Act for federal activities is the Section 7 Consultation. Under Section 7 of the Act, federal agencies are to consult with the US Fish and Wildlife Service to ensure that any agency actions are "not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species." Appendix B contains letters demonstrating that for the KTF proposed rocket launches, the DOE is following the compliance and consultation process known as the "Section 7 Process." Biological assessments completed for other Federal projects such as STARS (strategic target system) and EDX (exoatmospheric discrimination experiment) in combination with reports on botany, ornithology, and green sea turtles that have been prepared for the DOE KTF site-wide EA indicate that everything has been done, or is being done to assure compliance by the KTF with the ESA for the proposed rocket campaign as well as for future actions to be covered by the site-wide EA. The letter of January 10, 1991 from the US Fish and Wildlife Service states that:

"Unless significant changes are made in the Facility plans or operations which may affect listed species in ways not addressed in the STARS and EDX documentation and in the three survey reports referenced above, no further consultation with this Service is required."

NOTES

A detailed draft site-wide environmental assessment "**Kauai Test Facility (KTF) Environmental Assessment**" is currently being prepared. The site-wide EA examines the potential effect of all rocket systems proposed for launching at KTF. Several issues discussed in this EA are covered more comprehensively in the draft site-wide EA.

An Environmental Assessment for the STARS rocket program was conducted by the U.S. Army Strategic Defense Command. In Section 3.6 on Launch/Flight/Data Collection the Assessment considered the cumulative impact of launching four STARS, three EDX, an unspecified number of Navy rockets, and five KTF small rockets of the type proposed for STRYPI/LACE and RAP on Air Quality, Biological Resources, Cultural Resources, Public Health and Safety, Land Use and Noise. The STARS EA resulted in a Finding Of No Significant Impact (FONSI) which was signed by Lieutenant General Robert D. Hammond, Commander, Strategic Defense Command on August 4, 1990. Only two STARS and four KTF launches of small rockets, including STRYPI/LACE and RAP are tentatively scheduled during the upcoming twelve month period. Since this is below the benchmark level of activity examined in the STARS EA, the environmental impact would be even less than those which resulted in the STARS FONSI. No other potential environmental issues have been identified.

APPENDIX A

CONSIDERATION OF THE IMPACT OF THE HCL COMPONENT OF
PROPELLANT EXHAUST ON THE ENVIRONMENT

APPENDIX A: CONSIDERATION OF IMPACT OF THE HCL COMPONENT OF PROPELLANT EXHAUST ON THE ENVIRONMENT

Chlorine is a natural component of ocean water (salt: NaCl). Massive amounts of chlorine are injected into the atmosphere every second in the form of mist from ocean spray. As mist droplets are carried by atmospheric currents away from the ocean surface, they evaporate, leaving particles of NaCl suspended in the air. As a result, NaCl is a significant component of the global background aerosol in the lower atmosphere (troposphere).

The concern about chlorine, however, is not in the troposphere, but in the atmosphere, where chlorine is capable of catalytically destroying ozone. Just as ocean spray generates NaCl, precipitation removes it. It takes so long to migrate to the stratosphere, and precipitation is so efficient at bringing it back to the surface, that very little NaCl ever gets to the stratosphere where it could break down into its components and do damage.

A similar situation exists for HCl generated in the troposphere, that is, below the tropopause. In the troposphere, precipitation is frequent, and because HCl is highly soluble in water, its lifetime is short. Thus, if HCl is emitted in the troposphere, it is quickly removed by natural processes much like sea salt, and poses no hazard to stratospheric ozone. Note that the reason a similar argument does not hold for chlorofluorocarbon compounds is that they are not efficiently removed from the troposphere by precipitation.

An analysis of the STRYPI trajectory data shows that most of the HCl in its exhaust is emitted in the troposphere. At the latitude of Kauai, the tropopause is at about 15 km (49,200 ft.). It takes the STRYPI 28 seconds to reach that altitude. All the HCl that is emitted up to that altitude is injected into the troposphere and is not of significant concern. What is emitted above that altitude is the material of concern. Since the stage containing the HCl-producing propellant burns out in 40.7 seconds, and since it burns at a constant rate, only 31 % of the total HCl generated is injected into the stratosphere. Consideration of the total weight of propellant burned, the fraction of the propellant mass which is emitted as HCl, and the fraction of that which is injected into the stratosphere lead to the conclusion that only 224 kg of HCl is of concern.

There are several ways of evaluating the impact of this magnitude of injection of HCl on the stratosphere. First, consider that the concern is global in nature. Hence, it is pertinent to compare this quantity of HCl with the amount of HCl already present in the stratosphere. Estimates of that number can be made on the basis of measured stratospheric HCl concentrations. A number of experimenters have found that the HCl volume mixing ratio in the stratosphere is about 5 times 10^{-10} to the minus 10 (Good, 1985), which converts to about 6.3 times 10^{-10} to the minus 10 mass ratio (the mass of HCl is 6.3 times 10^{-10} to

the minus 10 times the mass of air in the stratosphere). Using a standard reference atmosphere (Champion et al, 1985), we roughly estimate the mass of stratospheric air to be 6.8 times 10 to the 17th kg. Thus, the stratosphere presently contains about 4.3 times 10 to the 8th kg of HCl. Hence, a STRYPI launch would temporarily increase the stratospheric burden of HCl by less than one part in a million. (HCl is more efficiently removed from the stratosphere by natural processes than most chlorine-containing chemical species).

Another way of putting the injection of HCl into perspective is by noting that there is a continuous natural input of chlorine into the upper atmosphere by the solar wind. The sun continuously sheds mass in the form of a radial flow of ionized atoms. Some fraction of those atoms are chlorine atoms.

Yet a further way of putting the injection of HCl into perspective is by comparing it to the total annual production of chlorine in the form of chloroflorocarbons. Virtually all of this material can be expected to eventually find its way to the stratosphere.

Having compared the stratospheric HCl injection from a STRYPI launch with the HCl already in the stratosphere and with other flows of chlorine to the stratosphere, the conclusion that one reaches is that this injection is insignificant.

REFERENCES

- Good, R. E. (1985). Section 21.2 of "Atmospheric Composition" in Handbook of Geophysics and the Space Environment, A. S. Jura, Ed., Air Force Geophysics Laboratory.
- Champion, K. S. W. et al (1985). "Standard and Reference Atmospheres" in Handbook of Geophysics and the Space Environment, A. S. Jura, Ed., Air Force Geophysics Laboratory.

APPENDIX B

CONCURRENCE LETTERS FROM THE HAWAII STATE HISTORIC
PRESERVATION OFFICER (SHPO) - CULTURAL RESOURCES

JOHN WAINHEE
GOVERNOR OF HAWAII



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
STATE HISTORIC PRESERVATION DIVISION
23 SOUTH KING STREET, 8TH FLOOR
HONOLULU, HAWAII 96813

WILLIAM W. PATY, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

DEPUTIES

KEITH W. AHUE
MAMABU TAGOMORI
RUBELL N. FUKUMOTO

AGRICULTURE DEVELOPMENT PROGRAM
CLIMATE RESOURCES
CONSERVATION AND ENVIRONMENTAL AFFAIRS
OBSERVATION AND RESOURCES ENFORCEMENT
OCEANOGRAPHY
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION PROGRAM
LAND MANAGEMENT
STATE PARKS
WATER RESOURCE MANAGEMENT

January 7, 1991

Harold L. Rarrick
Member of Technical Staff
Project Engineering Division 7501
Sandia National Laboratories
Albuquerque, New Mexico 87185

Dear Mr. Rarrick:

SUBJECT: National Historic Preservation Act Compliance
Kauai Test Facility (PMRF)

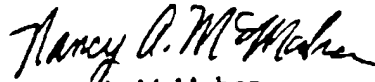
This letter is in response to your phone call of January 4th, 1991, regarding NHPA Compliance. On Friday, January 4th, 1991, I received a fax from Advance Science, Inc. (Tirzo Gonzales). The fax contained amended pages of the Archaeological Survey and Testing Report (August 1990), which our Division requested in a letter to Albert Chernoff on November 5, 1990. The State Historic Preservation Division, Department of Land and Natural Resources, State of Hawaii, will write a letter to Mr. Chernoff from William Paty, the SHPO, informing him of the corrected information and compliance.

I will also inform Mr. Chernoff that, that the launch scheduled for the 15th of February, has been the type of launch that has taken place since ca. 1963. It is our understanding that this project and similar launches involve no new ground disturbing activities. Therefore, it will have "no adverse effect" on significant historic sites.

Page 2.

I hope this letter addresses your concerns. If you have any questions please call me at (808) 587-0047.

Sincerely,



Nancy A. McMahon
Staff Archaeologist
State Historic Preservation Division

777



STATE OF HAWAII
 DEPARTMENT OF LAND AND NATURAL RESOURCES
 STATE HISTORIC PRESERVATION DIVISION
 33 South King Street, 6th Floor
 Honolulu, Hawaii 96813

REF: HP-JE

NOV 5 1990

Albert Chernoff
 Director, Management Support Division
 Department of Energy
 Albuquerque Operations Office
 P.O. Box 5400
 Albuquerque, New Mexico 87115

Dear Mr. Chernoff:

SUBJECT: National Historic Preservation Act Compliance -- EDX
 Archaeological Survey and Testing Report Department of
 Energy, Kauai Testing Facility (Advance Science, Inc.
 and International Archaeological Research Institute,
 Inc. August 1990)
 Sandia National Laboratories
 Mana, Waimea, Kauai

Thank you for your submittal and letter of September 20, 1990,
 which we received on October 11, 1990.

We believe that the surface of the project area as stated in this
 report was adequately surveyed, and no archaeological sites were
 found on the surface. We agree that the archaeological testing
 found no burials or sites. Because subsurface testing was
 limited, additional testing would still be necessary if plans
 exist for ground disturbance outside of where subsurface testing
 had taken place. Specifically, we believe that further work is
 needed to evaluate the possibility of a subsurface historic
 deposit near the vicinity of bore holes #3 and #4. Findings will
 need to be submitted in report format. If no deposit is found
 then, we can agree that no historic sites are present in the
 project area.

However, a few burials may possibly be inadvertently found during
 future construction improvements. We agree, as a precaution for
 possible unknown burials being found, that an archaeological
 monitor should be present during all ground disturbing
 activities. Also, a burial treatment plan should be in place in
 case burials are uncovered. The MOA for burial treatment on the
 base is not yet finalized, so if construction activity occurs
 before the finalization of the MOA with the Navy, then a specific
 plan will need to be devised for this project and be approved.
 Also, a monitoring report will be needed.

WILLIAM W. PATE, CHAIRPERSON
 BOARD OF LAND AND NATURAL RESOURCES
 4019 DU
 HONOLULU

KEITH W. ANUI
 MANABU TALOMORI
 RUSSELL W. FURUMOTO

AGRICULTURE DEVELOPMENT
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 DIVISIONS
 FOREST AND WILDLIFE
 HISTORIC PRESERVATION
 PROGRAM
 LAND MANAGEMENT
 STATE PARKS
 WATER AND LAND DEVELOPMENT

Tom

*Tah
John O
B...*

APPENDIX

APPENDIX

MINOR COMMENTS ON ARCHAEOLOGICAL REPORT
FOR
KTF, DEPARTMENT OF ENERGY, KAUA'I

1. On page 18, a correction should be made; Bennett's sites 1-5 are no longer listed in the Na Pali Coast Archaeological District. This district ends at Milolii. These sites should be corrected and added to the list of sites in the area.
 2. The title page does not list the authors of this report. We need to know who were the authors, along with their degrees. The report only indicates Advance Science. The EDX report must also list authors.
 3. Unrecorded sites (page 13 & 14) should be given SHPD numbers. Call our office for numbers. This can be included with corrections.
-

APPENDIX C
CONCURRENCE LETTERS FROM FEDERAL AND STATE AGENCIES
REGARDING THREATENED AND ENDANGERED SPECIES



United States Department of the Interior

FISH AND WILDLIFE SERVICE
PACIFIC ISLANDS OFFICE

P.O. BOX 20127
HONOLULU, HAWAII 96820

10 JAN 1981

Mr. Albert Chernoff
Director, Management Support Division
U.S. Department of Energy, Albuquerque Operations Office
P.O. Box 5400
Albuquerque, New Mexico 87115

Dear Mr. Chernoff:

International Technology Corporation (IT) is in the process of preparing an environmental assessment for the development and use of the Sandia National Laboratories' Kauai Test Facility (Facility) at Barking Sands, Hawaii. Ms. Lucille Bambray of IT has provided us copies of botanical, ornithological, and sea turtle survey reports. In addition, we have reviewed biological assessments prepared by the Army for both the Strategic Target Systems Project (STARS) and the Exoatmospheric Discrimination Experiment (EDX)

After review of the documents and other information in our files, it is our belief that listed species of plants and animals which may be found in the vicinity of the Facility will not be adversely affected by the activities proposed at Barking Sands. This is with the understanding that floodlights will only be used on the beach for short periods and for specific purposes. Limiting the use of lights on the beach will help greatly in reducing any chance that nesting or hatching sea turtles will be disoriented due to the illumination.

Unless significant changes are made in the Facility plans or operations which may affect listed species in ways not addressed in the STARS and EDX documentation and in the three survey reports referenced above, no further consultation with this Service is required.

Thank you for allowing us to review the reports and plans. If we can be of further assistance, please contact us again.

Sincerely yours,

Ernest Kosaka
Field Office Supervisor
Fish and Wildlife Enhancement

cc: R. Hansen, IT, Englewood, CO



INTERNATIONAL
TECHNOLOGY
CORPORATION

January 7, 1991

T.A. Wolff, Ph.D.
Sandia National Laboratories
Division 3223
Albuquerque, New Mexico 27185

301182.24.01

Archeological and Threatened/Endangered Species
Concurrences for STRYPI/LACE Experiment
Kanai Test Facility, Hawaii

Dear Dr. Wolff:

It is our understanding that the STRYPI/LACE experiment will be flown on a STRYPI rocket system at the Kauai Test Facility (KTF) in February 1991. Further, we understand that Sandia National Laboratories (SNL) is preparing a "mini" environmental assessment (mini-EA) with the intent of satisfying the requirements of the National Environmental Policy Act (NEPA). The purpose of this letter is to document activities that have taken place, or are in progress, regarding compliance by the KTF with the National Historic Preservation Act (NHPA), the Endangered Species Act (ESA), and other related federal and state statutes or regulations.

A report entitled "Archeological Survey and Testing, Department of Energy, Kauai Test Facility, Kanai, Hawaii, Prepared as Supplement for the Kanai Test Facility Environmental Assessment" was submitted to the Hawaii State Historic Preservation Division on September 20, 1990 by Mr. Albert Chernoff of the DOE Albuquerque Operations Office Management Support Division (MSD). In his letter of November 5, 1990 to Mr. Chernoff, William W. Pary, the State Historic Preservation Officer (SHPO), concurred with the survey's finding that no archeological sites were located on the surface or as indicated by limited subsurface testing that would be impacted by the KTF program. Mr. Pary qualified this concurrence by pointing out that additional subsurface testing would be required prior to further subsurface disturbance and that archeological monitoring should be conducted during all future ground disturbance activities. The SHPO also made minor comments pertaining to recommended revisions of the report. The November 5 letter inadvertently referred to "EDX" rather than "KTF."

Regional Office

5000 South Quebec Street • Suite 280D • Englewood, Colorado 80111 • 303-694-0044

T.A. Wolff, Ph.D.

2

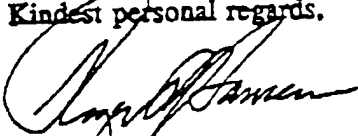
January 7, 1991

Our office contacted Ms. Nancy McMahon, a State staff archeologist for Kauai County, on January 4, 1991 to obtain an interpretation of the November 5, 1990 letter from Mr. Pary regarding the need for additional subsurface testing and to assure that SHPO concurrence would be broad enough to cover all KTF activities including the STRYPI/LACE experimental launch. Ms. McMahon confirmed that the SHPO will provide the needed concurrence (i.e., that there would be no significant archeological effects) for activities not involving new construction or subsurface disturbance. She will send a letter to Harold Rarrick of SNL/Albuquerque stating that the NHPA process has been complied with for launch activities which do not involve subsurface disturbance and of the type that have historically been conducted at the KTF since 1962. This will be followed up by a "formal" concurrence from Mr. Pary although this will not be signed in time for the STRYPI/LACE launch. In the meantime, Advanced Sciences, Inc. (ASI) will revise the KTF archeological report to incorporate the revisions suggested in Mr. Pary's November 5 letter. While this will "finalize" the report, acceptance by the State of a "final" report is not the equivalent of a concurrence that archeological sites will not be significantly impacted; these are two different processes.

With respect to threatened or endangered species, the Honolulu office of the U.S. Fish and Wildlife Service has preliminarily indicated to our office that the STARS and EDX Biological Assessments, in combination with reports by our biological consultants (Brock and Funk) on vegetation, ornithology, and green sea turtles, should suffice as compliance by the KTF with the Endangered Species Act. We have requested that they send a letter similar to that sent to Col. Arnold Gaylor of the Army Strategic Defense Command on July 20, 1990 on EDX and STARS. We are continuing to follow-up with the Fish and Wildlife Service.

It is our opinion that everything possible has been done, or is being done, to assure compliance by the KTF with the NHPA and the ESA in time for the STRYPI launch in February. We will continue to follow up on the contacts we have been making over the past several months.

Kindest personal regards.



Roger P. Hansen
Environmental Attorney

RPH:tkh

(SNLaar1)



INTERNATIONAL
TECHNOLOGY
CORPORATION

October 22, 1990

Mr. William Kramer
Deputy Field Supervisor
U.S. Fish and Wildlife Service
Pacific Islands Office
P.O. Box 50167
Honolulu, Hawaii 96850

301182.24.01

Transmittal
Botanical and Ornithological Survey Reports
Kauai Test Facility
Sandia National Laboratories
Kauai, Hawaii

Dear Mr. Kramer:

Enclosed for your review are copies of "Botanical Survey of the Kauai Test Facility Site, Barking Sands, Kauai, Hawaii" and "Ornithological Survey Report of the Kauai Test Facility Site, Barking Sands, Kauai, Hawaii." These reports were prepared by Evangeline Funk, Ph.D. for IT Corporation during the preparation of the Environmental Assessment (EA) for Sandia National Laboratories' Kauai Test Facility (KTF).

The reports address vegetation types at the KTF, floral species, bird and mammal species, and species of note, such as the Category 1 Proposed endangered species *Ophioglossum concinnum*, which occur at the KTF. Dr. Funk observed the marked location of the *O. concinnum* colony previously recorded within the KTF. Because of the dry conditions, no extant plants were observed. Moving the entire *O. concinnum* colony (after a wet period when they are visible) to a compatible area within the Pacific Missile Range Facility (PMRF) is recommended because of their proximity to a beach access road and their location in a frequently mowed kiawe/koa-haole vegetation zone.

Please review and provide any comments at your earliest convenience. Information with respect to floral and faunal resources will be included in the EA to be provided by Sandia National Laboratories. Because the KTF is within a State of Hawaii "Conservation District," a copy of



INTERNATIONAL
TECHNOLOGY
CORPORATION

October 22, 1990

Mr. William Kramer
Deputy Field Supervisor
U.S. Fish and Wildlife Service
Pacific Islands Office
P.O. Box 50167
Honolulu, Hawaii 96850

301182.24.01

Transmittal
Green Sea Turtle
Survey Report for Kauai Test Facility
Sandia National Laboratories
Kauai, Hawaii

Dear Mr. Kramer:

Enclosed for your review is a copy of "A Survey of the Green Sea Turtle Population Fronting the Kauai Test Facility, Pacific Missile Range, Barking Sands, Kauai: An Analysis of Potential Impacts with Implementation of the Strategic Defense Initiative." This report was prepared by Richard Brock, Ph.D. for IT Corporation during the preparation of the Environmental Assessment (EA) for Sandia National Laboratories' Kauai Test Facility (KTF). The threatened green sea turtle is a faunal species of concern at the KTF because of the lack of previous information with respect to its presence at or near the facility.

Dr. Brock's team recorded at least 32 green sea turtles at up to five locations on two subsequent days of field work. Some of the individual turtles were undoubtedly recorded more than once as they moved from foraging to rest areas and offshore waters. Dr. Brock concludes that construction of an additional launch pad and conducting further launches similar to those historically conducted at the KTF since 1962 will probably not have any quantifiable impacts on green sea turtles residing in waters near the KTF. No specific mitigation measures are recommended.

Please review and provide any comments at your earliest convenience. Information with respect to other threatened or endangered faunal species known to exist at or near the KTF will be included in the EA to be provided by Sandia National Laboratories. Because the KTF is within a State of Hawaii "Conservation District," a copy of Dr. Brock's report is being sent to the



United States Department of the Interior

FISH AND WILDLIFE SERVICE
PACIFIC ISLANDS OFFICE

P.O. BOX 50167
HONOLULU, HAWAII 96850

DEC 0 1990

28 NOV 1990

Ms. Lucy Hackett Bambrew
Environmental Compliance Specialist
International Technology Corporation
5600 South Quebec Street, Suite 250D
Englewood, Colorado 80111

Dear Ms. Bambrew:

This responds to your October 22, 1990 request for our review of the botanical and ornithological survey reports prepared for the Kauai Test Facility (KTF) at Barking Sands, Kauai, Hawaii.

While the botanical report has some typos, incorrect authorities and citations, and other minor errors, the list of plants appears to be accurate and current.

The ornithological survey adequately lists species found in the area. However, the Introduction and Methods section of the report states that relative densities of bird species at the study site were determined by several circular plot censuses. No such densities were presented and there is no statistical analysis of the populations of birds which may be found at KTF. If, in fact, the circular plot method was used, the results should be included.

Thank you for allowing us to review the reports.

Sincerely yours,

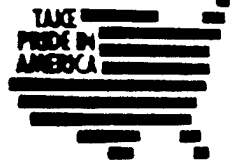
Ernest R. Kosaka
807 Ernest Kosaka
Field Office Supervisor
Fish and Wildlife Enhancement



United States Department of the Interior

FISH AND WILDLIFE SERVICE
PACIFIC ISLANDS OFFICE

P O BOX 50167
HONOLULU, HAWAII 96850



July 20, 1990

Colonel Arnold H. Gaylor
Deputy for Operations
U. S. Army Strategic Defense Command - Huntsville
P. O. Box 1500
Huntsville, Alabama 35807-3801

Attention: Environmental Office

Dear Colonel Gaylor:

This replies to your July 9, 1990 request for our review of the Biological Assessment for the Exoatmospheric Discrimination Experiment (EDX). It was delivered here on July 17, 1990 by Mr. Randy Gallien of your staff.

As noted in the Assessment, there are eight endangered and one threatened species (all animals) which can be found in the general area of the Pacific Missile Range Facility on Kauai. Eight of the species are under this Service's jurisdiction and are the subject of this response; the ninth species, the humpback whale, is under the jurisdiction of the National Marine Fisheries Service.

Two plants that are candidates for listing can also be found within the general project area.

We concur with your determination that the construction and operation of the EDX project will not affect seven of the eight species. These are the:

Hawaiian coot	Hawaiian hoary bat
Hawaiian common moorhen	Hawaiian monk seal
Hawaiian stilt	Green sea turtle
Hawaiian duck	

We also concur with your determination that although the eighth listed species, the threatened Newell's Townsend's shearwater, may fly over the site and may be affected by the lights as described in the Assessment, the mitigation offered of shading the lights and other measures to reduce upward light will greatly reduce the chances for birds being adversely affected to any appreciable degree. We recommend that the following mitigation be implemented to further reduce the chances for any adverse impact on shearwaters:

1. Unless absolutely necessary, flood lights and other non-essential lights should be extinguished during the few weeks each year when fledgling shearwaters fly from the upper interior portions of Kauai to the sea. This period is usually in the early Fall (October). The State's District Wildlife Biologist in Lihue can be consulted annually for more specific dates.

2. Although the security fence planned as part of the project will aid any shearwaters which may land within fenced areas by excluding such predators as dogs, the birds may fly into the fences if they are flying at low elevations. Security guards and other appropriate staff should be instructed to inspect fence lines during the fledging season and pick up any grounded shearwaters. Shearwaters can be turned over to "aid stations" established around the island during those weeks to collect, treat, and release "fallout" fledglings. A record of any such birds collected should be provided to the State's District Biologist and to this office.

The Assessment also identified that two species of plants which are Category I candidates for listing as endangered (Ophioglossum concinnum and Sesbania tomentosa) can be found within the Barking Sands facility. Of these, only Ophioglossum will be affected by the proposal. We were pleased that you adjusted your project design so that as few of these plants as possible will be adversely affected. The transplanting program helps to mitigate the loss of plants which will be destroyed during construction.

Both of the candidate plants are scheduled to be proposed for listing as endangered in 1992. Once a species is proposed for listing, you must consider the possible impacts of any further federal actions on them and may be required to formally confer with this Service.

Thank you for allowing us to review your proposal. Should you have any questions or comments, please contact us again.

Sincerely yours,



William R. Kramer
Acting Field Office Supervisor
Fish and Wildlife Enhancement

APPENDIX D

HAWAII STATE COASTAL ZONE MANAGEMENT COMPLIANCE LETTER